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Agricultural Policy, Gravity and Welfare*†

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Abstract

This paper relies on recent developments in the gravity literature to estimate welfare (terms of trade) effects from the removal of trade barriers and domestic production support in the world. In a fully estimated (rather than calibrated) general equilibrium setting, we obtain terms of trade indexes for several agricultural commodity categories including Grains, Rice, Sugar and Wheat and sixty nine countries in 2001, and we decompose the incidence of these effects on the consumers and the producers in the world. Our results suggest that, in addition to helping domestic producers, trade policies and production subsidies in developed countries have significant indirect effects on producers and consumers in the rest of the world. In addition, we find significant variability in the welfare implications across commodities. Our findings suggest that any trade policy or production support recommendation should be product specific and should take into account the indirect effects on the rest of the world, which, for various reasons, often involve small, less developed nations.

JEL Classification Codes: F13, F14, F16
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1 Introduction

For most poor countries agricultural is a critical industry in that it is both an important source of income and accounts for a substantial share of household expenditures. Despite the fact that 90% of the world's farmers live in developing countries, world agricultural markets are often shaped by the policies of a few rich countries. While it is clear that the existing system of subsidies and trade barriers has significant effects on prices of agricultural commodities there is no consensus on whether these effects have a positive or a negative impact on the poor nations.[1] Such disagreements and lack of clarity about the possible effects of cuts in tariffs and trade-distorting subsidies may explain the long "modalities" phase (since July 2004) for the "framework agreement" on agriculture reached at the Doha Round of trade negotiations.

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[2] that improve on existing partial and conditional general equilibrium studies[3] in two important ways: First, these

[1]For example, Panagariya (2002) states that "assertions. . . that subsidies and other interventions in agriculture in the OECD countries are hurting the poor countries are not grounded in facts," he continues, to conclude that "the claim that the change [in OECD policies] will bring net gains to the least developed countries as a whole is at best questionable and at worst outright wrong" (p.9). In a cross-country study McMillan et al (2007) provide empirical support that OECD policies do not hurt welfare and do not worsen poverty in developing nations. In addition, some computable general equilibrium (CGE) studies, for example Harrison et al (1997) and Hertel et al (1998), find evidence for negative effects of trade liberalization in the developed world on the poorest nations. On the opposite side of the spectrum we find a series of CGE studies (see for example Beghin et al, 2002 and Anderson et al, 2001 among others) that estimate economically significant gains in the developing nations. Furthermore, Anderson and Martin (2005) and Hertel et al (2006) show that the welfare gains for the poor countries are the largest from liberalization and reforms in agriculture.

[2]In particular, Anderson and van Wincoop (2003) and series of papers by Anderson and Yotov 2010, 2011a and 2011b.

[3]For example, Disdier and Marette (2010) combine gravity and welfare analysis in a partial equilibrium model to estimate the effects of a standard that caps antibiotic residues. Anderson and Yotov (forthcoming) estimate the effects of the Canadian Agreement on Internal Trade (AIT) in a conditional

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 most successful empirical trade model, 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, presented in section 3.3, as fairly convincing.[4] 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

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GE setting. Anderson and Yotov (2010b) extend gravity to a full general equilibrium to focus on the effects of free trade agreements in series of manufacturing industries.

[4]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.

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.

Overall, we find the results of our counterfactual experiments to be plausible and intuitive for the most part. Several clear patterns stand out from the counterfactual experiments in which we remove trade protection in the European Union and in the United States. (i) As expected, the largest impact of trade liberalization in the developed world (EU and US in our experiments) is 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. In addition, 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. On the other hand, 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. Importantly, our estimates provide evidence that producer losses from trade liberalization are outweighed by gains for consumers. This is encouraging evidence in support of trade liberalization.

(ii) Our estimates suggest significant effects of trade liberalization in the EU and the US on consumers and producers in the rest of the world. Some outside countries lose while others gain. Overall, the effects make intuitive sense. For example, we find that trade partners 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. 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.

(iii) More intense competition and geographical proximity are also important determinants of the effects of trade liberalization in the developed world on outside countries. Thus, for example, 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.

Finally, (iv) our estimates capture an additional channel through which trade liberalization in a large market can affect prices in smaller countries. For example, we find that 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. Our explanation for these findings is that the lower farm-gate prices for US producers are transferred to these smaller economies because US is essentially their largest supplier of this good.

In section 3.5, we experiment by removing domestic production support for some agricultural commodities in the European Union and in the United States. Several patterns stand out. (i) We find that, 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; (ii) In some instances, for example EU-Rice, we find that 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 explain the second.

(iii) In other cases, such as EU-Wheat and US-Wheat, we find that 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; (iv) 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; Finally, (v) 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.

The rest of the paper is structured as follows. Section 2 reviews the theoretical framework used to estimate gravity and the welfare effects of the removal of trade protection and production subsidies. Section 3 present the empirical analysis. In particular, section 3.1 sets the econometric specification. Section 3.2 describes the data. Section 3.3 reports on the disaggregated gravity estimates. And sections 3.4 and 3.5 present and discuss the welfare implications of trade protection and production support. Finally, section 4 concludes.

2 Theoretical Foundation

2.1 Structural Gravity

To set up the structural foundation for our analysis, we rely on the theoretical framework from Anderson and Yotov (2011b), who extend the standard conditional general equilibrium gravity model, with given output and expenditures, to a more general setting that allows them to estimate the general equilibrium (terms of trade and efficiency) effects of free trade agreements that entered into force during the 90s. In addition to concentrating on the effects of domestic production support and trade liberalization through lowering applied protection barriers including both tariffs and all forms of non-tariff trade barriers, in this paper we actually estimate all parameters, inclusive of the elasticities of import demand, needed to perform the counterfactual experiments. This makes our approach completely estimated, rather than calibrated.

Each country produces variety of goods that are traded with the rest of the world. Goods are differentiated by place of origin and form separable groups. On the supply side, trade separability implies that goods from origin i, $i \in N$, in class k, $k \in M$, shipped to each destination j, are perfect substitutes in supply. On the demand side, trade separability implies that expenditures on goods in a given class from all origins form a separate group.

Trade separability allows for a two-stage budgeting structure, which is instrumental for obtaining structural gravity. To model the upper level equilibrium, which determines the value of production, Y_i^k, and the level of expenditure, E_j^k, for each good in each country, we employ the simplest possible framework. On the production side we assume endowment economies at the sectoral level.[5] Thus, the value of sectoral production is $Y_i^k = (1 + s_i^k) p_i^{*k} q_i^k$, where q_i^k is the endowment of class k goods in country i, p_i^{*k} is the corresponding factory- or farm-gate price, and s_i^k is the percentage amount of subsidies given to domestic producers.[6] Subsidy funding is collected through taxes subject to balanced budget. Consumer preferences at the upper level are represented by a Cobb-Douglas utility function, which translates into constant expenditure shares such that total expenditures on goods from class k in country i are $E_i^k = \alpha^k Y_i$, where α^k, $\sum_k \alpha_k = 1$, is a share parameter (common across countries), and $Y_i = \sum_k Y_i^k$ is i's total Gross Domestic Product (GDP).

Conditional on the values of production and expenditure from the upper level, the lower level gravity equilibrium determines the level of bilateral shipments, X_{ij}^k, across regions (countries) for each class of goods. Lower level consumer preferences are approximated by a globally common CES utility function:

$$\left\{ \sum_i {\beta_i^k}^{\frac{1-\sigma_k}{\sigma_k}} {c_{ij}^k}^{\frac{\sigma_k - 1}{\sigma_k}} \right\}^{\frac{\sigma_k}{\sigma_k - 1}} \tag{1}$$

where, c_{ij} is consumption in destination j of goods in class k imported from origin i; σ_k is the elasticity of substitution for goods' class k;[7] and β_i^k is a CES share parameter. Consumers

[5] Anderson (2009) develops a specific factors gravity model.

[6] As will become clear later, this simple approach in modeling subsidies fits well with our production support data.

[7] Recent developments in the empirical trade literature suggest that the elasticity of substitution varies across countries. See Broda et al (2006). In the empirical analysis however, we allow the elasticity to vary across countries.

maximize (1) subject to series of budget constraints for each goods class:

$$\sum_i p_{ij}^k c_{ij}^k = E_j^k, \qquad \forall k, \tag{2}$$

where, E_j^k is total expenditure on goods from class k in country j (determined at the upper level equilibrium) and $p_{ij}^k = p_i^{*k} T_{ij}^k$ is the price of origin i goods from class k for region j consumers. $T_{ij}^k = (1+\tau_{ij}^k)t_{ij}^k$ denotes the variable trade cost factor on shipment of goods in class k from i to j, where τ_{ij}^k is the tariff on shipments of goods in class k from i to j and $t_{ij}^k \geq 1$ captures other observable and unobservable trade barriers between the two regions for goods in class k.

Solving the consumer's problem obtains the expenditures on goods of class k shipped from origin i to destination j as:

$$X_{ij}^k = (\beta_i^k p_i^{*k} T_{ij}^k / P_j^k)^{(1-\sigma_k)} E_j^k. \tag{3}$$

Here, for now, $P_j^k = [\sum_i (\beta_i^k p_i^{*k} T_{ij}^k)^{1-\sigma_k}]^{1/(1-\sigma_k)}$ is only interpreted as a CES price index. Impose market clearance (at delivered prices) for goods in each class from each origin:

$$Y_i^k = \sum_j (\beta_i^k p_i^{*k})^{1-\sigma_k} (T_{ij}^k / P_j^k)^{1-\sigma_k} E_j^k, \qquad \forall k, \tag{4}$$

Define $Y^k \equiv \sum_i Y_i^k$ and divide the preceding equation by Y^k to obtain:

$$(\beta_i^k p_i^{*k} \Pi_i^k)^{1-\sigma_k} = Y_i^k / Y^k, \tag{5}$$

where $\Pi_i^k \equiv \sum_j (T_{ij}^k / P_j^k)^{1-\sigma_k} E_j^k / Y^k$. To complete the derivation of the structural gravity model, use (5) to substitute for $\beta_i^k p_i^{*k}$ in (3), the market clearance equation and the CES price index. Then:

$$X_{ij}^k = \frac{E_j^k Y_i^k}{Y^k} \left(\frac{T_{ij}^k}{P_j^k \Pi_i^k} \right)^{1-\sigma_k} \tag{6}$$

$$(\Pi_i^k)^{1-\sigma_k} = \sum_j \left(\frac{T_{ij}^k}{P_j^k} \right)^{1-\sigma_k} \frac{E_j^k}{Y^k} \tag{7}$$

$$(P_j^k)^{1-\sigma_k} = \sum_i \left(\frac{T_{ij}^k}{\Pi_i^k}\right)^{1-\sigma_k} \frac{Y_i^k}{Y^k}. \tag{8}$$

(6) is the structural gravity equation that governs bilateral trade flows. Π_i^k denotes outward multilateral resistance (OMR). And, P_j^k denotes inward multilateral resistance (IMR). Equation (7) shows that the outward multilateral resistance consistently aggregates all bilateral trade costs for the producers of each class of goods from each country: It is as if each country i shipped its product k to a single world market facing supply side incidence of trade costs of Π_i^k. Similarly, equation (8) shows that the inward multilateral resistance is constructed as a weighted average of all bilateral trade costs faced by the consumers in each region: It is as if each country j bought its class k goods from a single world market facing demand side incidence of P_j^k. In addition, Anderson and van Wincoop (2004) show that if the actual set of bilateral trade costs were to be replaced by hypothetical numbers $\tilde{t}_{ij}^k = P_j^k \Pi_i^k$, all budget constraints and market clearance conditions would continue to hold, so that no disturbance at the upper level general equilibrium would occur. Thus, the multilateral resistance indexes consistently aggregate bilateral trade costs (including FTA effects)[8] and simultaneously decompose their incidence on consumers and producers in each country.

2.2 Welfare (Terms of Trade) Effects

Economy-wide welfare depends on the interactions of several intuitive components including nominal income of producers, consumer price index, taxes for subsidies and rents from tariff revenue. For expositional purposes, and given the main purpose of this project, we will concentrate on the direct effects on producers, via changes in farm-gate prices, and on consumers, via changes in the inward multilateral resistances, which can loosely be interpreted as changes in consumer price indexes,[9] and we will ignore direct accounting of the implications of the removal

[8]Note that the effects of any particular source of trade costs can be investigated and interpreted through the MR terms.

[9]As noted in Anderson and Yotov (2011a), in principle, IMR changes are comparable to average CPI changes. However, IMR's may only loosely track variations in consumer price indexes and any differences between the CPI's and the IMR's have a number of explanations. First, our IMR indexes are based on a manufacturing sample, excluding services, some agricultural categories and mining. Second, the inward

of subsidies on the tax burden on the population in the developed world as well as the rents forgone due to trade liberalization, which, given the level of protection in the developed world and the design of our counterfactuals, are very small indeed.

Given the assumptions of our theoretical model, the effects on producers will be channeled through changes in factory gate prices, while the effects on consumers will be measured by changes in the inward multilateral resistances.[10] Assuming that data were available on both volumes and prices of production, the market-clearing conditions for each class of goods in the economy provide a system that may solve for farm-gate prices:

$$\frac{Y_i^k}{Y^k} = \sum_j (\beta_i^k p_i^{*k} T_{ij}^k / P_j^k)^{1-\sigma_k} \frac{E_j^k}{Y}, \quad \forall i, k, \tag{9}$$

where, based on the definitions above, the supply shares on the left-hand side can be expressed as:

$$\frac{Y_i^k}{Y^k} = \frac{p_i^{*k}(1+s_i^k)q_i^k}{\sum_i p_i^{*k}(1+s_i^k)q_i^k}, \forall i, k. \tag{10}$$

Next, using the upper-level Cobb-Douglas, identical preferences assumption in combination with the requirement that expenditure in each country equals this nation's income, it can be shown that the expenditure shares on the right-hand side are:

$$\frac{E_j^k}{Y^k} = \frac{\sum_k p_j^{*k}(1+s_i^k)q_j^k}{\sum_{k,j} p_j^{*k}(1+s_i^k)q_j^k}, \forall j, k. \tag{11}$$

Finally, recall the definition of the CES price index:

$$P_j^k = [\sum_i (\beta_i^k p_i^{*k} T_{ij}^k)^{1-\sigma_k}]^{1/(1-\sigma_k)}, \quad \forall j, k. \tag{12}$$

incidence of trade costs probably falls on intermediate goods users in a way that does not show up in measured prices. Third, the production weighted IMR's are not really conceptually comparable to the consumer price indexes of final goods baskets. Next, home bias in preferences may be indicated by our results. Home bias in preferences results in attributions to 'trade costs' that cannot show up in prices. Finally, the IMR's are no doubt subject to measurement error and are based on a CES model that itself may be mis-specified.

[10] Anderson and Yotov (2011b) develop a theoretical measure of global efficiency calculated on the basis of changes in the outward multilateral resistances. Analyzing this index in the context of agricultural commodities is an interesting venue that is beyond the scope of our current purposes.

Substituting (10), (11) and (12) into (9) obtains a system of $N \times K$ equations that can solve for the factory- and farm-gate prices in each of the N countries and each of the K commodity categories in our sample as functions of endowments, q_i^k's, bilateral trade costs, T_{ij}^k's, subsidies, s_i^k's, and the CES share parameters, β_i^k's.

In principle, one does not need the β_i^k's to solve for changes in the farm-gate prices corresponding to changes in trade costs of subsidy payments. This can be achieved via an iterative procedure between the upper and lower level gravity equilibrium, which consecutively updates output, expenditures and the inward multilateral resistances in response to shocks (in terms of trade cost or subsidy changes) to the gravity system until all market clearing conditions and budget constraints are satisfied.

Anderson and Yotov (2011b) propose a more elegant method, that actually obtains a set of β_i^k's and then solves for the farm-gate prices. Their strategy is as follows. First, choose units at an initial equilibrium by setting all farm-gate prices equal to one. This allows to use the existing output values as proxy for endowments and to obtain the CES share parameters, the β_i^k's, by solving system (9) subject to (10), (11) and (12) at the initial unit choice. Then, to investigate the effects of free trade agreements, they remove this trade reducing component from the bilateral trade costs, T_{ij}^k's, and, given the β_i^k's they solve for a new set of farm-gate prices.[11] The difference between the farm-gate prices obtained this way and the initial prices gives the effects on the producers in the world.

This is the approach that we adopt as well. The difference is that in our case, in addition to changing trade costs by reducing a continuous trade protection component, we also introduce an additional, production support channel in the gravity system. To estimate consumer effects, we employ (12) to calculate two sets of consumer prices: one at the initial unit choice and one after the changes in trade costs and/or subsidies. The difference between the two sets of multilateral resistances captures consumer effects of the corresponding policy.

[11] It is worth mentioning that, due to separability and homotheticity, the $N \times K$ system (9) consists of only $N \times K - K$ linearly independent equations, which calls for normalization choices. We follow Anderson and Yotov (2011b) to chose a natural normalization that holds real resource use constant. In particular, for each commodity class, we impose $1 = \sum_{i,k} p_i^{*k} \frac{q_i^k}{\sum_i q_i^k}, \quad \forall k$.

3 Empirical Analysis

3.1 Econometric Specification

We start our empirical analysis by estimating the gravity equation (6)

$$X_{ij}^k = \frac{Y_i^k E_j^k}{Y^k} \left(\frac{T_{ij}^k}{\Pi_i^k P_j^k} \right)^{1-\sigma_k} \tag{13}$$

in order to obtain measures of the elasticity of substitution for each commodity class and to construct a set of bilateral trade costs at the commodity level, which are needed to calculate the indexes of interest and to perform counterfactuals. Our first step is to provide more structure behind the bilateral trade costs. To do this we follow the standard approach in the gravity literature. In particular, for a generic good, we define:

$$T_{ij}^{1-\sigma} = (1+\tau_{ij})^{\gamma_1} DIST_{ij}^{\gamma_2} e^{\gamma_3 BRDR_{ij} + \gamma_4 LANG_{ij} + \gamma_5 CLNY_{ij} + \gamma_6 SMCTRY_{ij}}, \tag{14}$$

where, as defined above, τ_{ij} is *ad-valorem* bilateral trade protection; $DIST_{ij}$ is the distance between trading partners i and j; $BRDR_{ij}$, $LANG_{ij}$ and $CLNY_{ij}$ capture the presence of contiguous borders, common language and colonial ties, respectively; and $SMCTRY_{ij}$ is a dummy variable for internal trade.[12] It is worth noting that the presence of tariffs, and more precisely tariff equivalent trade protection, as a regressor in our estimations will allow us to obtain direct estimates of the elasticity of substitution for each commodity class in our sample. σ can be recovered from the estimate of $\gamma_1 = 1 - \sigma$.[13]

The econometric gravity model is completed by substituting (14) for T_{ij} into (13) and then expanding the empirical equation with a multiplicative error term. However, before estimating our gravity model, we address several econometric concerns. First, there are many zero bilateral

[12] Anderson and van Wincoop (2004) provide excellent survey and exhaustive discussion on the literature of trade costs.

[13] Furthermore, once we have σ at hand, we can also recover estimates of the direct effects of the standard gravity variables, which are not separately identifiable in estimations without tariffs. This however is beyond the scope of this study.

trade flows, especially at the sectoral level. In addition, trade data is famous for the strong presence of heteroscedasticity that may render the gravity coefficient estimates inconsistent. To address both issues Santos-Silva and Tenreyro (2007) advocate the use of the the Poisson pseudo-maximum-likelihood (PPML) estimator. We follow their advice to obtain our main estimates.[14] Third, in order to account for the unobservable multilateral resistance terms, we use directional, country-specific fixed effects, which is the now standard approach in the gravity literature, pioneered by Feenstra (2004). With these considerations in mind, we use the PPML technique to estimate:

$$\begin{aligned} X_{ij} &= \beta_0 + \gamma_1 \ln(1+\tau_{ij}) + \gamma_2 \ln DIST_{ij} + \gamma_3 BRDR_{ij} + \gamma_4 LANG_{ij} + \gamma_5 CLNY_{ij} + \\ &+ \gamma_6 SMCTRY_{ij} + \eta_i + \theta_j + \epsilon_{ij}, \qquad \forall k. \end{aligned} \tag{15}$$

Here, X_{ij} is bilateral trade (in levels) between partners i and j; η_i denotes the set of dummies for the country of origin, which we use to control for the outward multilateral resistances; and θ_j encompasses the dummy variables that account for the inward multilateral resistances.[15] One final concern with the estimation of (15) is the well-known fact that trade policy is endogenous, which may bias our estimates of the elasticity of substitution. Fortunately, one of the greatest advantages of the data set that we use to measure bilateral trade protection is that by construction it accounts for trade protection endogeneity. We describe our data next.

[14]Helpman, Melitz and Rubinstein (2008) (HMR) develop an alternative approach to account for the zero trade flows. In their model, exporters must absorb some fixed costs to enter a market and countries where there are no firms productive enough to overcome these fixed costs cannot engage in trade. We experimented with religion, the HMR exogenous variable that enters selection but is excluded from determination of the volume of trade, but it did not work convincingly in our sample.

[15]In fact, a structural interpretation of the set of directional dummy variables suggests that in addition to the inward and outward multilateral resistances, these regressors will absorb output and expenditure shares as well. In a static setting, (13) implies that income and expenditure elasticities of bilateral trade flows are equal to one and, therefore, size-adjusted trade is the natural dependent variable. However, we prefer not to bringing output and expenditures on the right-hand side in order to impose these restrictions. Given the fact that we employ directional fixed effects, our choice does not have any quantitative implication for the gravity estimates. In addition, Olivero and Yotov (2009) show formally that income and expenditure elasticities are not necessarily equal to one in a dynamic setting, which is another reason to prefer a more general setting.

3.2 Data Description

Our world consists of sixty nine (69) countries in 2001, that produce and trade Wheat, Rice, Sugar, Grains (including all grains other than wheat and rice) and all Manufacturing commodities aggregated into one sector, which we need for comparison purposes and to be able to gauge the overall economy effects of trade protection and agricultural subsidies.[16] The number of countries in the sample and the sample period were predetermined by the availability of reliable protection data, which is probably the most important and interesting data that we employ in this study.

It is well-known that tariffs are no-longer the most prominent and relevant trade-protection instrument in the current state of the world economy. Given the strict tariff regulation rules of the World Trade Organization (WTO), various forms of non-tariff trade barriers (NTBs) play far more important role than tariffs in shaping world protection patterns. Even more so, when agricultural products are concerned. Therefore, in order to be able to draw sound conclusions about the effects of trade policy on the patterns of grains trade and production in the world, we need a reliable protection data set that not only includes both tariffs and NTB measures but also consistently translates the latter into tariff equivalents. Fortunately, a data set that meets these requirements exists. This is the Market Access Map (MAcMap) database.

The MAcMap data is developed and maintained jointly by ITC (UNCTAD-WTO, Geneva) and CEPII (Paris) and we use a version of it that is aggregated to the GTAP level of aggregation, which allows for complete and consistent coverage of sixty nine trading partners.[17] As indicated in the documentation accompanying the MAcMap data (see Bout et al, 2005), its two greatest

[16]These countries include: Albania, Argentina, Australia, Austria, Belgium, Bangladesh, Bulgaria, Brazil, Botswana, Canada, Switzerland, Chile, China, Colombia, Cyprus, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, United Kingdom, Greece, Hong Kong (China), Croatia, Hungary, Indonesia, India, Ireland, Italy, Japan, Korea, Rep., Sri Lanka, Lithuania, Luxembourg, Latvia, Morocco, Madagascar, Mexico, Malta, Mozambique, Malawi, Malaysia, Netherlands, New Zealand, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Singapore, Slovak Republic, Slovenia, Sweden, Thailand, Tunisia, Turkey, Taiwan (China), Tanzania, Uganda, Uruguay, United States, Venezuela, Vietnam, South Africa, Zambia, and Zimbabwe.

[17]The original MAcMap data covers 168 countries and 208 partners. However, we chose the GTAP level of aggregation because this is the most disaggregated level to which we had acces that provides consistent covergae of the same sixty nine countries that appear both as importers and as exporters in a balanced panel.

advantages are that (i) it systematically collects and harmonizes the relevant protection data on tariffs and NTBs needed to compute and aggregate a consistent *ad-valorem* equivalent of actual applied trade protection measures, which, we agree with the authors of MAcMap, is particularly suited for computable general equilibrium analysis; and, (ii) that, in building the database, special efforts have been devoted to developing and applying a methodology that minimizes the endogeneity bias in the aggregate protection measures. In particular, aggregation in MAcMap is based on a weighting scheme using groups of countries as "reference groups". (See Bout et al, 2005, for further details.)

We realize that having the data for only the year of 2001 and being able to extract a balanced panel of only sixty nine trading partners are limitations that need to be overcome in future work. However, the fact that the data consistently combines tariffs and NTBs and simultaneously controls for potential trade protection endogeneity are extremely valuable characteristics that are not featured in any other protection data. Thus, we view the MAcMap database as particularly suitable and the best available data needed for our analysis. We make three uses of these data. First, it allows us to estimate the elasticities of import demand for each of the commodity categories in our sample. Second, we use it to construct one of the key components of our proxy for bilateral trade costs. Finally, it is used to simulate trade liberalization in our counterfactual experiments.

In addition to the protection data from MAcMap, to estimate gravity and to calculate the producer and consumer indexes of interest, we employ sectoral data on bilateral trade flows and output, and we construct expenditures for each trading partner and each commodity class, all measured in thousands of current 2001 US dollars.[18] In addition, we use data on bilateral distances, contiguous borders, colonial ties and common language. Finally, in our counterfactual experiments, we use production subsidy data in order to simulate the removal of domestic production support.

Bilateral trade flows, defined as the value of exports from partner i to partner j come from

[18] See Baldwin and Taglioni (2006) for an externsive discussion of the use of real versus nominal trade data in gravity-type estimations.

two sources. To obtain a maximum number of valid observations, we combine the trade flows from MAcMap with trade data from the United Nation Statistical Division (UNSD) Commodity Trade Statistics Database (COMTRADE).[19] Internal commodity-level trade for each country is constructed as the difference between total output and aggregate exports to all trading partners, which come from COMTRADE .

Sectoral output level data comes from several sources. The primary source for manufacturing output is the United Nations' UNIDO Industrial Statistics database, which reports industry-level output data at the 3-digit and 4-digit level of ISIC Code (Revisions 2 and 3). We use the CEPII TradeProd database[20] as a secondary source of industrial manufacturing output data. Given the purposes of this project, and to speed up computations, we combine all manufacturing sectors into one, aggregate sector.

Our main source for agricultural production data is the FAOSTAT production database, which is constructed and maintained by the Food and Agriculture Organization of the United Nations. FAOSTAT reports values of production, in local currency, as well as volume and farm-gate prices. To take complete advantage of the information from the FAOSTAT database, we combine the actual values of production from the data with those constructed on the basis of volumes and unit prices. We further improve the data with values, accounting for about 3 percent of the total number of observations, from the United States Department of Agriculture.

The primary source of agricultural subsidy data, needed for our counterfactual experiment, is the OECD Producer Support Estimate (PSE), which measures the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers as percentage of their income in most developed nations and the EU. This is particularly convenient for our counterfactual experiment. Producer support is provided at the commodity level that can be matched with our level of aggregation.

[19] We access COMTRADE through the World Integrated Trade Solution (WITS) software, http://wits.worldbank.org/witsweb/. The software reports trade data in three different concordances including Harmonized System (HS) Revisions 1989/92 and 1996, and the Standard International Trade Classification (SITC), which are automatically converted to ISIC Rev. 2. To obtain maximum number of observations, we combine the data from the different concordances.

[20] TradeProd uses the OECD STAN Industrial Database in addition to UNIDO's Industrial Statistics Database.

To construct distance, we employ the distance measure from Mayer and Zignago (2006), which is appealing because the same procedure can be used to calculate bilateral distances as well as internal distances. Mayer and Zignago's (2006) methodology (based on Head and Mayer, 2000[21]) uses the following formula to generate weighted distances: $d_{ij} = \sum_{k\in i} \frac{pop_k}{pop_i} \sum_{l\in j} \frac{pop_l}{pop_j} d_{kl}$, where pop_k is the population of agglomeration k in trading partner i, and pop_l is the population of agglomeration l in trading partner j, and d_{kl} is the distance between agglomeration k and agglomeration l, measured in kilometers, and calculated by the Great Circle Distance Formula. To calculate distances, we use data on latitude, longitude, and population for the 50 biggest cities in each country in the sample.[22] Data on the other standard gravity variables, such as common language, common border, and colonial ties are from CEPII's *Distances*. Finally, we construct an indicator variable equal to one for internal trade.

3.3 Gravity Estimation Results

Gravity estimation results of equation (15), obtained with the PPML estimator and directional, country-specific fixed effects, are reported in Table 1. Several properties stand out. First, it is encouraging to note that, without any exception, the estimates on all standard gravity variables, including distance, common language, colonial relationships, and contiguity, have the expected signs and reasonable magnitude for each of the commodities in our sample. Second, our estimates capture the well known home bias in trade via the positive, large and significant coefficients on the estimate of the coefficient on $SMCTRY$, capturing internal trade. Finally, without any exception, for each commodity, we estimate strictly negative (actually quite large in absolute value) effects of trade protection on the volume of bilateral trade flows among the economies in our sample. These estimates imply, in accordance with the gravity theory, elasticities of substitution for each commodity class that are greater than one.

Next, we spend some time to discuss and compare our gravity estimates in the context of the

[21] These authors provide an excellent summary and discussion of the alternative approaches of distance calculations.

[22] All data on latitude, longitude, and population are from the World Gazetteer web page at http://world-gazetteer.com/.

specifics of the commodities covered. We find this discussion informative since only until recently it was generally believed that gravity does not explain well the variability in commodity-level trade. Anderson and Yotov (2010 and 2011a) show that this is not the case for a wide range of commodity categories; first, in the case of Canadian provincial trade, and next, for the world economy consisting of seventy six nations and eighteen manufacturing sectors. Furthermore, we are not aware of any existing study utilizing the structural gravity model to obtain convincing estimates for a series of agricultural commodities as we do here. In our discussion, we will use the manufacturing estimates as basis for comparison because those have been studied more and we have some prior expectations not only for the signs, but also for the magnitude of these numbers.

Trade Protection (PRTCN). In the first row of Table 1 we report estimates of the coefficients on the variable measuring *ad-valorem* equivalent trade protection measures. These numbers are of particular importance for our study because they will be used (i) in the construction of our proxy of bilateral trade costs and (ii) to recover estimates of the elasticities of substitution,[23] which are crucial for the calculation of farm-gate prices and the multilateral resistance indexes used to measure welfare changes in our counterfactual experiments. Overall, as expected, we find that bilateral trade protection is still a very significant impediment to trade and more so for more homogeneous commodities. The variability in the effects of protection on bilateral trade makes intuitive sense for the most part.

We start off by noting that our estimate of -4.61 (std.err. 1.45) on $PRTCN$ for Manufacturing implies an estimate of the elasticity of substitution $\sigma = 5.6$, which is exactly what a trade economist would expect it to be. (See for example Anderson and van Wincoop ,2003 and 2004, Eaton and Kortum, 2002, and Broda and Weinstein, 2006.) This result is encouraging and gives credibility to our data and methods. Furthermore, one would expect that, as compared to manufacturing, the agricultural elasticities of substitution should be much larger, because, by nature, these types of products are much more homogeneous. In addition, the agricultural data in our sample is at a much more disaggregated level.

[23]For each good, the estimate on $PRTCN$, γ_1, is equal to the $1 - \sigma$.

Indeed, as expected, we do find that the coefficients on $PRTCN$ for each of the four agricultural categories in our sample are significantly larger than the corresponding number for manufacturing. In fact, while we find it plausible that the estimates for Rice and Sugar should be lower that the number for Wheat, we do view the Wheat estimate a bit higher than expected. At the same time however, our estimate for Wheat does provide empirical support for the use of this particular product as a classic example of a homogenous good in most introductory Microeconomics classes. The estimate for Grains is also significantly lower than the Wheat number, but we attribute this result to aggregation bias, as Grains includes all cereal categories other than Wheat and Rice. Finally, it is worth mentioning that our Grains estimate implies and elasticity of substitution for this product of about 16, which is comparable to the corresponding estimate of 12 for Unmilled Cereals from Broda and Weinstein (2006).

Based on (i) our priors about the elasticity of substitution in the manufacturing industry; (ii) the fact that agricultural products are much more homogenous that manufacturing commodities; (iii) the level of aggregation of our data; and (iv) comparisons with estimates obtained and used in other studies, we view our elasticity numbers as convincing and we are confident in using them for the purposes of this project.

Distance (DIST). Estimates of the effects of distance on bilateral trade are reported in row $DIST$ of Table 1. As expected, the estimated distance elasticities are always negative and significant, at any level. The distance estimates vary significantly across sectors, especially when we compare any agricultural category with manufacturing. Distance is less of an impediment to trade in manufacturing as a whole. This is consistent with the estimates from Anderson and Yotov (2010) who find Agriculture to be among the sectors with largest estimates of the distance coefficient across all sectors (but service) in Canadian trade. Our manufacturing estimates are also consistent with the corresponding numbers from Anderson and Yotov (2011a) who also estimate fairly low distance effects in manufacturing in the world. Their estimates are larger for some manufacturing sectors including Wood Products, Minerals, Beverages and Tobacco, and Paper Products, and lower for other categories, such as Machinery and Textiles, but overall, without any exception, they do not estimate any distance coefficient to be greater than one and our estimate of 0.34 (std.err. 0.08) falls comfortably within the bounds of their sectoral numbers.

Looking at the estimates for the agricultural commodities, we find that distance is a significant obstacle to trade for all of them, and all estimates are greater than one in absolute value. It should also be noted that, in accordance with the claims from Santos-Silva and Tenreyro (2007) and Helpman et al (2008), we do find the OLS distance estimates at the sectoral level (available by request) to be biased upward as compared to their PPML and HMR counterparts. Among the agricultural sectors, we estimate the effects of distance to be stronger for Wheat and Grains and smaller for Rice and Sugar. Transportation costs seem to be the natural explanation for these findings.

Common Language (LANG). Sharing a common official language facilitates bilateral trade. Without any exception, the estimated language effects from Table 1 are positive and significant at any level. The variation in the magnitude of the coefficients across commodities is not large. Even though, we obtain a slightly smaller $LANG$ number for manufacturing, as compared to the agricultural commodities, and the estimate for Sugar is the largest, the differences among the language coefficient estimates are not statistically significant.

Colonial Ties (CLNY). The estimates from Table 1 indicate that colonial ties increase bilateral, commodity-level trade flows only for some of the agricultural commodities. The effect is stronger for Sugar, followed by Grains and Rice. The latter effect however, is only marginally significant. We also estimate a positive but insignificant $CLNY$ effects for Wheat and Manufacturing, which is in accordance with the findings from Anderson and Yotov (2011a), who find that, as compared to the other gravity variables, 'colonial ties' is the regressor with least explanatory power among eighteen manufacturing sectors.[24] They conclude that, overall, the effects of colonial ties on manufacturing trade have slowly disappeared during the 90s. Interestingly, we find these effects to be still strong for some agricultural categories such as Sugar and Grains. It is possible however, that the coefficient on Grains is subject to aggregation bias

[24]Only one-third of the 18 CLNY coefficient estimates in their sample are positive and significant, and, in most cases, marginally so. Furthermore, they find the significant estimates to be very small in magnitude.

because this category combines several agricultural commodities.

Common Border (BRDR). All else equal, countries that share a common border are expected to trade more with each other. Our findings confirm this stilized fact for the category of Manufacturing, which is in accordance with previous studies, and for Grains. We also estimate a marginally significant positive effect of contiguity for Wheat. However, we find no significant effects for Rice and Sugar. Our explanation for these results is that the categories of Rice and Sugar are classic examples of sectors where the patterns and volumes of trade are governed to a greater extent by political economy forces rather than through the standard gravity channels.

Same Country (SMCTRY). It is well established, in both the theoretical and in the empirical trade literature that international borders reduce trade, and, all else equal, that countries tend to consume more of their own produce. Our estimates from Table 1 provide strong empirical support for these claims at the commodity level. All estimates of the coefficients on $SMCTRY$ (the dummy variable capturing internal trade) are positive, large, and significant at any level. Not surprisingly, Rice and Sugar are among the categories with highest domestic bias in trade. These results may be driven by the strong domestic political support for these industries in the developed world (for example in EU, US and Japan). The correspoding effects are smaller for Grains and Wheat, where, even though present and significant, political economy distortions are not so pronounced. Interestingly, we find huge home bias in Manufacturing. The explanation here is different and, based on the disaggregated estimates from Anderson and Yotov (2011a), we attribute the large $SMCTRY$ coefficient to manufacturing sectors with clear patterns of international specialization, such as Machinery and Transportation.

Overall, we view the disaggregated gravity estimates presented in this section as fairly convincing. The standard gravity variables coefficients for the agricultural commodities in our sample have expected signs and the variability in their magnitudes makes good intuitive sense. We were also able to obtain reasonable estimates of the elasticity of substitution. Thus, we are confident in the use of those gravity estimates, along with the actual protection and gravity data, to construct the bilateral trade costs:

$$\hat{T}_{ij}^{1-\sigma} = (1+\tau_{ij})^{\hat{\gamma}_1} DIST_{ij}^{\hat{\gamma}_2} e^{\hat{\gamma}_3 BRDR_{ij} + \hat{\gamma}_4 LANG_{ij} + \hat{\gamma}_5 CLNY_{ij} + \hat{\gamma}_6 SMCTRY_{ij}}, \tag{16}$$

needed to obtain the welfare indexes and to perform counterfactuals. We report on those next.

3.4 Trade Liberalization and Terms of Trade Effects

Our framework can be used to simulate numerous trade liberalization scenarios involving any sector, nation or group of industries and countries in our sample. Simulating and describing all possible trade liberalization scenarios is not feasible and is beyond the scope of this study, so we limit ourselves to experiments, which we believe are important and which carry most weight in the determination of agricultural prices and income in the world. We consider three cases of trade liberalization: liberalization by just the EU,[25] liberalization by just the US, and liberalization by all countries. In all 3 simulations we considered 50 percent reductions in trade protection, including all barriers (tariffs and all NTBs). The simulations were done for Grains, Rice, Sugar, Wheat and all of them together.[26] In each case, we are interested in how policy changes affect prices and, given our theoretical set up, income domestically and internationally. When considering the international impact of liberalization we will focus on the impact of policy changes on the major importing and exporting countries for the good in question as they are the ones most likely affected by the policy changes. We also discuss the implications for some small and developing countries that were affected by trade liberalization in the developed world.

Tables 2- 5 report our findings. To obtain the indexes in each table, we solve system (9)-(12) after adjusting trade costs in order to capture trade liberalization in the regions of interest. The structures of these tables are identical. The first three columns of each table report the effects

[25] The 2001 EU members for which we simulate trade liberalization include Austria, Belgium, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Sweden.

[26] The experiment for Grains protection removal by the US is the only exception, where we completely eliminated all trade barriers in this sector faced by the exporters to the United States. The reason is that US protection in this sector is very small and, at the same time, US imports are very small as well and we do not find almost any effects from a 50 percent trade liberalization.

of trade liberalization in the sector in question on the producers of this agricultural good in each country. The next three columns report the corresponding effects on the consumers of the commodity in question in each country. The last three columns of the table present aggregate effects on the consumers and the producers in each country from trade liberalization in this particular sector in the whole world. It should be noted that these numbers describe the effects on producers and consumers of all goods, including the commodity in question. Total effects on producers are obtained with output shares used as weights and total effects on consumers are obtained with expenditure shares used as weights. The effect on consumers could be interpreted as the change in the consumer price index (CPI) in this country, calculated on the basis of a basket included all the goods in our sample, in response to a 50 percent trade liberalization in the world. Columns *EU* simulate a decrease of 50 percent in the level of trade protection faced by all trading parters exporting the good to the *EU* in 2001. Columns *US* simulate 50 percent decrease (except for Grains, where the decrease is 100 percent) in US trade protection. Finally, columns *ALL* simulate a 50 percent fall in all trade barriers for Grains in the world. Below, we discuss our findings for each of the agricultural commodities in the sample.

Grains. We start with the effects of EU trade liberalization in Grains. Several interesting and intuitive properties stand out. First, we note that trade policies in the European Union have significant effects on world prices. For example, we estimate producer price changes varying between almost 6 percent losses for the Grains producers in Great Britain to more than 1.5 percent gains for the Canadian producers of Grains. Second, we find that the removal of half of the EU trade barriers will generate winners and losers both on the producer and on the consumer side. We estimate that more than two thirds of the producers of grains in the world will enjoy moderate gains, while the losses will be concentrated in a few countries that will suffer significantly.

As expected, the biggest losers will be producers from the European Union. Without any exception, producers in all EU members will register losses varying between 5.9 percent for Britain and 3.2 percent for Greece. EU producers are not the only ones to lose however. There are two more groups of countries who will lose as well. The first group consists of smaller European countries that are close to the EU, such as Albania, Cyprus and Turkey. The explanation for their losses is that, in addition to their proximity to the EU, these countries have been given preferential treatment in terms of trade barriers and once the EU opens to free trade with the rest of the world, producers there will lose their advantage.

Importantly, producers in some small, least developed countries such as Malawi, Tanzania and Uganda will also register significant estimated losses in producer prices of more than 2 percent each due to EU trade liberalization. The explanation here is that all these nations trade with the EU under the Union's larger Generalised System of Preferences. Trade between Malawi, Tanzania, Uganda and the EU is governed by the Everything But Arms (EBA) Regulation, which gives these nations duty-free and quota-free access to the EU market for all of its products except arms and ammunition. EBA is part of the EU's Generalised System of Preferences. The explanation is trade diversion: Once these countries lose their free trade preferences with the EU, they will no longer be competitive and will lose their largest export market to more competitive sellers many of whom are from the Americas. This is an important result that points out to the indirect benefits of the EU trade policy for some of the least developed nations in the world.

In terms of winners from the removal of the EU Grains protection, we find that those will be some of the biggest grains producers in the world who are facing significant trade barriers for their exports to the European union. Thus, it is not surprising at all to find countries such as Canada, United States, Brazil and Mexico in the upper tail of the producers gains distribution. Another group of winners are some European countries that did not have the privilege of exporting grains freely to the EU in 2001. Examples include Poland and Romania. The combination of the significant direct effect of the removal of the EU trade barriers for imports from Poland and Romania, the proximity of these nations to the rest of Europe explains the fact that their grains producers are among the biggest winners.

Next, we turn to the effects on grains consumers from the EU trade liberalization in Grains. Several properties stand out. First, we see that, in general, producer gains are associated with consumer losses and producer losses are accompanied by consumer gains. The explanation for the latter is intuitive. Producer losses are usually associated with more import competition and lower prices for the consumers. The explanation for the first is that once faced with certain better export conditions, domestic producers bid up domestic prices (or otherwise stop selling domestically), which of course hurts domestic consumers. Combined with the huge home bias in trade, this explains the almost identical (but not exactly) increase in consumer prices of Grains that goes along with the gains for producers.

Second, it is interesting to note that while, as explained above, consumer gains in the EU members are roughly equal to the corresponding producer losses, we estimate that, without any exception, for each EU member the gains for consumers of grains are slightly larger, which is in support of the liberal trade argument that while trade liberalization hurts producers, its overall effects are beneficial. These effects vary by nation. For example, our numbers suggest about 0.3 percent net effect for Great Britain (this is the difference between the effects on the grains producers and the grains consumers in this country) and only 0.01 percent for Denmark. [27] More interestingly and importantly, we find that the gains for grains consumers in the smaller and least developed countries, where producers were hurt by the EU trade liberalization, are not large enough to offset producer losses. Even though the numbers are small in magnitude, we find that, without any exception, the net effect of the consumers and the producers in these nations (e.g. Albania, Cyprus, Turkey, Malawi, Tanzania and Uganda) is a loss.

We do not find any significant pattern on the net effects for the countries where producers gained most from the EU trade liberalization. For example, the net effect in Canada and Mexico is positive, while it is negative in Brazil and US. The effects are mixed in Europe too: Romania gains, while Poland loses. Notably however, we estimate the magnitude of these indirect effects to be much smaller than the effects on the EU members, regardless of whether effects on consumers, producers or net effects are considered.

Without going into details, we note that the effects of US trade liberalization on grains price in the world are essentially zero. The reason is that the US is a leading exporter of grain and thus we would not expect that reducing US trade barriers would have much effect on prices.

[27] It is encouraging that, without any exception, we find net gains for the combination of grains producer and consumer effects. However, given the small magnitude of these numbers, they should be interpreted with caution.

The results in Table 2 clearly show that our priors are correct, as liberalization has essentially no effect on prices in all countries.

Next, we briefly discuss the case of global grains trade liberalization on the producers and the consumers of Grains, captured in columns (3) and (6) of Table 2, respectively. A couple of findings are worth a mention. First, we find only small changes in the effects on EU consumers and producers if in addition to EU and US trade liberalization, we open the world for free trade. More specifically, we find that the losses of the EU producers of Grains will be smaller, which may suggest two things: (i) either these produces are going to be more competitive on foreign markets where they were not able to compete due to trade protection, (This is the trade creation argument); or (ii), some of the import competitors will leave the EU market to sell elsewhere, due to free access to more attractive foreign markets, which will ease the situation for the EU producers.

Second, we see that global free trade in grains will have huge effects on some Asian economies. For example, grains producers in Korea and Japan will be among the biggest losers. We attribute these effects to the fact the both countries are among the economies with highest trade protection in Grains (Korea is the leader).[28]

Finally, in the last three columns of Table 2, we report overall effects on producers and consumers in the world caused by a 50 percent global decrease in the level of grains trade protection in the world. As expected, these effects are smaller than the corresponding effects on the producers and the consumer of Grains, because, by construction, these numbers are weighted averages across all commodities in our sample. However, we do see a couple of interesting results. For example, we find that the net welfare/terms of trade losses, reported in the last column of the table will be largest in Uganda, Malawi and Tanzania. These are exactly the nations that lost due to EU trade liberalization. This finding emphasizes the importance of the EU trade policy (both directed and indirect) for the wellbeing of these economies, at least in the short run. And second, it turns out that the biggest welfare gains are in nations where Grains producers

[28]We do not have good explanation for the effects in Hong Kong, where agricultural production is essentially zero.

registered large losses from trade liberalization. This finding is in support of the liberal traders' argument that larger deviations from free trade generate larger losses.

Rice. The next case we consider is EU liberalization of barriers to rice imports. This is a case where we would expect liberalization to have relatively large effects on prices as the EU is a major importer of rice and trade barriers are significant. Indeed, we find very large direct effect on prices in the EU but also on prices outside the Union. EU prices respond most. See column 1 of Table 3. The pass through of the removal of trade protection is very significant, which should not be surprising given the very small volume of rice production in the EU. As in the case of Grains, we do find that the pattern in the effects on consumers will be the opposite in direction and very similar in magnitude. However, interestingly, we find that the net effect (the difference between the effect on producers and consumers of rice) is positive for members that produce more significant amounts or rice. More competition, between domestic producers and importers, can explain the stronger effects on consumers in these nations.

Importantly, producers in some less developing countries and smaller European nations will suffer significantly from the liberalizing of the EU trade protection in the rice sector. Tanzania, Malawi and Uganda (followed by Mozambique and Zambia) are among the biggest losers outside of the EU. See column 1 of Table 3. Furthermore, we also find that the gains for the consumers in these nations are not enough to offset producer losses. Qualitatively, these results are very similar to our findings for grains and reinforce the importance of the Union's Generalised System of Preferences and the Everything But Arms (EBA) Regulation for the participating less developed countries as well as the indirect effects of the overall EU trade policy in agriculture.

As expected, we find the biggest winners from the EU trade liberalization in Rice to be the producers in major rice exporting countries such as China, Sri Lanka, Korea, Thailand, Taiwan. Comparative advantage is a natural explanation. Overall, these findings are confirmed by our second experiment, where we remove Rice trade barriers in the US. Us rice producers are now the biggest losers and, once again, we find China, Sri Lanka, Taiwan, and Korea to be the biggest winners. See column 2 of Table 3.

The big gains for the rice producers in the leading asian exporters translate into big overall gains for the producers in these nations. our numbers from column 7 of Table 3, labeled "Prdcrs" show that, overall, producers in China, Sri Lanka, and Korea are joined by producers from Thailand, Japan, and Vietnam for the top six place of the gains distribution. This emphasizes the importance of this sector for these economies. Finally, we find that significant overall gains for consumers in most European economies (see column 8 of Table 3) translate into the largest overall gains (see last column of Table 3) from global trade liberalization in the Rice industry.

Sugar. We start our analysis of the effects of trade liberalization in the Sugar industry by concentrating on the case of US. We find this case particularly interesting because US is a major importer and producer of sugar and because it has significant barriers to trade in this sector. Overall, we would expect any reduction in barriers to have substantial effects on prices, both in US and elsewhere.

We first consider the impact on producer prices. These effects are reported in column 2 of Table 4. As expected, we find that the strongest impact of trade liberalization in the US sugar industry will be on US sugar producers. We estimate this effect to be a 6 percent price decline. We also estimate significant losses for some of the producers in the rest of the world. For example, producers in Mexico and Venezuela experience declines in producer prices of 5 percent and 2 percent respectively. Given that the applied protection rate on Sugar exports from these countries is essentially zero, we attribute the significant producer losses to trade diversion and more competition with foreign exporters on the large US market.[29]

We are also interested in how US liberalization impacts some of the world's major exporters of sugar cane. We find the biggest increases in producer prices to be in some Latin American countries including Brazil, Colombia, Uruguay and the Philippines. We also estimate very large increase in producer prices in Zimbabwe, followed closely by India. Somewhat surprisingly China, which is the fourth biggest producer of Sugar in our sample, experiences only moderate producer gains of 0.95 percent, as compared to 2.17 percent for Columbia. The combination of

[29]We estimate very large negative effects for producers in Korea. We doubt that trade diversion can explain these results because Korean sugar exports to US are very small and the level of protection is significant. Similarly, we find suspiciously large negative effect on the producers in Hong Kong and New Zealand. It is not clear what is driving these results.

comparative advantage and trade costs may explain these results.

The impact on consumer prices also seems to be consistent with what one might expect for the most part. Overall, as before, we find that the changes in consumer prices move in opposite direction and have similar magnitude to the changes in producer prices. Thus, we estimate US and Mexican consumer prices to fall by 6.7 percent and 5 percent, respectively. Prices in Venezuela fall as well (by 1.7 percent). Trade diversion from the US market, where producers face much higher competition due to free trade, to the domestic markets in Mexico and Venezuela, combined with home bias in consumption, are natural candidates to explain these results. Similarly, in countries where producers gained a lot due to US trade liberalization, consumers are hurt. Thus, for example, consumers in Colombia, Brazil and Uruguay are among the ones who suffer the highest price increases. Decrease in domestic supply may explain these results.

As in all our analysis so far, we find that in the case of US Sugar, trade liberalization generates losses for domestic producers and gains for domestic consumers. More importantly, once again we estimate that the net effect (the difference between the effect on producers and consumers of sugar) in the US is positive. In particular, we estimate a net gain of more than half percent for the US from the removal of 50 percent of the US sugar trade barriers. This gain translates into a small, 0.02, but positive, overall welfare gain for US, which is reported in the last column of Table 4.

We do not find very significant effects of EU trade liberalization in the Sugar sector. The negative impact on producers does not spread out of the European Union and we see producers in most of the outside world to benefit from the EU trade liberalization. For the most part, the gains are distributed according to comparative advantage. See column 1 of Table 4. This is confirmed in our experiment of global trade liberalization. Results from column 3 of Table 4 reveal that the two biggest winners from global trade liberalization in Sugar will be producers in India and Brazil, which are two of the largest producers of Sugar in the world.

Finally, our results suggest that in order to win big from trade liberalization, a country needs not only a clear comparative advantage in the production of this good, but also relatively easy access to the largest markets. Thus, in column 7 of Table 4, we find that two of the largest winners from the removal of the global trade barriers will be producers from Brazil and Columbia; big producers with relatively easy access to one of the largest markets. Zimbabwe's success, on the other hand, seems to be driven purely by comparative advantage. We attribute France's success to strong domestic support. Finally, we see that large producers, such as India and China are not among the largest winners, potentially due to their remoteness.

Wheat. We start our Wheat analysis with the noteworthy case of 50 percent reduction of US trade barriers for wheat. Because the US is primarily a major exporter of wheat we would not expect liberalization to have much impact on world prices. Overall, this is confirmed by the numbers reported in Table 5. Column 2 of the table indicates that the effect on US producers will be a moderate price fall of only 1.2 percent. Producers in only a few other nations will suffer as well. Producers in Mexico and Canada are the two groups that register the larger losses after US producers of about 1 percent each. The explanation for these results is trade diversion. Once the US market is more open for everyone in the world, Canadian and Mexican producers lose part of the preferential treatment that they enjoy in the US and suffer producer losses.

Producers in three other countries including South Africa, Botswana and Uganda also suffer decrease in producer prices. The explanation for this result is not trade diversion because these nations export very small amounts of wheat, if any at all, to the US. We believe that the explanation is that in each case US is one of the largest exporters of Wheat to these nations while, at the same time, they are relatively small producers of Wheat and, therefore, the changes in US producer prices are translated into changes in the domestic prices in these countries.

Since liberalization in the US does not have much impact on US prices it is not surprising that both producer and consumer prices in other countries change very little; typically on the order of .1 percent. The two largest Wheat producers in the world, China and India, enjoy moderate gains of about 0.2 percent in producer prices from the US trade liberalization in this sector. Our numbers reveal that the increase in producer prices will be the largest in Singapore, Taiwan and Hong Kong. However, provided that these countries produce virtually zero wheat, we attribute the part of these changes to the increase in prices in the rest of the Asian producers.

As in the case of every commodity discussed so far, producer price changes are accompanied by similar in magnitude and opposite in direction changes in consumer prices. And, as before, we estimate the direct net effects on the consumers and the producers of Wheat in the US, the nation that liberalizes its trade policy to be positive, even though small. In addition we find mixed net effects in the rest of the world.

Overall, the case of EU Wheat trade liberalization is in support of our findings so far. First, we do find small losses for producers in all EU members. In addition, we estimate minor losses for producers in other European countries that, after trade liberalization of the Union's market, have to compete with more productive producers, who in turn are the biggest winners from the removal of the EU trade barriers in Wheat. Finally, once again, we find that the effects on consumers follow closely, in terms of magnitude, the changes in producer prices, but in the case of wheat, the net effects are very small.

Interestingly, we find that global trade liberalization will have much more significant impact on producer prices in the world. Thus for example, producer prices in Japan would fall by more than 24 percent. The explanation is that Japan is among the nations with highest trade protection in the wheat industry. More importantly, we find that producers in some less developed nations will suffer as well. Our explanation for the significant losses in Mozambique, Tanzania and Zambia is the direct effect of the removal of trade barriers in the Wheat sector in these nations. While, we suspect indirect effects through imports to explain the large fall in producer prices in Malawi for example.

Overall, our findings for wheat indicate that trade protection in the developed world does not play the most important role in shaping the returns for Wheat producers in the world. This should be expected because the largest players in the face of the European Union and, especially the United States are among the largest producers and exporters of Wheat in the world. (It will be more interesting to see how the picture will change when we consider the removal of domestic support for Wheat producers, especially in the EU.) Even though, we do find some small effects of the removal of the EU and the US wheat trade barriers on the rest of the world, our estimates suggest that these effects are small. Furthermore, we estimate large producer effects in response to global trade liberalization, which suggests that the impact on individual economies is mostly driven by the removal of their own trade barriers.

Overall, we view the vast majority of our results from this section to be consistent with the trade creation and trade diversion effects we would expect from the type of trade liberalization we consider. In sum, our estimates reveal several important patterns. First, the effects of trade liberalization in the developed world are largest for commodity categories, such as Rice and Sugar, in which these countries are small producers but import a lot. Second, we find that the largest impact of trade liberalization in the developed world is on the consumers and the producers in the liberalizing countries themselves. For most commodities, when a major importer with significant trade barriers liberalizes, we see that domestic producers and consumers experience significant price decreases. Importantly, we do provide evidence that the producer losses from trade liberalization are outweighed by the gains for consumers, which is encouraging evidence in support of trade liberalization.

In the case of European Union liberalization, we find that producers and consumers in some smaller, non-member European countries will be affected as well. Some European producers will lose because of the more intense competition in the Union's market. This is the case, for example, for Grains producers in Albania, Cyprus and Turkey. Other 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. Additionally, when we look at countries where the trade connections are strongest we see that, in response to trade liberalization in the developed world, prices for producers in major exporter countries rise as do prices for consumers in major importing countries. Next, one important finding that consistently appeared in our results is that some less developed countries, such as Tanzania, Malawi and Uganda for example, will register significant losses from the 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.

Two other interesting examples of significant indirect effects of trade liberalization in a developed region are the effects on Mexico and Canada, on the one hand, and on South Africa, Botswana and Uganda, on the other, from trade liberalization in the US Wheat market. In each case, we find significant losses for producers of Wheat in these nations. We explain the losses for Mexico and Canada with the more intense competition on the US market, while we believe that the losses for the producers in South Africa, Botswana and Uganda are driven by the fact that their prices are essentially determined by their biggest supplier of Wheat, which is US. Finally, when we consider liberalization for a country that is a net exporter or liberalization for a country that has relatively low trade barriers, we see that there are zero or near zero price effects. Thus for example, we find that Wheat trade policies in the developed world and US trade policies in Grains have little to no impact on world prices in these sectors. Our estimates suggest that individual countries' own trade policies are more important determinant of wheat prices in these nations. Overall, these results may suggest that our data and methodology are well suited for analyzing the general equilibrium effects we are interested in. Identifications of these effects should enable us to measure the welfare implications of various policies.

3.5 Effects of Domestic Support

In this section, we estimate and discuss the effects of production subsidies in the developed world on producers and consumers in the world. To do this, we use system (9)-(12) and we simulate the complete removal of domestic production support in the European Union and the United States by changing the level of production in these regions. Producer effects are calculated as the changes in producer prices resulting from the removal of the subsidies. Similarly, consumer effects are calculated as the change in the inward multilateral resistances resulting from the removal of the EU and US domestic production support. In our experiments, we consider Rice, Sugar and Wheat. All three categories are subject to heavy domestic production support. In particular, according to the OECD production support data, the subsidy numbers for Rice, Sugar and Wheat amount to 41 percent, 49 percent, and 47 percent, respectively, calculated as percentage of the farmers' income. the corresponding numbers in US are Rice-52 percent, Sugar-59 percent, and Wheat-43 percent.

Tables 6-8 report our findings. For consistency with the presentation of our trade liberalization results, the first three columns of each table report the effects of subsidy removal in the sector in question on the producers of this good in each country. The next three columns report the corresponding effects on the consumers of the same category in each country. The last three columns of the table present aggregate effects on the consumers and the producers in each country from the removal of subsidies in the sector under consideration simultaneously in both EU and US. These numbers are calculated as weighted averages across all good in our sample but only in response to the removal of subsidies for the one good in question. Output shares are used as weights to obtain the effects on producers and expenditure shares are used to obtain consumer effects. Columns labeled *EU* simulate 100 percent removal in the level of domestic support for the producers of the good in the European Union in 2001. Columns labeled *US* simulate 100 percent decrease in US subsidies. Finally, columns labeled *ALL* simulate a simultaneous removal of the subsidies for producers in both *EU* and *US*. As before, first we present and discuss estimates for each good, then we look for general patterns with potential policy implications.

Rice. We start with the potential effects caused by the removal of production subsidies for Rice producers in the European Union. OECD PSE data indicates that these amount to 41 percent of the Rice farmers' income. Column 1 of Table 6 reports the effects on Rice producers in the world resulting from a 41 percent decrease in the level of rice output in the EU. Several properties stand out. First, as expected, with only the exception of Rice producers in Denmark, producer prices or Rice in the EU will increase. However, only five countries, namely France, Italy, Spain, Portugal and Greece experience increase in producer prices that is greater than 1 percent. The increase of 4.7 percent is largest in Greece. Combined with the fact that in this experiment we have decreased producer output for farmers in each of the EU members by 41 percent, our findings translate into more than 35 percent income losses for EU Rice producers. Given the magnitude of this effects, we find it very unlikely for any similar policy to take place. Nonetheless, we are interested in knowing what will happen in the rest of the world.

Overall, we find that most producers in the rest of the world will enjoy moderate gains. Not surprisingly, we find the largest rice producers and exporters in the world including China, Japan, India, Korea and Vietnam to be among the winners. More importantly however, we find that producers small, less developed counties including Malawi, Uganda, Tanzania and Mozambique will surpass the large Rice producers in their gains and be among the biggest winners from the removal of EU domestic Rice support. the reason for that are the the Union's Generalised System of Preferences and the Everything But Arms (EBA) Regulation according to which the countries mentioned above can export all but arms and ammunition freely to the EU. Rice producers in only two nations, Albania and Tunisia, will suffer lower prices. Neither of these countries exports Rice to the EU and their Rice production is close to zero. More intense import competition in these nations is a possible explanation.

Next, we look at the effects on consumers of Rice. These indexes are reported in Column 4 of Table 6. Without any exception, we find that consumer prices of Rice in the world will increase in every single country. The increase in consumer prices however will be relatively small. The increase will be the largest for EU Rice prices and smallest in the largest producers of Rice. Our numbers indicate that the net effect on most of the countries in the world (41) will be negative, which suggests that the gain for producers will be outweighed by the higher consumer prices. Two groups of countries will register net gains. These are the largest producers of Rice in the world (e.g. China, Japan, and Vietnam) and some of the small, less developed nations that have the luxury to trade freely with the EU.

We now turn to US Rice subsidies, which account for 52 percent of the income of Rice producers in US. Effects on Rice producers in the world are reported in column 2 of Table 6. Several findings deserve a mention. First, as expected US Rice prices will increase. However, the 5 percent increase is not enough to offset the huge fall in production and consequently income for the US farmers. This, once again, implies that a policy that will lead to such a drastic change in the income of one relatively small group of people in the US is not likely to be implemented in practice.

The pattern of gains for producers in the world is very clear. Without any exception, we find all the largest Rice producers including Japan, China, Vietnam, India, Korea, Sri Lanka, Indonesia, Thailand and the Philippines in the very top of the gains distribution from the removal of the US domestic support for Rice. We also find that the small, less developed countries (e.g. Malawi, Uganda, Tanzania and Mozambique) that enjoyed some of the largest gains from the EU subsidy removal will gain as well, but this time less than the big players. The explanation is that for these nations EU is the largest export destination. Interestingly, we estimate losses for the producers in most European countries that are heavily subsidized. Our explanation is that the removal of such a large trade distortion stimulates competition in the Rice market and hurts those producers who were not competitive to start with.

Turning to the effects on consumers, we see that, without any exception, all consumers in the world will suffer higher prices. Turns out that, as was the case in the EU, US has subsidized consumption in the rest of the world, ironically, more so for the larger producers and consumers from the Asian region. As was the case with the EU subsidies however, we estimate the net effects of the removal of the US production support for Rice to have negative net effects in the rest of the world. The small group of exceptions includes the largest Rice exporters, where the gains for producers outweigh the increase in consumer prices.

Finally, we look at the effects of a simultaneous removal of the EU and US subsidies, reported in columns 3 and 6 of Table 6, and at the overall effects on consumers and producers in the world, reported in the last three columns of the table. The numbers from columns 3 and 6 indicate that there are not any strong additional effects from the simultaneous removal of subsidies in EU and US. This can be seen from the fact that the sum of the effects reported in columns 1 and 2 add almost exactly to the numbers in column 3, and, similarly the numbers from columns 4 and 5 add almost exactly to the numbers in column 6. Overall, we find that the effects of the removal of the rice subsidies in EU and US translates into very small aggregate effects on consumers and producers and even smaller aggregate welfare effects, reported in the last column of Table 6. Interestingly, we estimate that while the net effects for most countries in the world are negative, some small, less developed nations enjoy small net gains.

Sugar. In the case of Sugar, we only limit our analysis to the removal of US subsidies, which account for 59 percent of the income of farmers producing this product. The reason is that the OECD data that we use reports subsidy levels for refined Sugar in the EU, while our data and analysis cover Sugar cane and beets. Effects on producers and consumers of Sugar in the world are reported in Table 7. Several properties stand out.

First, as before, we find and increase in producer prices in the US. In fact, we estimate the increase to be quite significant, more than 18 percent, however still not strong enough to compensate farmers for the decrease in their output. Thus, once again, the removal of production support will lead to a significant fall in farmers' income. Second, we estimate significant gains, often more than one percent increase in prices, for producers in most of world. Among the biggest winners are some Latin American countries including Brazil, Colombia, Mexico and Venezuela. Relative proximity to the US market in combination with strong comparative advantage in this sector can explain these findings. In the case of Mexico, we also need to account to the preferential trade position of this country on the US market. Interestingly, we estimate only small gains for Canadian producers, but we explain these results with the fact that Canada is a relatively small producer of sugar in the world.

From the Asian economies we find the largest gains to be registered by the Philippines, even though China and India are much larger producers than this country. The reason is that the Philippines has much stronger trading positions on the US market as compared to the rest of the big Asian producers of Sugar. Interestingly, as was the case of Rice, we estimate that producer prices will fall in many European countries. Our explanation is that the removal of such a large trade distortion stimulates competition in the Sugar market and hurts those producers in the world who were heavily subsidized and not competitive to start with.

Finally, we estimate that, with very few exceptions in Europe, the effect on US Sugar subsidies on consumer prices in the world is negative. As in the case of Rice, we find that the removal of domestic support in the US Sugar industry will result in significant price increase in most of the world. This, points to the conclusion that in addition to helping their own producers, the US has subsidized sugar consumption in the rest of the world.

Wheat. The effects of the removal of EU Wheat subsidies on producers and consumers in the world are reported in columns 1 and 4 of Table 8, respectively. Wheat subsidies amount to 47 percent of the income of EU farmers. Overall, our findings for this sector are consistent with the results for Rice. First, we estimate that producers prices in the EU will increase, but the increase, varying between 1.9 percent, for Portugal, and 4.3 percent, for France, is far from enough to compensate farmers for the fall in production. Thus, again, we estimate very large fall in farmers' income.

Our results suggest that in the case of wheat, the countries that will benefit most from removal of the EU domestic support are smaller European economies in proximity to the large EU members. Interestingly, we estimate small losses for the large Wheat producers in the world. The combination of very strong protection effects, relatively weak presence in the EU market and high transportation costs may explain these findings.

Turning to consumers, our estimates, reported in column 4 of Table 8, reveal that consumer prices in most of the world will rise, especially in the European Union. However, consumers in the largest Wheat exporters will enjoy lower prices. We estimate the net effect (the difference between the effect on producers and consumers of Wheat) of the removal of EU subsidies in most of the world to be small, but negative. This applies to the larger producers as well as to some less developed nations such as Malawi, Mozambique and Tanzania, who are among the countries that are most adversely affected.

Next, we remove US Wheat subsidies, which are equivalent to 43 percent of the income of the producers of this good in the US. As expected, we find an increase in US farm-gate prices that is not enough to offset the fall in production. Among the biggest winners from the removal of US domestic support in the Wheat industry are Canada and Mexico. These nations are the two largest exporters of Wheat to the US in 2001. The combination of low transportation costs along with preferential trade treatment are natural candidates to explain these results. India is also among the countries that benefit significantly from the removal of US subsidies. Comparative advantage is a natural candidate to explain this result. We do not find significant gains for China, the largest Wheat producer in the world. The reason is that China exports only small amount of this agricultural product to the US.

Another group of countries where producers will experience increase in prices as result of the removal of US subsidies includes small, less developed nations (e.g. Uganda, Botswana and

Zimbabwe) that rely almost exclusively on imports of Wheat from the US. The fall in US supply and the increase in US farm-gate prices are valid reasons to explain these results.

Turning to the effects on consumers, we find that along with consumers in US and its major trading partners (Canada and Mexico), consumers in many developing countries (including Botswana, Uganda, Tanzania, Malawi and Zambia) will be among the ones experiencing highest increases in Wheat prices. As discussed above, the large US presence on those markets is the reason for these findings. Finally, we find that the net effect (the difference between the effect on producers and consumers of Wheat) of the removal of US subsidies in most of the world will be negative.

In sum, the estimates from this section reveal several interesting and intuitive patters. First, we find that, without any exception, the removal of domestic subsidies will have huge negative impact on domestic farmers and will lead to a relatively small increase in domestic prices. In some cases (e.g. EU Rice), we find that removal of domestic support will benefit the largest producers in the world but also some less developed nations that enjoy free access to the EU market. In other cases (e.g. EU Wheat and US Wheat) we find that 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. Next, 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. Finally, our estimates of the effects on consumers reveal that in addition to helping their own producers, both US and the EU have essentially subsidized consumption in the rest of the world.

4 Conclusion

In this paper we rely on a relatively simple and tractable general equilibrium framework to estimate welfare effects of trade liberalization and domestic production support on consumers and producers of important agricultural commodities in sixty nine countries in 2001. We contribute to the existing literature in several ways. First, we use detailed, commodity-level data in a structural gravity setting along with the latest econometric advances in the gravity literature to estimate (rather than calibrate) the parameters needed to describe the world economy and the potential changes caused by the removal of trade barriers and farm supports. Our estimates are reasonable and convincing. Second, we use these estimates to perform series of counterfactual experiments in a tractable general equilibrium framework, which produces believable results. Our findings suggest that trade policies and production support in the developed world (US and the European Union in our analysis) have important effects on producers and consumers in the developed countries themselves, but also on economic agents in many economies from the rest of the world. In addition, the simplicity of the framework that we employ allows us to contemplate on the channels through which trade protection and domestic support affect welfare and terms of trade.

Even though we view our findings as fairly convincing, we see many opportunities to improve. First, a natural extension is to include all agricultural commodities and add services data in our analysis. The lack of these sectors in the current project renders our aggregate estimates biased downward. Second, 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. Third, 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. However, at this stage, we do believe that the results that we offer are informative and instructive.

References

Anderson, James E. and Eric van Wincoop, 2003. "Gravity with Gravitas", *American Economic Review*, 93, 170-92.

Anderson, James E. and Eric van Wincoop. 2004."Trade Costs", *Journal of Economic Literature*, 42, 691-751.

Bergstrand, Jeffrey H., 1989, "The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade," *Review of Economics and Statistics*, Vol. 71, No. 1, February 1989, 143-153.

Anderson, James E. and Yoto V. Yotov, Forthcoming. "The Changing Incidence of Geography," *American Economic Review.*

Anderson, James E. and Yoto V. Yotov. 2011a. "Specialization: Pro- and Anti-Globalizing, 1990-2002," *Manuscript.*

Anderson, James E. and Yoto V. Yotov. 2011b. "On the Incidence and Welfare Effects of Free Trade Agreements," *Manuscript.*

Broda, C., J. Greenfield and D. Weinstein, "From Groundnuts to Globalization: A Structural Estimate of Trade and Growth", NBER Working Paper No. 12512, 2006.

Anderson, Kym, Dimaranan, Betina, Francois, Joseph F., Hertel, Thomas W., Hoekman, Bernard and Martin, Will. 2001. "The Cost of Rich (and Poor) Country Protection to Developing Countries". *CIES Discussion Paper No. 0136.*

Anderson, Kym & Will Martin, 2005. "Global Trade Policy," *The World Economy*, Vol. 28(9).

Disdier and Marette, 2010. "The Combination of Gravity and Welfare Approaches for Evaluating Nontariff Measures,"*American Journal of Agricultural Economics* 92(3): 713-726.

John C. Beghin & David Roland-Holst & Dominique van der Mensbrugghe, 2002. "Global Agricultural Trade and the Doha Round: What are the Implications for North and South?," *Food and Agricultural Policy Research Institute (FAPRI) Publications 02-WP308.*

Harrison, Glenn W & Rutherford, Thomas F & Tarr, David G, 1997. "Quantifying the Uruguay Round," *Economic Journal*, vol. 107(444), pages 1405-30.

Head, Keith and Thierry Mayer (2000), "Non-Europe : The Magnitude and Causes of Market

Fragmentation in Europe", *Weltwirtschaftliches Archiv* 136, 285-314.

Helpman, Elhanan, Marc J. Melitz and Yona Rubinstein. 2008. "Estimating Trade Flows: Trading Partners and Trading Volumes", Harvard University, *Quarterly Journal of Economics*, 123: 441-487.

Hertel, Thomas W & Masters, William A & Elbehri, Aziz, 1998. "The Uruguay Round and Africa: A Global, General Equilibrium Analysis," *Journal of African Economies*, vol. 7(2), pages 208-36.

Hertel, Thomas & Keeney, Roman & Ivanic, Maros & Winters, Alan, 2006. "Distributional Effects of WTO Agricultural Reforms in Rich and Poor Countries," *GTAP Working Papers 2185, Center for Global Trade Analysis*, Purdue University.

McMillan Margaret S. & Alix Peterson Zwane & Nava Ashraf, 2007. "My Policies or Yours: Does OECD Support for Agriculture Increase Poverty in Developing Countries?," NBER Chapters, in: *Globalization and Poverty*, pages 183-240.

Mayer, T. and R. Paillacar and S. Zignago (2008), "TradeProd. The CEPII Trade, Production and Bilateral Protection Database: Explanatory Notes", CEPII.

Mayer, T. and S. Zignago (2006), "Notes on CEPIIs distances measures", CEPII.

Mayer, T. and S. Zignago (2005), "Market Access in Global and Regional Trade", CEPII Working Paper 2005-02.

Olivero, Maria and Yoto V. Yotov. 2009. "Dynamic Gravity: Theory and Empirical Implications," Manuscript, Drexel University.

Panagariya, A, 2002. "Trade and food security: Conceptualizing the linkages." Paper prepared for presentation at the Conference on Trade, Agricultural Development, and Food Security: The Impact of Recent Economic and Trade Policy Reform, Food and Agricultural Organization, Rome, July 11-12.

Redding, Stephen and Anthony J. Venables. 2004. "Economic Geography and International Inequality", *Journal of International Economics*, 62(1), 53-82.

Santos Silva, Jorge and Sylvana Tenreyro. 2006. "The Log of Gravity", *Review of Economics and Statistics*, Vol. 88, No. 4: 641-658.

Table 1: Sectoral Gravity Estimates

	(1) Grains	(2) Rice	(3) Sugar	(4) Wheat	(5) Mnfctrng
PRTCN	-15.796	-16.160	-9.561	-56.273	-4.610
	(2.432)**	(8.781)+	(1.249)**	(2.721)**	(1.453)**
DIST	-1.615	-1.156	-1.062	-1.826	-0.335
	(0.251)**	(0.174)**	(0.207)**	(0.187)**	(0.080)**
LANG	0.878	0.885	0.966	0.821	0.722
	(0.447)*	(0.423)*	(0.345)**	(0.274)**	(0.205)**
CLNY	1.080	1.023	1.783	0.318	0.248
	(0.534)*	(0.539)+	(0.691)**	(0.275)	(0.178)
BRDR	1.969	0.263	0.935	0.654	0.771
	(0.414)**	(0.407)	(0.641)	(0.338)+	(0.257)**
SMCTRY	6.027	7.357	8.654	3.611	11.206
	(0.775)**	(2.502)**	(0.824)**	(0.436)**	(0.214)**
CONST	15.368	-9.492	11.425	20.534	16.863
	(2.073)**	(0.837)**	(1.854)**	(1.719)**	(0.540)**
N	4752	4750	4743	4751	4760
LL	-4.026e+10	-3.790e+09	-1.017e+10	-7.160e+09	-2.311e+12

Notes: This table reports PPML estimates for each of the commodities in our sample. Huber-Eicker-White standard errors are reported in parentheses. + $p < 0.10$, * $p < .05$, ** $p < .01$. Estimation results for each commodity are obtained with directional, country-specific fixed effects, whose estimates are omitted for brevity.

Table 2: Trade Liberalization Effects, Grains

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
ALB	-1.822	0.000	-5.067	-1.766	0.000	-4.979	-0.679	-0.486	-0.193
ARG	1.129	0.001	1.324	1.131	0.006	1.327	0.219	0.209	0.010
AUS	-0.158	0.000	0.781	-0.150	0.000	0.786	0.124	0.122	0.002
AUT	-3.895	0.000	-3.587	-4.177	0.000	-3.870	-0.220	-0.218	-0.002
BEL	-4.303	0.000	-3.813	-4.548	0.000	-4.035	-0.037	-0.058	0.021
BGD	0.686	0.000	0.646	0.733	0.000	0.688	-0.032	-0.034	0.003
BGR	0.145	0.000	0.284	0.188	0.000	0.214	-0.002	-0.008	0.006
BRA	1.257	0.001	2.117	1.262	0.006	2.113	0.566	0.559	0.007
BWA	0.639	0.000	-4.941	1.254	0.000	0.887	-0.061	-0.043	-0.018
CAN	1.585	0.000	2.628	1.542	0.000	2.543	0.332	0.326	0.006
CHE	-0.428	0.000	-14.881	-0.456	0.000	-15.729	-0.418	-0.503	0.086
CHL	0.813	0.000	-3.612	0.978	0.005	-2.705	-0.236	-0.226	-0.010
CHN	0.780	0.000	1.628	0.777	0.000	1.627	0.206	0.203	0.003
COL	0.688	0.000	-1.289	0.720	0.000	-1.369	-0.110	-0.105	-0.005
CYP	-1.434	0.000	-0.789	-1.416	0.000	-0.771	-0.050	-0.048	-0.002
CZE	1.076	0.000	0.115	1.071	0.000	-0.106	0.019	0.014	0.005
DEU	-4.166	0.000	-4.029	-4.404	0.000	-4.275	-0.205	-0.219	0.014
DNK	-3.949	0.000	-3.725	-3.958	0.000	-3.727	-0.741	-0.724	-0.017
ESP	-3.293	0.000	-3.088	-3.432	0.000	-3.212	-0.314	-0.310	-0.004
EST	0.772	0.000	-10.396	0.762	0.000	-7.601	-0.833	-0.753	-0.079
FIN	-3.945	0.000	-3.490	-4.181	0.000	-3.633	-0.193	-0.190	-0.003
FRA	-3.496	0.000	-3.021	-3.619	0.000	-3.143	-0.594	-0.585	-0.009
GBR	-5.859	0.000	-5.352	-6.212	0.000	-5.684	-0.155	-0.176	0.021
GRC	-3.262	0.000	-2.889	-3.269	0.000	-2.895	-0.490	-0.476	-0.015
HKG	0.704	-0.004	-15.207	0.800	0.000	1.631	0.117	0.121	-0.004
HRV	0.810	0.000	-3.635	0.856	0.000	-3.865	-0.008	-0.033	0.025
HUN	0.930	0.000	1.008	0.951	0.000	1.003	0.213	0.209	0.004
IDN	0.645	0.000	1.044	0.650	0.000	1.055	0.040	0.035	0.005
IND	0.525	0.000	-0.599	0.523	0.000	-0.604	0.010	0.016	-0.006
IRL	-5.608	0.000	-5.074	-5.930	0.000	-5.361	-0.119	-0.135	0.015
ITA	-3.956	0.000	-3.461	-4.209	0.000	-3.679	-0.216	-0.225	0.009
JPN	0.881	0.000	-9.267	0.936	0.000	-9.824	-0.055	-0.139	0.084
KOR	0.776	0.000	-28.081	0.823	0.000	-29.510	-1.315	-1.546	0.231
LKA	0.771	0.000	-1.299	0.827	0.000	-1.378	-0.024	-0.027	0.003
LTU	-0.335	0.000	0.202	-0.319	0.000	0.175	-0.010	-0.010	-0.001
LUX	-4.172	0.000	-3.701	-4.427	0.000	-3.922	-0.043	-0.058	0.015
LVA	1.016	0.000	0.782	0.987	0.000	0.635	-0.000	-0.007	0.007
MAR	-0.730	0.000	-4.085	-0.715	0.000	-4.087	-0.372	-0.347	-0.025
MDG	-2.054	0.000	-1.519	-2.010	0.000	-1.500	-0.058	-0.056	-0.002
MEX	1.161	0.000	1.972	1.159	0.000	1.972	0.784	0.775	0.009
MLT	0.869	0.000	1.559	0.923	0.000	1.665	0.037	0.041	-0.005

Continued

Table 2 – continued from previous page

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
MOZ	-1.612	0.000	-2.072	-1.534	0.000	-1.989	-0.518	-0.373	-0.145
MWI	-3.551	0.000	-3.082	-3.543	0.000	-3.076	-0.704	-0.275	-0.429
MYS	0.731	0.000	1.321	0.782	0.000	1.392	0.051	0.057	-0.005
NLD	-4.983	0.000	-4.431	-5.287	0.000	-4.707	-0.009	-0.036	0.028
NZL	0.884	0.000	1.565	0.936	0.000	1.666	0.077	0.082	-0.005
PER	1.152	0.000	2.247	1.151	0.000	2.230	0.315	0.306	0.009
PHL	0.650	0.000	-0.611	0.642	0.000	-0.632	0.012	0.019	-0.007
POL	1.424	0.000	0.955	1.424	0.000	0.936	0.207	0.197	0.009
PRT	-4.587	0.000	-4.231	-4.855	0.000	-4.487	-0.171	-0.177	0.005
ROM	1.540	0.000	2.977	1.538	0.000	2.973	0.740	0.719	0.022
RUS	0.182	0.001	0.964	0.185	0.000	0.959	0.096	0.087	0.009
SGP	0.892	0.004	2.429	0.857	0.000	1.507	0.059	0.067	-0.008
SVK	0.566	0.000	0.156	0.582	0.000	-0.028	0.008	0.004	0.005
SVN	0.674	0.000	-1.548	0.785	0.000	-1.692	-0.004	-0.007	0.003
SWE	-4.191	0.000	-3.692	-4.433	0.000	-3.904	-0.155	-0.161	0.006
THA	0.454	0.000	-8.908	0.482	0.000	-9.397	-0.820	-0.827	0.007
TUN	0.917	0.000	0.455	0.963	0.000	0.474	0.009	0.008	0.001
TUR	-1.437	0.000	-0.703	-1.437	0.000	-0.708	-0.117	-0.112	-0.006
TWN	0.855	0.009	2.933	0.837	0.000	1.529	0.088	0.095	-0.007
TZA	-2.663	0.000	-3.091	-2.662	0.000	-3.125	-0.534	-0.330	-0.204
UGA	-2.261	0.000	-4.036	-2.260	0.000	-4.040	-1.377	-0.403	-0.975
URY	0.842	0.000	-2.057	0.977	0.000	-0.660	-0.131	-0.125	-0.005
USA	1.375	-0.001	2.203	1.376	0.000	2.205	0.371	0.360	0.012
VEN	0.781	0.000	-1.825	0.838	0.000	-1.900	-0.253	-0.251	-0.002
VNM	0.683	0.000	-0.485	0.723	0.000	-0.567	-0.029	-0.030	0.001
ZAF	1.381	0.000	2.088	1.378	0.000	2.081	0.453	0.443	0.009
ZMB	-2.698	0.000	-2.831	-2.658	0.000	-2.813	-0.283	-0.268	-0.015
ZWE	0.291	0.000	-0.962	0.266	0.000	-1.008	-0.099	-0.095	-0.004

Notes: This table reports general equilibrium estimates of the effects of various trade liberalization scenarios on the consumers and the producers in the world. The first three columns of the table report the effects of trade liberalization in the Grains sector on the producers of Grains in each country. The next three columns report the corresponding effects on the consumers of Grains in each country. The last three columns of the table present aggregate effects on the consumers and the producers in each country from Grains trade liberalization in the whole world. Columns *EU* simulate a decrease of 50 percent in the level of trade protection faced by all trading parters exporting Grains to the *EU* in 2001. Columns *US* simulate 100 percent decrease in US Grains trade protection. Finally, columns *ALL* simulate a 50 percent fall in all trade barriers for Grains in the world.

Table 3: Trade Liberalization Effects, Rice

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
ALB	-20.539	-2.382	-13.434	0.700	0.124	-1.337	-0.099	-0.107	0.008
ARG	0.644	0.088	-3.859	0.688	0.097	-4.084	-0.192	-0.203	0.011
AUS	0.626	0.042	0.849	0.666	0.046	0.900	-0.017	-0.017	0.001
AUT	-19.027	-0.947	-15.765	-19.571	-0.020	-19.427	-0.089	-0.289	0.200
BEL	-18.822	-1.094	-15.323	-18.747	-0.124	-18.632	-0.076	-0.303	0.227
BGD	-5.670	-0.128	-5.619	-5.656	-0.126	-5.616	-1.592	-1.054	-0.538
BGR	0.642	0.106	-4.515	0.686	0.116	-4.813	-0.105	-0.121	0.016
BRA	0.588	0.086	-4.302	0.616	0.092	-4.507	-0.975	-0.983	0.009
BWA	0.460	-0.209	0.582	0.491	0.015	0.672	-0.100	-0.101	0.002
CAN	-0.553	-0.930	2.991	0.683	0.107	0.963	-0.065	-0.059	-0.007
CHE	-0.209	-0.854	0.693	0.593	0.101	-2.340	-0.091	-0.106	0.015
CHL	0.651	0.098	-2.128	0.698	0.104	-2.252	-0.105	-0.113	0.008
CHN	1.037	0.425	1.660	1.039	0.423	1.655	0.294	0.282	0.012
COL	0.593	-0.419	-3.362	0.596	-0.416	-3.362	-0.809	-0.779	-0.029
CYP	0.993	-0.265	1.505	0.669	0.113	0.962	-0.083	-0.079	-0.004
CZE	-0.257	-0.669	3.361	0.724	0.138	1.045	-0.083	-0.079	-0.004
DEU	-19.541	-1.173	-16.041	-19.105	-0.104	-19.003	-0.081	-0.386	0.305
DNK	-16.587	-0.813	-14.274	-19.041	0.049	-18.833	-0.076	-0.218	0.142
ESP	-18.033	-0.071	-17.948	-18.996	-0.078	-18.908	-0.842	-1.016	0.174
EST	0.034	-0.182	1.291	0.738	0.151	1.073	-0.057	-0.053	-0.005
FIN	-20.707	-0.909	-18.152	-18.690	-0.055	-18.541	-0.063	-0.240	0.177
FRA	-17.624	-0.136	-17.535	-18.598	-0.144	-18.504	-0.150	-0.334	0.185
GBR	-18.053	-1.378	-15.103	-16.591	-0.302	-16.692	-0.099	-0.302	0.203
GRC	-17.366	-0.052	-17.244	-18.291	-0.056	-18.162	-0.889	-0.952	0.063
HKG	-2.236	-0.050	0.559	0.904	0.264	1.363	0.117	0.113	0.004
HRV	-0.012	-0.842	4.296	0.713	0.132	0.048	-0.058	-0.055	-0.002
HUN	0.687	0.115	-7.171	0.737	0.121	-7.600	-0.098	-0.129	0.031
IDN	0.515	-0.320	0.442	0.514	-0.320	0.441	0.052	0.037	0.015
IND	-0.579	-0.455	-0.863	-0.573	-0.452	-0.863	-0.177	-0.161	-0.016
IRL	-18.631	-0.941	-15.201	-18.681	0.000	-18.518	-0.095	-0.281	0.186
ITA	-17.186	-0.190	-17.147	-18.118	-0.203	-18.077	-0.588	-0.793	0.206
JPN	0.906	0.172	1.315	0.907	0.170	1.312	0.392	0.384	0.008
KOR	1.028	0.213	1.431	1.029	0.209	1.425	0.970	0.951	0.020
LKA	1.308	0.287	1.853	1.305	0.286	1.854	0.430	0.360	0.070
LTU	0.276	-0.262	2.122	0.729	0.143	1.055	-0.094	-0.089	-0.004
LUX	-18.793	-0.451	-17.427	-18.799	-0.029	-18.646	-0.076	-0.230	0.154
LVA	1.107	-0.175	1.613	0.733	0.146	0.796	-0.067	-0.072	0.005
MAR	0.735	0.186	-20.057	0.803	0.201	-21.154	-0.249	-0.324	0.075
MDG	-6.308	-0.145	-6.446	-6.139	-0.136	-6.270	-2.154	-0.852	-1.302
MEX	0.706	0.122	-6.074	0.747	0.133	-6.435	-0.082	-0.112	0.031
MLT	0.118	-0.027	0.759	0.538	0.045	0.755	-0.086	-0.079	-0.007

Continued

Table 3 – continued from previous page

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
MOZ	-3.370	-0.110	-4.169	-1.748	-0.014	-3.257	-0.195	-0.177	-0.019
MWI	-4.124	-0.211	-5.482	-4.018	-0.204	-5.431	-0.473	-0.263	-0.210
MYS	0.694	0.080	0.956	0.717	0.076	0.986	0.098	0.098	0.000
NLD	-18.926	-1.143	-15.401	-18.881	-0.167	-18.819	-0.070	-0.314	0.244
NZL	-0.163	-0.737	3.435	0.686	0.067	0.942	-0.065	-0.060	-0.005
PER	-1.541	-0.415	-2.363	-1.533	-0.408	-2.367	-0.625	-0.614	-0.011
PHL	0.614	-0.838	0.010	0.616	-0.835	0.011	-0.034	-0.038	0.004
POL	-0.075	-0.696	3.452	0.626	0.117	0.824	-0.070	-0.068	-0.003
PRT	-17.632	0.007	-17.471	-18.581	0.007	-18.412	-0.639	-0.767	0.127
ROM	0.723	0.195	-4.361	0.772	0.209	-4.623	-0.087	-0.104	0.017
RUS	0.713	0.166	-3.064	0.761	0.176	-3.257	-0.083	-0.092	0.009
SGP	-0.313	-0.805	4.040	0.719	0.045	0.967	-0.004	0.003	-0.007
SVK	-0.560	-0.420	2.260	0.717	0.135	1.039	-0.072	-0.072	-0.000
SVN	-0.032	-0.663	3.598	0.715	0.134	1.035	-0.092	-0.085	-0.007
SWE	-19.092	-1.012	-14.939	-18.500	-0.140	-18.415	-0.064	-0.252	0.189
THA	0.979	-0.424	0.889	0.980	-0.420	0.891	0.310	0.296	0.014
TUN	1.402	-0.466	-7.482	0.709	0.129	-8.467	-0.076	-0.113	0.038
TUR	0.636	0.111	-9.816	0.681	0.118	-10.378	-0.337	-0.367	0.031
TWN	0.870	0.254	1.315	0.927	0.272	1.397	0.096	0.104	-0.008
TZA	-9.372	-0.156	-9.473	-9.185	-0.150	-9.437	-1.028	-0.687	-0.340
UGA	-3.515	-0.301	-4.083	-3.430	-0.290	-4.133	-0.229	-0.146	-0.083
URY	0.648	0.045	-3.454	0.645	0.044	-3.456	-0.904	-0.872	-0.032
USA	0.436	-2.620	-1.941	0.469	-2.776	-2.053	-0.084	-0.105	0.022
VEN	0.606	-0.069	-5.115	0.644	-0.067	-5.393	-0.463	-0.485	0.022
VNM	0.820	0.073	1.136	0.817	0.069	1.135	0.232	0.147	0.084
ZAF	0.470	0.005	0.638	0.501	0.011	0.685	-0.040	-0.040	-0.000
ZMB	-0.464	-0.022	-2.391	0.358	0.007	-1.756	-0.076	-0.085	0.010
ZWE	0.132	0.004	-5.182	0.143	0.003	-5.498	-0.034	-0.055	0.021

Notes: This table reports general equilibrium estimates of the effects of various trade liberalization scenarios on the consumers and the producers in the world. The first three columns of the table report the effects of trade liberalization in the Rice sector on the producers of Rice in each country. The next three columns report the corresponding effects on the consumers of Rice in each country. The last three columns of the table present aggregate effects on the consumers and the producers in each country from Rice trade liberalization in the whole world. Columns *EU* simulate a decrease of 50 percent in the level of trade protection faced by all trading parters exporting Rice to the *EU* in 2001. Columns *US* simulate 50 percent decrease in US Rice trade protection. Finally, columns *ALL* simulate a 50 percent fall in all trade barriers for Rice in the world.

Table 4: Trade Liberalization Effects, Sugar

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
ALB	0.146	1.007	0.678	0.224	1.114	0.672	0.021	0.022	-0.001
ARG	0.481	0.799	2.664	0.480	0.799	2.653	0.179	0.172	0.007
AUS	0.368	0.743	1.610	0.402	0.814	1.760	0.075	0.074	0.001
AUT	-1.592	0.575	0.294	-1.760	0.629	0.306	0.078	0.077	0.001
BEL	-0.945	0.542	0.756	-1.005	0.580	0.815	0.109	0.111	-0.002
BGD	0.192	0.144	-1.859	0.210	0.157	-1.880	-0.022	-0.019	-0.003
BGR	0.261	1.040	-12.957	0.289	1.147	-14.215	0.010	-0.020	0.030
BRA	0.471	2.152	6.117	0.471	2.156	6.120	1.534	1.518	0.016
BWA	0.701	0.516	-2.947	0.775	0.938	-3.160	0.146	0.140	0.006
CAN	0.047	1.090	1.625	0.044	1.253	1.891	0.094	0.102	-0.008
CHE	-0.134	1.225	-5.980	-0.145	1.348	-6.583	-0.021	-0.039	0.018
CHL	0.647	1.376	4.302	0.644	1.372	4.295	0.366	0.356	0.010
CHN	0.649	0.946	-1.444	0.713	1.043	-1.588	-0.076	-0.077	0.001
COL	0.607	2.169	4.926	0.605	2.165	4.923	0.549	0.526	0.023
CYP	0.218	0.464	-0.608	0.241	1.118	-0.559	0.068	0.063	0.004
CZE	0.135	0.356	-3.367	0.143	0.386	-3.708	-0.127	-0.127	-0.000
DEU	-1.559	0.811	0.957	-1.714	0.891	1.051	0.100	0.104	-0.003
DNK	-0.907	0.293	0.129	-0.985	0.320	0.133	0.051	0.055	-0.004
ESP	-1.739	0.276	-0.481	-1.917	0.302	-0.539	0.062	0.061	0.001
EST	0.404	-0.441	3.438	0.444	1.215	4.273	0.043	0.058	-0.015
FIN	-3.080	0.637	-0.901	-3.395	0.700	-1.002	0.048	0.047	0.001
FRA	-1.580	1.059	1.660	-1.576	1.063	1.660	0.442	0.433	0.010
GBR	-5.365	0.790	-2.440	-5.905	0.867	-2.705	0.079	0.071	0.008
GRC	-0.642	0.685	0.963	-0.646	0.686	0.959	0.088	0.089	-0.001
HKG	0.804	-3.245	4.375	0.849	1.274	5.746	0.027	0.041	-0.014
HRV	-0.062	1.088	-0.038	-0.066	1.204	-0.047	0.078	0.075	0.004
HUN	0.141	0.447	-5.386	0.153	0.487	-5.925	-0.206	-0.207	0.001
IDN	0.288	0.017	-0.384	0.291	0.029	-0.393	-0.021	-0.019	-0.002
IND	0.971	1.178	6.456	0.971	1.174	6.454	0.334	0.273	0.061
IRL	-2.638	0.709	-0.208	-2.890	0.780	-0.224	0.124	0.123	0.001
ITA	-1.602	0.831	0.985	-1.765	0.913	1.082	0.099	0.098	0.001
JPN	0.579	0.502	-19.641	0.637	0.550	-21.397	-0.729	-0.907	0.178
KOR	0.738	-5.955	-2.578	0.736	1.302	-1.279	-0.021	-0.027	0.006
LKA	0.462	0.675	-1.129	0.504	0.739	-1.275	-0.025	-0.024	-0.001
LTU	0.757	0.182	-0.803	0.745	0.185	-0.802	-0.003	0.002	-0.005
LUX	-1.497	-2.948	0.063	-1.656	1.044	1.549	0.095	0.093	0.002
LVA	0.671	0.107	-0.025	0.665	0.104	-0.025	0.010	0.011	-0.001
MAR	0.408	0.027	-3.381	0.400	0.030	-3.431	-0.082	-0.073	-0.009
MDG	0.592	0.801	5.066	0.595	0.803	5.064	0.325	0.127	0.198
MEX	0.396	-5.059	-2.795	0.395	-5.058	-2.795	-0.476	-0.463	-0.013
MLT	0.591	1.053	2.460	0.649	1.380	2.729	0.114	0.121	-0.007

Continued

Table 4 – continued from previous page

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
MOZ	0.564	0.967	1.683	0.595	1.056	1.572	0.024	0.020	0.004
MWI	0.928	1.177	4.440	0.928	1.176	4.435	0.312	0.138	0.174
MYS	0.626	1.049	4.439	0.693	1.156	4.896	0.121	0.127	-0.006
NLD	-0.490	0.221	0.245	-0.520	0.235	0.257	0.083	0.080	0.004
NZL	0.742	-4.957	2.786	0.757	1.374	5.439	0.104	0.119	-0.015
PER	0.419	1.496	2.825	0.418	1.496	2.811	0.189	0.184	0.006
PHL	0.565	1.887	3.813	0.565	1.887	3.813	0.209	0.192	0.017
POL	1.030	0.188	1.593	1.035	0.198	1.563	0.123	0.126	-0.004
PRT	-0.883	0.389	0.532	-0.907	0.386	0.525	0.112	0.113	-0.001
ROM	0.160	1.204	-3.804	0.178	1.327	-4.192	-0.001	-0.007	0.007
RUS	0.286	0.419	-3.460	0.313	0.461	-3.839	-0.094	-0.096	0.001
SGP	0.849	-5.480	3.383	0.859	1.259	5.798	0.097	0.114	-0.017
SVK	0.188	0.370	-2.621	0.209	0.402	-2.926	-0.056	-0.060	0.003
SVN	-0.339	1.031	-3.983	-0.372	1.140	-4.402	0.056	0.045	0.011
SWE	-2.420	0.619	-0.321	-2.657	0.683	-0.360	0.068	0.066	0.003
THA	0.390	0.692	2.580	0.387	0.693	2.574	0.169	0.166	0.003
TUN	-1.033	-4.335	-7.379	-1.087	1.140	-4.760	0.050	0.044	0.006
TUR	0.305	0.661	3.507	0.302	0.659	3.502	0.167	0.165	0.002
TWN	0.559	-0.255	-12.204	0.615	-0.286	-13.395	0.013	-0.074	0.087
TZA	0.617	0.988	-3.047	0.678	1.087	-3.569	-0.012	-0.003	-0.009
UGA	0.067	0.433	-6.150	0.086	0.455	-6.055	-0.312	-0.081	-0.230
URY	0.422	1.804	2.993	0.462	1.996	3.295	0.075	0.077	-0.002
USA	0.383	-6.089	-3.970	0.420	-6.685	-4.372	-0.038	-0.056	0.018
VEN	0.411	-1.702	-2.165	0.408	-1.701	-2.161	-0.792	-0.779	-0.013
VNM	0.491	0.577	4.540	0.492	0.577	4.529	0.031	0.022	0.010
ZAF	0.774	0.930	3.294	0.775	0.929	3.290	0.358	0.350	0.008
ZMB	0.752	1.020	2.831	0.753	1.033	2.864	0.265	0.255	0.010
ZWE	0.868	1.425	3.945	0.870	1.424	3.942	1.294	1.251	0.043

Notes: This table reports general equilibrium estimates of the effects of various trade liberalization scenarios on the consumers and the producers in the world. The first three columns of the table report the effects of trade liberalization in the Sugar sector on the producers of Sugar in each country. The next three columns report the corresponding effects on the consumers of Sugar in each country. The last three columns of the table present aggregate effects on the consumers and the producers in each country from Sugar trade liberalization in the whole world. Columns *EU* simulate a decrease of 50 percent in the level of trade protection faced by all trading parters exporting Sugar to the *EU* in 2001. Columns *US* simulate 50 percent decrease in US Sugar trade protection. Finally, columns *ALL* simulate a 50 percent fall in all trade barriers for Sugar in the world.

Table 5: Trade Liberalization Effects, Wheat

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
ALB	-0.210	0.192	0.907	-0.207	0.199	0.895	0.145	0.105	0.040
ARG	0.045	0.196	0.459	0.049	0.197	0.459	0.109	0.102	0.006
AUS	0.070	0.190	0.889	0.074	0.190	0.892	0.275	0.266	0.009
AUT	-0.197	0.179	0.865	-0.206	0.190	0.863	0.098	0.098	-0.000
BEL	-0.184	0.184	0.900	-0.189	0.189	0.905	0.096	0.098	-0.002
BGD	0.014	-0.266	0.981	0.017	-0.268	0.964	0.012	0.000	0.011
BGR	-0.133	0.177	-0.855	-0.137	0.177	-0.871	-0.149	-0.130	-0.019
BRA	0.046	0.193	0.249	0.045	0.194	0.246	0.015	0.015	0.000
BWA	0.040	-0.348	0.765	0.053	-0.424	0.681	0.066	0.065	0.001
CAN	0.028	-0.954	-0.094	0.030	-0.775	-0.061	0.046	0.048	-0.002
CHE	0.130	0.178	-15.822	0.137	0.182	-16.070	-0.322	-0.329	0.007
CHL	0.069	0.279	1.422	0.065	0.276	1.396	0.259	0.251	0.008
CHN	0.040	0.199	1.673	0.033	0.199	1.661	0.111	0.109	0.002
COL	0.059	0.193	-3.988	0.061	0.195	-4.066	-0.001	-0.003	0.003
CYP	0.173	0.212	1.135	0.242	0.226	1.218	0.076	0.077	-0.002
CZE	-0.139	0.175	0.028	-0.136	0.176	0.016	0.065	0.061	0.003
DEU	-0.188	0.178	0.883	-0.191	0.183	0.891	0.114	0.112	0.002
DNK	-0.148	0.177	0.925	-0.141	0.183	0.929	0.208	0.210	-0.003
ESP	-0.196	0.187	0.720	-0.210	0.195	0.779	0.101	0.100	0.002
EST	-0.020	0.177	0.423	-0.046	0.177	0.331	0.074	0.077	-0.003
FIN	-0.103	0.187	1.105	-0.103	0.190	1.137	0.101	0.103	-0.001
FRA	-0.173	0.182	0.873	-0.177	0.185	0.870	0.170	0.171	-0.001
GBR	-0.170	0.188	1.008	-0.167	0.199	1.027	0.126	0.122	0.003
GRC	-0.176	0.176	-3.195	-0.520	0.197	-1.530	-0.410	-0.387	-0.023
HKG	0.102	0.424	1.171	0.032	0.206	1.588	0.099	0.094	0.005
HRV	-0.132	0.173	-5.634	-0.134	0.174	-5.731	0.052	0.035	0.017
HUN	-0.001	0.183	1.445	0.000	0.182	1.435	0.232	0.229	0.003
IDN	0.049	0.213	0.681	0.045	0.220	0.728	-0.008	-0.006	-0.002
IND	0.032	0.243	1.553	0.026	0.240	1.546	0.112	0.098	0.014
IRL	-0.174	0.202	1.044	-0.179	0.202	1.057	0.098	0.097	0.000
ITA	-0.224	0.187	0.888	-0.235	0.196	0.895	0.104	0.100	0.003
JPN	0.095	0.190	-24.544	0.095	0.191	-24.910	-0.682	-0.766	0.084
KOR	0.026	0.196	0.460	0.031	0.198	0.473	-0.014	-0.012	-0.001
LKA	0.034	0.231	1.500	0.032	0.237	1.531	0.000	-0.000	0.001
LTU	-0.138	0.177	1.001	-0.140	0.173	0.998	0.155	0.149	0.006
LUX	-0.193	0.184	0.883	-0.189	0.189	0.904	0.096	0.090	0.006
LVA	-0.031	0.179	0.964	-0.040	0.178	0.963	0.063	0.057	0.007
MAR	0.206	0.190	0.733	0.208	0.191	0.732	0.168	0.154	0.013
MDG	0.098	0.188	-11.255	0.046	0.214	1.405	-0.008	0.001	-0.008
MEX	0.035	-1.041	-0.824	0.035	-1.060	-0.843	-0.053	-0.051	-0.003
MLT	0.063	0.209	0.717	0.070	0.218	0.733	0.087	0.089	-0.002

Continued

Table 5 – continued from previous page

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
MOZ	0.134	0.173	-9.701	0.045	0.045	0.194	-0.006	-0.009	0.004
MWI	0.134	0.163	-13.322	0.046	0.208	1.418	0.015	0.025	-0.009
MYS	0.033	0.217	1.470	0.039	0.225	1.512	0.065	0.068	-0.003
NLD	-0.199	0.181	0.941	-0.194	0.194	0.965	0.090	0.090	0.000
NZL	0.056	0.197	1.041	0.062	0.201	1.053	0.095	0.088	0.006
PER	0.043	0.215	-5.488	0.053	0.224	-5.591	-0.106	-0.105	-0.001
PHL	0.040	0.222	-0.752	0.037	0.223	-0.774	-0.005	-0.004	-0.002
POL	0.079	0.184	1.122	0.083	0.182	1.125	0.232	0.225	0.007
PRT	-0.263	0.191	0.763	-0.268	0.199	0.773	0.079	0.081	-0.002
ROM	-0.155	0.191	1.106	-0.152	0.194	1.105	0.245	0.238	0.007
RUS	-0.024	0.182	1.247	-0.025	0.182	1.238	0.276	0.257	0.019
SGP	0.093	3.075	1.414	0.039	0.227	1.504	0.083	0.084	-0.001
SVK	-0.120	0.179	-0.738	-0.118	0.173	-0.730	-0.079	-0.072	-0.007
SVN	-0.089	0.188	-2.032	0.000	0.196	-1.137	0.053	0.056	-0.003
SWE	-0.151	0.189	1.002	-0.158	0.189	1.017	0.112	0.111	0.001
THA	0.038	0.204	-7.044	0.045	0.213	-7.159	-0.006	-0.014	0.009
TUN	0.137	0.176	-2.636	0.138	0.176	-2.633	-0.499	-0.470	-0.029
TUR	0.290	0.229	1.224	0.288	0.229	1.221	0.311	0.299	0.012
TWN	0.385	2.909	-0.677	0.029	0.198	-1.631	0.083	0.079	0.005
TZA	0.094	0.187	-9.677	0.042	0.221	-3.896	-0.077	-0.039	-0.038
UGA	0.029	-0.057	0.698	0.039	0.148	1.236	0.014	0.024	-0.010
URY	0.049	0.196	0.431	0.040	0.191	0.437	0.037	0.033	0.004
USA	0.027	-1.158	-0.155	0.022	-1.183	-0.165	0.051	0.047	0.004
VEN	0.056	0.193	-3.732	0.054	0.196	-3.797	0.007	0.002	0.005
VNM	-0.017	0.195	0.960	0.031	0.218	1.534	-0.009	-0.009	-0.000
ZAF	0.046	-0.429	0.675	0.048	-0.428	0.673	0.108	0.106	0.002
ZMB	0.093	0.185	-9.054	0.044	0.198	-0.961	-0.077	-0.072	-0.005
ZWE	0.045	0.126	-1.012	0.044	0.118	-1.029	-0.026	-0.020	-0.006

Notes: This table reports general equilibrium estimates of the effects of various trade liberalization scenarios on the consumers and the producers in the world. The first three columns of the table report the effects of trade liberalization in the Wheat sector on the producers of Wheat in each country. The next three columns report the corresponding effects on the consumers of Wheat in each country. The last three columns of the table present aggregate effects on the consumers and the producers in each country from Wheat trade liberalization in the whole world. Columns *EU* simulate a decrease of 50 percent in the level of trade protection faced by all trading parters exporting Wheat to the *EU* in 2001. Columns *US* simulate 50 percent decrease in US Wheat trade protection. Finally, columns *ALL* simulate a 50 percent fall in all trade barriers for Wheat in the world.

Table 6: Effects of Domestic Production Support, Rice

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
ALB	-4.557	-2.680	-10.109	0.402	0.391	0.800	-0.084	-0.089	0.006
ARG	0.348	0.327	0.680	0.391	0.375	0.768	-0.004	-0.004	-0.000
AUS	0.367	0.337	0.704	0.398	0.383	0.789	0.043	0.041	0.002
AUT	0.307	-3.994	-1.121	0.510	0.370	0.889	0.123	0.130	-0.007
BEL	0.282	-4.010	-1.111	0.492	0.380	0.879	0.127	0.135	-0.008
BGD	0.623	0.342	0.973	0.623	0.337	0.967	0.193	0.080	0.112
BGR	0.357	0.338	0.705	0.399	0.386	0.792	-0.038	-0.037	-0.000
BRA	0.288	0.242	0.531	0.311	0.274	0.589	0.311	0.314	-0.003
BWA	0.377	-0.331	0.628	0.417	0.395	0.819	0.033	0.028	0.005
CAN	0.713	-4.302	-1.091	0.408	0.393	0.805	0.108	0.114	-0.007
CHE	0.467	-4.020	-0.945	0.412	0.392	0.808	0.121	0.126	-0.005
CHL	0.369	0.342	0.711	0.401	0.384	0.792	0.147	0.149	-0.002
CHN	0.336	0.375	0.721	0.333	0.378	0.718	0.176	0.174	0.002
COL	0.309	0.324	0.649	0.314	0.332	0.651	0.094	0.088	0.006
CYP	0.095	-1.461	-0.173	0.406	0.391	0.804	0.075	0.075	-0.000
CZE	0.627	-3.928	-0.793	0.403	0.388	0.799	0.147	0.146	0.001
DEU	0.341	-4.095	-1.122	0.499	0.379	0.885	0.138	0.151	-0.013
DNK	-0.055	-3.851	-1.606	0.482	0.377	0.863	0.126	0.137	-0.012
ESP	4.426	0.319	4.769	1.458	0.355	1.831	-1.365	-1.340	-0.025
EST	0.382	-1.938	-0.008	0.403	0.391	0.798	0.059	0.065	-0.006
FIN	0.509	-3.893	-0.923	0.483	0.378	0.871	0.125	0.132	-0.007
FRA	3.604	0.344	3.964	0.520	0.385	0.912	0.009	0.024	-0.014
GBR	0.249	-4.104	-1.255	0.497	0.393	0.896	0.114	0.121	-0.007
GRC	4.708	0.314	5.051	1.767	0.352	2.142	-1.639	-1.650	0.010
HKG	0.584	-3.207	-0.487	0.368	0.385	0.761	0.162	0.160	0.002
HRV	0.257	-4.039	-1.133	0.402	0.391	0.797	0.125	0.127	-0.003
HUN	0.371	0.348	0.719	0.409	0.390	0.805	0.055	0.059	-0.004
IDN	0.413	0.421	0.838	0.411	0.417	0.834	0.159	0.135	0.024
IND	0.504	0.398	0.908	0.510	0.400	0.909	0.029	0.000	0.029
IRL	0.217	-3.973	-1.162	0.451	0.385	0.840	0.105	0.114	-0.009
ITA	4.279	0.328	4.631	1.276	0.368	1.660	-0.923	-0.892	-0.031
JPN	0.420	0.370	0.794	0.418	0.372	0.796	0.428	0.421	0.007
KOR	0.458	0.399	0.863	0.459	0.396	0.862	0.762	0.754	0.008
LKA	0.386	0.416	0.813	0.381	0.417	0.805	0.169	0.138	0.031
LTU	0.357	-2.638	-0.379	0.402	0.387	0.796	-0.013	-0.008	-0.005
LUX	0.524	-2.303	-0.038	0.489	0.379	0.873	0.114	0.112	0.002
LVA	0.054	-1.767	-0.363	0.400	0.389	0.796	-0.025	-0.027	0.002
MAR	0.343	0.331	0.683	0.387	0.381	0.773	-0.040	-0.038	-0.002
MDG	0.587	0.340	0.934	0.579	0.344	0.927	0.246	0.025	0.221
MEX	0.367	0.339	0.706	0.401	0.389	0.791	0.029	0.038	-0.008
MLT	0.536	-0.750	0.792	0.415	0.393	0.811	0.071	0.076	-0.004

Continued

Table 6 – continued from previous page

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
MOZ	0.593	0.335	0.928	0.503	0.362	0.872	-0.065	-0.084	0.019
MWI	0.577	0.345	0.929	0.567	0.350	0.921	-0.030	-0.103	0.073
MYS	0.299	0.277	0.577	0.323	0.305	0.632	0.203	0.201	0.002
NLD	0.281	-4.028	-1.122	0.504	0.383	0.891	0.134	0.143	-0.009
NZL	0.637	-3.848	-0.737	0.408	0.393	0.809	0.114	0.117	-0.003
PER	0.631	0.327	0.966	0.636	0.332	0.973	0.223	0.217	0.006
PHL	0.360	0.555	0.925	0.370	0.554	0.930	0.120	0.098	0.022
POL	0.389	-3.953	-0.980	0.388	0.392	0.787	0.098	0.099	-0.000
PRT	4.429	0.318	4.770	1.437	0.359	1.811	-0.986	-0.968	-0.018
ROM	0.356	0.344	0.707	0.397	0.391	0.791	0.024	0.026	-0.002
RUS	0.348	0.337	0.691	0.391	0.384	0.782	0.000	0.001	-0.001
SGP	0.681	-3.905	-0.655	0.397	0.397	0.802	0.134	0.138	-0.003
SVK	0.807	-3.237	-0.211	0.404	0.389	0.800	0.050	0.055	-0.005
SVN	0.465	-3.694	-0.799	0.402	0.391	0.797	0.109	0.116	-0.006
SWE	0.290	-3.999	-1.083	0.482	0.385	0.874	0.131	0.139	-0.008
THA	0.375	0.451	0.832	0.376	0.452	0.834	0.393	0.382	0.011
TUN	-1.583	-1.310	-2.106	0.403	0.391	0.799	0.101	0.107	-0.006
TUR	0.352	0.333	0.689	0.395	0.377	0.778	0.006	0.007	-0.000
TWN	0.337	0.330	0.673	0.369	0.369	0.742	0.181	0.182	-0.001
TZA	0.623	0.332	0.962	0.612	0.334	0.953	0.006	-0.036	0.042
UGA	0.581	0.350	0.938	0.580	0.356	0.936	-0.045	-0.124	0.079
URY	0.328	0.305	0.640	0.331	0.305	0.641	0.131	0.120	0.011
USA	0.379	5.028	5.432	0.413	0.737	1.160	-0.524	-0.513	-0.011
VEN	0.329	0.308	0.643	0.362	0.349	0.715	0.192	0.194	-0.003
VNM	0.459	0.391	0.856	0.455	0.387	0.854	0.161	0.098	0.063
ZAF	0.379	0.350	0.734	0.416	0.394	0.814	0.121	0.128	-0.006
ZMB	0.426	0.349	0.775	0.419	0.394	0.816	0.075	0.072	0.003
ZWE	0.387	0.347	0.739	0.424	0.395	0.825	0.042	0.046	-0.004

Notes: This table reports general equilibrium estimates of the effects of various subsidy removal scenarios on the consumers and the producers in the world. The first three columns of the table report the effects of subsidy removal in the Rice sector on the producers of Rice in each country. The next three columns report the corresponding effects on the consumers of Rice in each country. The last three columns of the table present aggregate effects on the consumers and the producers in each country from Rice trade liberalization in the whole world. Columns *EU* simulate 100 percent removal in the level of domestic support for the producers of Rice in the European Union in 2001. Columns *US* simulate 100 percent decrease in US Rice subsidies. Finally, columns *ALL* simulate a simultaneous removal of the subsidies for Rice producers in *EU* and *US*.

Table 7: US Subsidies, Sugar

Country	Producers	Consumers
ALB	1.401	1.881
ARG	1.581	1.584
AUS	-0.062	0.240
AUT	-0.332	-0.081
BEL	-0.813	-0.662
BGD	1.025	1.058
BGR	1.897	2.422
BRA	3.144	3.147
BWA	2.736	3.221
CAN	2.343	2.806
CHE	1.621	2.095
CHL	2.750	2.749
CHN	1.758	2.255
COL	4.053	4.053
CYP	1.598	2.082
CZE	-1.030	-0.840
DEU	0.432	0.780
DNK	-1.636	-1.523
ESP	1.014	1.419
EST	2.433	3.025
FIN	0.875	1.274
FRA	1.244	1.248
GBR	0.730	1.113
GRC	0.567	0.567
HKG	2.887	3.379
HRV	2.025	2.548
HUN	-0.906	-0.697
IDN	0.192	0.207
IND	3.393	3.388
IRL	0.489	0.850
ITA	0.534	0.894
JPN	2.256	2.786
KOR	3.166	3.465
LKA	0.199	0.535
LTU	2.134	2.138
LUX	0.816	1.241
LVA	2.931	2.930
MAR	1.951	1.951
MDG	3.561	3.565
MEX	8.128	8.124
MLT	2.690	3.296
MOZ	2.461	2.654

Continued

Table 7 – continued

Country	Producers	Consumers
MWI	4.021	4.019
MYS	2.050	2.579
NLD	-2.031	-1.985
NZL	3.020	3.386
PER	1.822	1.828
PHL	3.739	3.741
POL	-1.561	-1.534
PRT	-0.949	-0.942
ROM	2.303	2.856
RUS	-0.279	-0.013
SGP	2.969	3.364
SVK	-0.961	-0.772
SVN	1.657	2.143
SWE	0.401	0.745
THA	0.560	0.561
TUN	1.157	1.653
TUR	0.277	0.275
TWN	3.343	4.015
TZA	1.813	2.303
UGA	2.485	2.507
URY	2.377	2.938
USA	18.924	10.834
VEN	5.517	5.516
VNM	1.501	1.504
ZAF	3.068	3.067
ZMB	3.046	3.073
ZWE	3.882	3.884

Notes: This table reports general equilibrium estimates of the effects of US subsidy removal on the producers and the consumers of Sugar in the world.

Table 8: Effects of Domestic Production Support, Wheat

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
ALB	1.532	0.189	1.721	1.534	0.191	1.716	0.025	-0.073	0.098
ARG	-0.511	0.111	-0.350	-0.508	0.115	-0.344	0.553	0.558	-0.005
AUS	0.100	0.390	0.450	0.107	0.396	0.463	0.851	0.849	0.002
AUT	2.689	0.066	2.793	1.694	0.135	1.876	-0.397	-0.397	-0.001
BEL	3.170	0.046	3.345	2.258	0.110	2.502	-0.121	-0.123	0.002
BGD	-0.061	0.634	0.565	-0.059	0.629	0.562	-0.199	-0.220	0.021
BGR	1.367	-0.172	1.211	1.362	-0.177	1.209	0.316	0.285	0.031
BRA	-0.608	0.046	-0.534	-0.500	0.112	-0.358	1.995	2.010	-0.015
BWA	-0.398	0.606	0.288	-0.522	0.628	0.227	0.280	0.269	0.011
CAN	-0.196	1.141	1.094	-0.084	0.988	1.056	1.063	1.057	0.007
CHE	-0.567	-0.294	-1.305	-0.430	-0.228	-1.113	0.560	0.551	0.009
CHL	-0.197	0.298	0.102	-0.203	0.292	0.097	1.189	1.188	0.001
CHN	-0.239	0.159	-0.119	-0.232	0.158	-0.108	0.642	0.652	-0.010
COL	0.017	0.260	0.227	0.155	0.337	0.458	0.566	0.565	0.000
CYP	0.442	0.231	0.625	0.444	0.282	0.678	0.470	0.471	-0.001
CZE	1.396	-0.153	1.285	1.394	-0.152	1.290	1.240	1.233	0.008
DEU	3.306	0.019	3.419	2.402	0.072	2.593	-0.950	-0.932	-0.017
DNK	4.006	0.079	4.055	3.850	0.091	3.916	-6.352	-6.375	0.023
ESP	2.590	0.112	2.767	1.721	0.187	1.978	-1.112	-1.107	-0.006
EST	0.786	0.069	0.777	0.916	0.108	0.946	0.449	0.444	0.005
FIN	2.069	0.272	2.285	1.090	0.348	1.382	0.307	0.304	0.003
FRA	4.251	0.000	4.357	3.627	0.016	3.796	-4.758	-4.750	-0.008
GBR	3.271	0.094	3.506	2.397	0.151	2.715	-1.147	-1.133	-0.014
GRC	2.436	-0.157	2.288	1.080	0.142	1.270	-5.720	-5.772	0.052
HKG	0.055	0.432	0.204	-0.032	0.294	0.191	0.810	0.794	0.016
HRV	1.382	-0.206	1.193	1.548	-0.141	1.434	0.699	0.686	0.013
HUN	1.284	0.094	1.373	1.286	0.091	1.377	0.890	0.887	0.003
IDN	0.131	0.377	0.435	0.280	0.470	0.682	0.110	0.109	0.001
IND	0.384	0.577	0.889	0.378	0.575	0.885	-0.060	-0.085	0.025
IRL	2.300	0.211	2.574	1.322	0.288	1.672	0.065	0.063	0.002
ITA	2.683	0.122	2.851	1.750	0.188	2.002	-0.684	-0.678	-0.006
JPN	0.165	0.225	0.335	0.300	0.293	0.542	1.404	1.388	0.016
KOR	-0.179	0.187	-0.051	-0.061	0.260	0.137	1.700	1.706	-0.006
LKA	0.223	0.472	0.617	0.371	0.552	0.852	0.051	0.043	0.008
LTU	1.523	0.240	1.715	1.518	0.239	1.707	0.385	0.367	0.018
LUX	3.155	0.037	3.320	2.210	0.110	2.453	0.030	0.017	0.014
LVA	1.130	0.204	1.288	1.149	0.202	1.311	0.081	0.060	0.022
MAR	0.657	0.256	0.864	0.657	0.258	0.865	0.135	0.108	0.027
MDG	0.140	0.202	0.286	0.374	0.489	0.802	-0.284	-0.352	0.068
MEX	-0.460	1.561	1.197	-0.337	1.657	1.419	1.270	1.276	-0.006
MLT	0.345	0.236	0.526	0.491	0.312	0.757	0.458	0.457	0.001

Continued

Table 8 – continued from previous page

	Producers			Consumers			Welfare		
Country	EU	USA	ALL	EU	USA	All	Prdcrs	Cnsmrs	Total
MOZ	-0.566	-0.291	-1.305	0.127	0.507	0.648	-0.130	-0.152	0.022
MWI	-0.571	-0.297	-1.306	0.347	0.516	0.809	-0.289	-0.369	0.079
MYS	0.084	0.367	0.359	0.217	0.442	0.574	0.860	0.855	0.005
NLD	2.462	0.136	2.652	1.486	0.218	1.766	0.323	0.317	0.007
NZL	-0.028	0.338	0.253	0.108	0.402	0.449	0.653	0.649	0.004
PER	-0.292	0.181	-0.138	-0.152	0.257	0.079	0.738	0.738	-0.001
PHL	0.095	0.380	0.396	0.238	0.461	0.617	0.162	0.156	0.006
POL	1.531	0.101	1.637	1.530	0.108	1.638	0.861	0.861	-0.000
PRT	1.871	0.236	2.098	0.896	0.314	1.202	0.559	0.554	0.005
ROM	1.495	0.201	1.666	1.502	0.203	1.671	0.926	0.919	0.007
RUS	0.915	0.389	1.215	0.916	0.388	1.214	0.549	0.530	0.019
SGP	2.527	1.182	1.445	0.282	0.501	0.705	0.675	0.665	0.010
SVK	1.316	-0.199	1.136	1.303	-0.196	1.130	0.744	0.739	0.005
SVN	1.244	-0.089	1.146	1.031	0.203	1.235	0.656	0.649	0.007
SWE	2.704	0.161	2.884	1.789	0.221	2.041	-0.643	-0.641	-0.002
THA	0.159	0.371	0.462	0.304	0.452	0.685	0.991	0.995	-0.004
TUN	-0.594	-0.309	-1.316	-0.589	-0.306	-1.316	0.446	0.459	-0.013
TUR	0.405	0.280	0.636	0.407	0.280	0.636	0.532	0.529	0.004
TWN	2.547	1.916	2.101	-0.103	0.242	0.088	0.841	0.830	0.011
TZA	0.164	0.218	0.335	0.381	0.519	0.837	-0.234	-0.252	0.017
UGA	0.182	0.641	0.794	0.342	0.536	0.824	-0.251	-0.368	0.117
URY	-0.569	0.078	-0.441	-0.532	0.095	-0.381	0.545	0.543	0.002
USA	-0.173	2.289	2.271	-0.030	1.407	1.549	-0.831	-0.827	-0.004
VEN	0.080	0.282	0.314	0.203	0.345	0.514	1.644	1.650	-0.006
VNM	0.501	0.195	0.569	0.164	0.405	0.491	-0.108	-0.116	0.008
ZAF	-0.529	0.625	0.222	-0.530	0.625	0.222	1.165	1.167	-0.002
ZMB	0.162	0.224	0.332	0.337	0.514	0.800	0.614	0.613	0.001
ZWE	0.000	0.406	0.361	0.133	0.474	0.578	0.811	0.815	-0.004

Notes: This table reports general equilibrium estimates of the effects of various subsidy removal scenarios on the consumers and the producers in the world. The first three columns of the table report the effects of subsidy removal in the Wheat sector on the producers of Wheat in each country. The next three columns report the corresponding effects on the consumers of Wheat in each country. The last three columns of the table present aggregate effects on the consumers and the producers in each country from Wheat trade liberalization in the whole world. Columns *EU* simulate 100 percent removal in the level of domestic support for the producers of Wheat in the European Union in 2001. Columns US simulate 100 percent decrease in US Wheat subsidies. Finally, columns ALL simulate a simultaneous removal of the subsidies for Wheat producers in *EU* and US.

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