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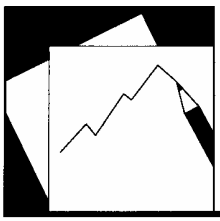

IMF Working Paper

Assessing Protectionism and Subsidies in Agriculture: A Gravity Approach

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Assessing Protectionism and Subsidies in Agriculture: A Gravity Approach

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Abstract

This paper provides the first comprehensive empirical analysis of agricultural trade using a gravity model. The data set covers bilateral trade in agricultural goods for 152 countries over the periods 1990–93 and 1999–2002. The estimations support claims that protectionism and distortive subsidies to agriculture remain widespread in more developed nations, which are shown to import less and export more agricultural products than expected given other economic, political, and geographic determinants of trade. However, some developing regions that are often thought to be the main victims of industrial-country protectionism are also found to be relatively closed to agricultural trade.

JEL Classification Numbers: F13, F14, F15

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I. INTRODUCTION

After being virtually neglected through decades of rapid trade liberalization, agricultural policy – market access, domestic support, and export subsidies – has become the most contentious topic in trade negotiations. In fact, the lack of progress in agriculture reform has led to several missed deadlines in the latest round of negotiations promoted by the World Trade Organization (WTO), putting at risk the Doha Development Agenda (Cline, 2004; WTO, 2004). The controversial issues often oppose industrial countries, notably the United States and members of the European Union, and developing nations, led by Brazil, India, and China, with the latter group claiming that tariffs, nontariff barriers, and subsidies give an unfair advantage to farmers in industrialized countries.

This paper applies the well-established empirical tool of gravity equations to model an extensive data set of bilateral trade in agricultural products in order to characterize the pattern and investigate the determinants of agricultural trade in the world. Dummy variables are progressively and selectively added to the general model so as to compare the relative trade performances of particular groups of countries – divided by regions, stage of development, and trading blocs. In determining which groups of countries import relatively less or export relatively more than others (after controlling for the standard determinants of trade), these estimates provide evidence of protectionist practices or unfair advantages created by subsidies to production or export activities. This is the first paper that provides a detailed empirical analysis of agricultural trade using a gravity model.

As a preview of the main results, this paper finds that rich countries do seem to import relatively fewer agricultural products than other countries and that this gap increased in the 1990s. Moreover, rich countries that are part of NAFTA and the EU seem to export relatively more agricultural products than other countries, perhaps reflecting the substantial subsidies granted to farming activities. Nonetheless, areas of the globe such as Latin America and Africa, which are normally thought of as being the victims of rich countries' protectionism and distortive agricultural policy, also seem to be relatively closed to agricultural trade themselves.

The remainder of this paper is structured as follows. Section II discusses some aspects of the process of trade liberalization observed in the last few decades, with emphasis on the differences between trade in agricultural products and other merchandise and between rich and less developed nations. Data description, model estimates and results are presented in section III. The last section brings my concluding remarks.

II. UNEVEN TRADE LIBERALIZATION AND MARKET ACCESS

Progress in liberalizing trade in agricultural goods has been substantially more modest than in other sectors. Total world trade increased from an average of about US$ 2 trillion a year in the period 1990–92 to US$ 6.2 trillion in the period 2000–02, an increase of nearly 210 percent (Table 1). Trade in agricultural goods increased by about 140 percent during the same period of comparison. As a result, the share of agricultural goods in world trade dropped from about 10.3 percent in the early 1990s to 7.8 percent in the early 2000s. The lower dynamism in agricultural trade is even more evident over a longer time horizon:

between 1950 and 2002, the volume of trade increased at yearly average of 6.3 percent (7.7 percent for manufactures), while the volume of trade in agricultural goods grew at yearly average of only 3.6 percent.

Table 1. Total Trade and Agricultural Trade in the World, 1950–2002

	1950-52	1960-62	1970-72	1980-82	1990-92	2000-02
Total Trade (in US$ billion)	30.5	56.1	149.1	802.7	1,997.4	6,191.7
average volume growth in the decade (%)	7.1	9.0	5.9	3.7	5.8	4.4
Agricultural Trade (in US$ billion)	11.7	15.0	26.6	106.0	205.6	487.0
average volume growth in the decade (%)	4.8	4.2	3.1	2.1	3.6	3.3
Share of Agriculture in Total Trade (%)	38.4	26.7	17.8	13.2	10.3	7.9

Source: WTO and author's calculations.

A closer look at the evolution of trade in 1990–2002 seems to support one of the complaints of developing countries: not only did the expansion of agricultural trade lag behind growth in overall trade, but agricultural exports of less developed countries also grew much more slowly than agricultural exports of OECD and EU members (Table 2). Moreover, imported agricultural products in OECD and EU countries come overwhelmingly from other industrialized nations, a trend that was reinforced during the 1990s. As a result, the only important gains in market share for agricultural exports of LDCs during the last decade was observed in other LDCs, which obviously offer a much smaller market.[2]

[2] LDC's refer to the group of Least Developed Countries as defined by the WTO. See Appendix 1 for details.

Table 2. Evolution of World Trade in Selected Country Groups 1990–2002 1/

	1990-92	2000-02	% change		1990-92	2000-02	% change
World Imports				**EU Imports**			
Total Goods	1,997.4	6,191.7	210	**Total Goods**	640.0	2,224.0	248
Agricultural Goods	205.6	487.0	137	**Agricultural Goods**	76.9	206.4	168
from OECD	135.9	329.1	142	from OECD	54.8	160.4	193
of which EU	70.1	188.0	168	of which EU	48.3	136.0	182
from LDCs	2.6	5.9	126	from LDCs	0.9	2.4	155
OECD Imports				**LDCs Imports**			
Total Goods	1,612.0	4,732.3	194	**Total Goods**	4.42	18.10	309
Agricultural Goods	172.1	372.1	116	**Agricultural Goods**	0.84	3.35	300
from OECD	117.7	270.4	130	from OECD	0.41	1.46	262
of which EU	64.4	167.1	160	of which EU	0.15	0.84	450
from LDCs	1.8	3.6	101	from LDCs	0.02	0.14	500

1/Source: WTO and United Nations (Comtrade database).
In billions of US dollars, unless otherwise noted.

The pattern of tariffs in industrial countries also seems to corroborate the bias against agricultural trade and developing nations. Although the simple average of import tariffs applied by developed nations declined between 1990–2002, the structure of these tariffs weighed more heavily on exports of LDCs, notably on agricultural goods (Table 3). The weighted average of tariffs imposed by developed countries on LDCs exports increased from 5.4 percent in 1990 to 8.9 percent in 2002, reflecting mainly an increase in agricultural tariffs from 3.3 percent to 6.6 percent. On the other hand, tariffs applied by developed nations on EU agricultural exports declined from 7.9 percent in 1990 to 4.6 percent in 2002.

Table 3. Evolution of Import Tariffs in Selected Country Groups, 1990–2002

	Simple Average		Std. Deviation		Weighted Average			
					From LDCs		From EU	
	1990	2002	1990	2002	1990	2002	1990	2002
Developed Countries								
Total Goods	6.9	3.3	8.9	9.5	5.4	8.9	5.6	2.0
Agricultural Products	7.5	3.6	10.6	20.5	3.3	6.7	7.9	4.6
LDCs 1/								
Total Goods	24.0	15.1	23.9	11.5	31.2	12.7	13.6	12.0
Agricultural Products	25.0	18.3	22.4	11.8	38.9	17.2	16.5	13.3

1/ Data for 1990 refers to the group of sub-Saharan Countries.
Source: WTO and United Nations (Comtrade database).

Substantial protectionism remains in developing countries as well (Anderson, 2003; Tokarick, 2003). Not only are the tariffs imposed by LDCs higher than those levied by developed nations, but the tariff structure in the former group also weighs more heavily on agricultural goods and on exports of other LDCs (Table 3).[3] For instance, in 2002, the tariffs imposed by LDCs on agricultural products coming from the EU were, on average, 4 percentage points lower than those levied on products coming from other LDCs. This pattern, however, is not observed in larger developing economies. Data for the same year show that the tariffs imposed on agricultural products by Indonesia, the Philippines, the Russian Federation, and the Mercosur countries fell slightly more heavily on developed countries' exports than on LDCs exports.

Besides market access, different forms of subsidies given to farmers in industrialized countries have been another source of contention in recent trade negotiations (WTO, 2004; Francois, Meijl and Tongeren, 2003; Dimaranan, Hertel and Keeney, 2003). Total agricultural support in OECD countries amounted to US$ 318 billion, or 1.2 percent of GDP, in 2002. Although this amount has declined from an average of 2 percent of GDP in 1990–92, it is still very significant, especially when compared with the size of developing economies where agriculture remains the main economic activity. Moreover, most of this support (about 70 percent) is given through output payments or direct price support, being therefore highly distortional to production and trade. Among the immediate consequences, prices received by OECD farmers were estimated to be about 30 percent higher than world prices (Ingco and Nash, 2004).

III. Data and Empirical Modeling

A. The Data

Information on the value of agricultural imports (as classified by the WTO) of 152 countries from their main trading partners during the period 1990–93 and 1999–2002 was obtained from the World Integrated Trade Solution Database (WITS), which, in turn, compiles data produced by the United Nations and the WTO.[4] The number of partners and available observations varies across countries. The series for GDP, GDP per capita, share of agriculture in GDP, and rural population density were extracted from the World Development Indicators Database produced by the World Bank. Countries' areas were obtained from the World Fact Book produced by the United States Central Intelligence Agency (CIA). Finally, distances between countries were estimated with the EARTH software available through a United States Department of Agriculture web page. The series

[3] Although data for the group of LDCs is not available for the early 1990s, a comparison using the group of sub-Saharan countries (for which the 2002 data are very similar to LDCs') shows that the average tariff imposed on agricultural exports of LDCs declined by about 20 percentage points between 1990 and 2002, substantially narrowing the gap between them and tariffs levied on developed countries' agricultural exports.

[4] A list of all countries covered by this data set can be found in the appendix.

were averaged over two distinct periods, namely 1990–93 and 1999–2002, in order to smooth out possible instability of agricultural production (bad harvests, etc.). The final data set used in the estimation has 18,200 observations.

B. The Model

Standard gravity equations are estimated following the general strategy adopted in Rose (2002), except that most specifications include country fixed effects in accordance to arguments in Subramanian and Wei (2003). The vast literature that uses gravity equations to investigate economic and geographical determinants of trade also includes papers by Croce, Juan-Ramon, and Zhu (2004), Anderson and Wincoop (2003), Taglioni (2002), Levy and Paiva (1998), and Frankel (1997). In the specification used here, a country's imports of agricultural products from a partner country depends on the size of the countries' respective economies, their land areas, the physical distance between them, the physical distance between the exporter and other potential markets, and several dummy variables capturing additional economic, historical, cultural, and geographical characteristics, which shall be discussed in detail below. Because this paper innovates in focusing exclusively on gravity modeling of agricultural trade, some variables with specific importance for agricultural activity are included among the main explanatory variables: each country's share of agriculture in GDP and rural population density. Since the data set covers two distinct periods – namely, the average in 1990–93 and the average over 1999–2002 – a dummy variable denoting the observations in the latter period is also included. The equations estimated thus have the following general specification (in logs):

$$M_t = Distance + Remoteness + SGDP_t + BGDP_t + SPCGDP_t + BPCGDP_t + SAREA + BAREA + SRPD_t + BRPD_t + SSAGDP_t + BSAGDP_t + Landl + Border + Comlang + Comcol + Colony + Island + FTA + Comcur + \varphi_i + D99 + DI + E_{t,}$$

where

M_t denotes the real US dollar amount of agricultural products imported at time *t*;

Distance and Remoteness are, respectively, the distance between the two trading countries and between the exporter and a GDP-weighted average of its main trading partners;

$SGDP_t$ *(*$BGDP_t$*)* is the seller (buyer) country's real GDP at time *t*;

$SPCGDP_t$ *(*$BPCGDP_t$*)* is the seller (buyer) country's real per capita GDP at time *t*;

SAREA (BAREA) is the seller's (buyer's) physical area;

SRPD (BRPD) is the seller's (buyer's) rural population density;

$SSAGDP_t$ *(*$BSAGDP_t$*)* is the seller's (buyer's) share of agriculture in GDP at time *t;*

Landl (Island) indicates whether two, one, or none of the trading countries are landlocked (Islands);

Border (Comlang, Comcur) indicates whether the two trading countries share a common border (language, currency);

Comcol indicates whether the two countries were ever colonized by the same country;

Colony indicates whether a country was ever a colony of the other country;

FTA indicates if the two countries are part of a regional trade agreement;[5]

φ_i are country fixed effects; and
D99 indicates whether the observation corresponds to the second period covered by the data.

The symbol DI denotes a set of dummy variables which are of central interest for the current study: (1) the regional dummy variables – namely Africa, Asia, LA (for the Latin American countries), MED (for Middle Eastern countries), and EUR (for European countries that are not members of the European Union) – and the dummy variable Brich denoting importing countries whose income per capita exceeds US$ 10,000 allow for an assessment of whether these groups of countries import relatively more or less than others; (2) the dummy variable BothRich denotes agricultural trade flows between two countries whose per capita incomes exceed US$10,000; (3) Susacan and Seu are dummy variables that indicate whether the seller country is the United States of America or Canada (Susacan) or a member of the EU (Seu), allowing the estimation to infer whether industrial countries in the NAFTA and EU regions export more agricultural products than similar countries in other areas.

C. Results

Estimation was done through ordinary least squares (OLS) using the PCGive econometrics software; the main results appear in Table 4 and are summarized as follows:

- All parameter estimates in the basic specification (summarized in the first column) have the expected signs. Imports of agricultural products are negatively affected by the distance between the trading countries and positively affected by the size of their economies. The magnitudes of these coefficients are also in line with most estimates of the impact of distance and economic size on total merchandise trade that are found in the literature. Exporting country remoteness is found to have a positive effect on trade.

[5] The regional trade agreements considered here are Association of Southeast Asian Nations (ASEAN), North America Free Trade Agreement (NAFTA), the EU, Southern Cone Common Market (MERCOSUR), South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA), Caribbean Community and Common Market (CARICOM), Papua New Guinea and Australia Trade and Commercial Relations Agreement (PATCRA), and Central American Common Market (CACM).

- The estimates also show that a higher share of agriculture in GDP is associated with higher exports of agricultural goods, as expected, and that higher rural population density tends to reduce agricultural exports, probably reflecting the fact that in countries with a large rural population, agricultural activity is less modern and more oriented toward subsistence rather than commercial purposes.

- The quantity of agricultural goods a country imports seems to be inversely related to its land area; the land area of the exporting country was not found to be significant in various specifications and was dropped from the estimation.

- Most geopolitical and historical characteristics have an impact on agricultural trade that is similar to the one they have on aggregate trade according to the existing literature. Hence, agricultural trade tends to be lower when countries are landlocked and higher when partners share a common border, or a common language, when they had the same colonizing country, or when one of the partners was colonized by the other.[6] The impact of regional Free Trade Agreements (FTAs) on agricultural trade is positive and similar to the impact they have on total merchandise trade as estimated in Rose (2002).

- The second model adds the square of distance to the basic specification. The term is significant and (marginally) improves the overall fit of the regression, suggesting it is important to consider nonlinear effects of distance on agricultural trade. The inclusion of this term reduces the estimated impact of Border on trade, but all other coefficients remain virtually unchanged.

- Column III shows the estimated coefficients for a model augmented with the variable Brich, a dummy variable that indicates the importing countries with a per capita income greater than US$ 10,000. The square of buyers' and sellers' GDPs are also added to the specification to control for possible nonlinear effects of economic size on imports of agricultural goods (estimated coefficients omitted for simplicity). The coefficient estimated for Brich suggests that agricultural imports by these countries are about 40 percent lower than expected, possibly reflecting the relatively higher incidence of tariff and nontariff barriers to agricultural trade in these countries, as often claimed by developing nations. This result is broadly in line with Subramanian and Wei (2003), which analyzed the impact of WTO on different categories of merchandise trade and estimated that industrialized countries import about 60 percent fewer agricultural goods than the average importer in their sample.[7]

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[6] The dummy variables Comcur and D99 failed to reach standard minimum significance levels and were omitted from the final specification.

[7] Although both studies cover similar time periods, the difference in point estimates may be driven mainly by the fact that the estimates in Subramanian and Wei (2003) are obtained from a system of Seemingly Unrelated Regressions (SUR) of four other sectors in addition to

(continued…)

- In order to assess possible changes in the degree of agricultural sector protection in "rich" countries during the 1990s, the model is augmented with a dummy variable (BrichL) that indicates when the importing country is rich and trade takes place in the second period covered in the sample (the average in 1999–2002). The estimated coefficient, reported in column IV, suggests that "rich" countries have imported even fewer agricultural goods than predicted during the second period, a finding that is compatible with the claim that protectionist practices in these countries may have increased or become more generalized in recent years.

- The model summarized in Column V simultaneously includes the dummy variables Brich and BothRich. The coefficient estimates for these variables suggest that besides importing fewer agricultural goods than countries with otherwise similar characteristics, rich countries tend to import more from other rich countries to the detriment of developing nations, possibly reflecting the tariff structure described in the previous section and nontariff barriers such as phyto-sanitary standards and requirements.

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agriculture and use a sample with only 4,000 observations after discarding trade flows of less than US$500,000.

Table 4. Main Econometric Results

	I	II	III	IV	V
Distance	-1.05 (-40.0)	-2.13 (-8.3)	-2.12 (-8.2)	-2.12 (-8.2)	-2.12 (-8.3)
Remoteness	1.18 (18.6)	1.17 (18.4)	1.17 (18.2)	1.17 (18.2)	1.17 (18.0)
Sgdp	0.81 (77.4)	0.81 (77.4)	0.82 (40.7)	0.81 (40.6)	0.81 (40.3)
Spcgdp	0.25 (9.9)	0.25 (9.8)	0.24 (9.7)	0.24 (9.5)	0.23 (9.0)
Srpd	-0.24 (-15.6)	-0.24 (-15.5)	-0.24 (-15.5)	-0.24 (-15.5)	-0.24 (-15.4)
Ssagdp	0.34 (9.8)	0.35 (9.8)	0.34 (9.7)	0.34 (9.4)	0.34 (9.5)
Bgdp	0.87 (12.5)	0.87 (12.5)	0.95 (11.2)	0.95 (11.2)	0.95 (11.2)
Barea	-0.16 (-3.7)	-0.16 (-3.7)	-0.21 (-4.2)	-0.21 (-4.2)	-0.21 (-4.1)
Bpcgdp	0.04 (0.5)	0.04 (0.4)	0.11 (1.2)	0.14 (1.5)	0.11 (1.2)
Landl	-0.37 (-7.4)	-0.37 (-7.4)	-0.37 (-7.4)	-0.36 (-7.4)	-0.37 (-7.5)
Island	-0.22 (-3.7)	-0.24 (-4.0)	-0.23 (-3.8)	-0.23 (-3.8)	-0.23 (-3.9)
Border	0.81 (9.1)	0.65 (6.8)	0.65 (6.9)	0.65 (6.9)	0.65 (6.9)
Comlang	0.62 (7.8)	0.63 (7.8)	0.63 (7.8)	0.63 (7.8)	0.62 (7.8)
Comcol	0.37 (4.2)	0.36 (4.1)	0.36 (4.1)	0.36 (4.1)	0.37 (4.2)
Colony	1.43 (13.8)	1.44 (13.9)	1.44 (13.9)	1.44 (13.9)	1.45 (14.0)
FTA	1.15 (13.8)	1.10 (13.1)	1.11 (13.2)	1.11 (13.2)	1.01 (11.1)
DistanceSQ		0.07 (4.2)	0.07 (4.1)	0.07 (4.1)	0.07 (4.2)
Brich			-0.51 (-2.1)	-0.43 (-1.8)	-0.55 (-2.3)
BrichL				-0.18 (-3.2)	
BothRich					0.23 (3.5)
Income Squared terms	no	no	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes
R2	0.585	0.586	0.586	0.586	0.586
Schwarz Criterion	1.5697	1.5705	1.5705	1.5705	1.5706

Note: Numbers in parentheses are heteroskedasticity-consistent t-ratios; all specifications were estimated through OLS with country fixed effects.

Additional results are reported in Table 5, where full model specifications are omitted for simplicity.

Table 5. Additional Econometric Results

	VI	VII	VIII	IX	X
Brich	-0.52 (-2.1)	-0.42 (-1.7)		-0.29 (-4.4)	-0.27 (-4.1)
BrichL		-0.19 (-3.3)		-0.10 (-1.8)	-0.10 (-1.9)
Suscan	0.39 (3.9)	0.49 (4.3)			0.55 (4.7)
Seu	0.46 (8.1)	0.38 (5.5)			0.37 (5.4)
SuscanL		-0.18 (-1.5)			-0.22 (-1.7)
SeuL		0.14 (2.2)			0.11 (1.7)
Africa			-0.29 (-4.3)	-0.34 (-4.9)	-0.35 (-5.2)
Asia			0.23 (3.9)	0.17 (2.7)	0.15 (2.5)
LA			-0.74 (-11.7)	-0.84 (-12.6)	-0.84 (-12.6)
MED			0.57 (5.5)	0.46 (4.4)	0.45 (4.3)
Income squared terms	yes	yes	no	yes	yes
Country fixed effects	yes	yes	no	no	no
R2	0.587	0.587	0.567	0.568	0.569
Schwarz Criterion	1.5688	1.5697	1.5554	1.5553	1.5547

Note: All specifications were estimated with squared distance among the explanatory variables.

- Dummy variables indicating when the exporting country is an industrial country member of NAFTA (Susacan) or the European Union (Seu) were added to the basic equation, and the coefficient estimates are reported in column VI. The new specification indicates that these countries export substantially more agricultural goods (about 48 percent more, on average) than would otherwise be expected given other economic and geopolitical characteristics, a finding that is compatible with the claim that farming subsidies and other incentives to agricultural activities in industrialized nations gives them an unfair advantage in international commodity markets.[8]

[8] Dummy variables indicating exports from Japan and from NAFTA as a whole (including Mexico) did not reach minimum significance levels when added to the basic model.

- The dummy variables Susacan and Seu were multiplied by the dummy variable identifying the latter period 1999–2002 to yield SusacanL and SeuL. These two new variables are then added to the model and their coefficient estimates are reported in column VII. These equations indicate that the level of "overexporting" in the United States and Canada has declined in the more recent period covered by the data. This decline maybe associated with the recorded decrease in government support to agricultural activities. Although EU countries have also recorded a similar reduction in agricultural support, the coefficient estimated for SeuL was positive and significant, indicating that the degree of "overexporting" by EU countries increased. This increase may be associated with the decline in tariffs imposed on EU agricultural products observed between the beginning and the end of the 1990s (Table 3).

- The estimation strategy is changed somewhat for subsequent models, with country-specific fixed effects giving place to regional dummy variables. The specification summarized in column VIII shows that (1) African and Latin American countries tend to import fewer and that (b) Asian and Middle Eastern countries tend to import more agricultural products in comparison with other regions of the world and after controlling for the determinants of trade discussed above.[9] The dummy for European countries did not reach minimum significance levels. The addition of the regional dummy variables has only a minimal effect on the coefficients estimated in Equation I.

- Finally, although some coefficient estimates change under specifications IX and X, the use of regional dummy variables do not alter the main analysis surrounding the set of DI, which again suggests that rich countries import fewer, and industrialized nations in the EU and NAFTA regions export more, agricultural goods than warranted by economic size, distance between trading partners, and other geopolitical and cultural determinants of trade. These models also confirm that "overexporting" by the United States and Canada decreased in the late 1990s, whereas it increased for countries in the EU.

[9] The dummy for common currency was also included in this specification, but it was again found to be statistically non-significant.

IV. CONCLUDING REMARKS

The expansion of trade in agricultural products has lagged behind the increase in merchandise trade observed in the world over the past few decades. Moreover, the expansion in agricultural trade seems to have benefited LDCs relatively less than industrialized nations such as those which form the EU. Many developing nations have seen these lags as the result of a biased process of trade liberalization which should be changed in the next rounds of WTO and regional trade talks. The results of this paper suggest that industrialized nations do import fewer and export more agricultural products than expected; however, the data also show that many developing countries import less than expected given their economic size and other determinants of trade.

Using gravity equations to model a comprehensive data set of bilateral trade in agricultural products, this paper shows that the main determinants of trade in a gravity framework – namely economic size and distance – have the same impact on agricultural trade as they have on total merchandise trade. The same is true for variables capturing geopolitical and historical characteristics of the trading partners. As for new variables specific to agricultural trade, the estimates indicate that a higher share of agriculture in GDP and a lower rural population density are associated with higher exports of agricultural products.

The econometric analysis also identifies groups of countries (divided alternatively by regions, stage of development, and trading blocs) whose pattern of trade is compatible with protectionism in, or subsidies to, the agricultural sector. It is found that countries with per capita income greater than US$ 10,000 tend to import fewer agricultural products than expected after controlling for the main determinants of agricultural trade. Moreover, these countries tend to trade more with each other, probably reflecting lower tariffs and nontariff barriers imposed on industrial countries' agricultural exports, mainly those coming from the EU. Nonetheless, countries in Latin America and Africa, which are often considered to be among the main victims of industrialized nations' protectionism in agriculture, have also been found to import less than expected, suggesting they do maintain important barriers to agricultural trade as well.

Finally, the estimates also show that industrialized countries in the NAFTA and EU regions export substantially more agricultural goods than would otherwise be expected, a finding that is compatible with the claim that farming subsidies and other incentives to agricultural activities in industrialized nations gives them an unfair advantage in international commodity markets. The degree of "overexporting" by the United States and Canada declined through the 1990s, perhaps reflecting a relative reduction in farming subsidies in these countries. On the other hand, the degree of "overexporting" by EU countries increased in the same period despite a similar reduction in farming subsidies, which may be associated with the observed reduction of tariffs faced by agricultural products coming from the region.

Countries Covered by the Data Set

* Albania
Algeria
* Angola
Antiga and Barbuda
Argentina
Armenia
Australia
Austria
Azerbaijan
* Bangladesh
Barbados
Belarus
Belgium
Belize
* Benin
* Bhutan
Bolivia
Botswana
Brazil
Bulgaria
* Burkina Faso
* Burundi
* Cambodia
Cameroon
Canada
* Cape Verde
* Central African Rep.
* Chad
Chile
China
Colombia
* Comoros
Costa Rica
Côte d'Ivoire
Croatia
Cyprus
Czech Republic
Denmark
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
* Equatorial Guinea
Estonia
* Ethiopia
Fiji
Finland
France
Gabon
* Gambia, The
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
* Guinea
* Guinea-Bissau
Guyana
* Haiti
Honduras
Hong Kong, SAR
Hungary
Iceland
India
Indonesia
Iran, Islamic Rep. of
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kazakhstan
Kenya
* Kiribati
Korea
Kyrgyz Republic
* Lao PDR
Latvia
Lithuania
Luxembourg
Macedonia, Fyr of
* Madagascar
* Malawi
Malaysia
* Mali
* Mauritania
Mauritius
Mexico
Moldova
Mongolia
Morocco
* Mozambique
Namibia
* Nepal
Netherlands
New Zealand
Nicaragua
* Niger
Nigeria
Norway
Pakistan
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Romania
Russia
* Rwanda
Samoa
Saudi Arabia
* Senegal
Seychelles
* Sierra Leone
Singapore
Slovak Republic
Slovenia
* Solomon Islands
South Africa
Spain
Sri Lanka
St. Kitts
St. Lucia
Suriname
Swaziland
Sweden
Switzerland
Syria
Tajikistan
* Tanzania
Thailand
* Togo
Tonga
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
* Uganda
Ukraine
United Kingdom
United States
Uruguay
Uzbekistan
* Vanuatu
Venezuela
Vietnam
* Yemen
* Zambia

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