

How Do Cultural Factors Affect Agricultural Trade?

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Abstract

The purpose of this paper is to investigate how cultural factors such as language, colonial ties, and religion affect trade in agricultural goods, in comparison with trade in manufactures. Using the augmented gravity model, we found that commonality of religion and the colonial relationship augment agricultural trade more remarkably than manufacturing trade. This result implies that the trade in agricultural goods depends more heavily on cultural ties between the partners than trade in manufactured goods. Furthermore, we find notable differences in the effect of cultural elements on trade among agricultural products.

Keywords: culture; gravity model; agricultural trade

JEL Classification: N50; Q10; Q17

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1. Introduction

The difference of language among trading partners has been considered one of the major impediments to trade, as exchange of goods may be impeded by costs associated with surmounting language barriers. The religious difference sometimes prohibitively decreases trade, say, trade in beef between the U.S.A. and India. On the other hand, a close trade relationship between colonizer and colonized country may persist after post-colonial freedom. Thus cultural factors, such as language, religion, and colonial experience, must play an important role in international trade.

A large number of papers have empirically investigated the effect of cultural ties on merchandise trade. In particular, scholars have performed econometric studies on the role of cultural ties in trade by introducing some dummy variables into a gravity equation, which is the most successful tool in explaining the volume of bilateral trade (see, for example, Havrylyshyn and Pritchett, 1991; Foroutan and Pritchett, 1993; Boisso and Ferrantino, 1997; Guo, 2004; Noland, 2005). In these studies, a positive relationship has been consistently obtained between cultural ties and merchandise trade.

The effect of cultural ties on international trade, however, seems different between agricultural goods and manufactured goods. Divergence of tastes for agricultural goods seems much larger than that for manufactured goods, and consequently the closer the cultural ties between countries, the more remarkably agricultural trade would increase than manufacturing trade.

The purpose of this paper is to investigate empirically whether trade in agricultural goods depends more heavily on cultural ties between trading partners than trade in manufactured goods. To this end, using the trade data among 165 countries, we estimate augmented gravity equations for trade in agricultural goods and manufactured goods separately and test whether the estimated coefficients for cultural variables are different between agricultural and manufacturing trade. We also test how they are

different among more detailed agricultural products.

We found that commonality of religion and a colonial relationship in history augment agricultural trade more than manufacturing trade. On the other hand, commonality of language boosts manufacturing trade more than agricultural trade. However, the elasticity difference is far larger for commonality of religion and colonial ties than for commonality of language. This result implies that trade in agricultural goods depends more heavily on cultural ties between trading partners than trade in manufactured goods. Furthermore, we find notable differences in the effect of cultural elements on trade among agricultural products.

The rest of this paper is organized as follows. Section 2 provides our gravity model and methodology for empirical analysis. In Section 3, we report empirical results, and Section 4 concludes.

2. The Gravity Equation and Methodology

This section provides our gravity equation. It is well known that the gravity equation can be supported by various kinds of theoretical models. A standard gravity equation takes the following form:

$$\ln T_{ij} = \alpha_0 + \alpha_1 \ln GDP_i + \alpha_2 \ln GDP_j + \alpha_3 \ln DISTANCE_{ij} + \varepsilon_{ij}.$$

T_{ij} denotes import values of country i from country j . GDP_i denotes Gross Domestic Product in country i . $DISTANCE_{ij}$ is geographical distance between countries i and j . ε_{ij} is a disturbance term. In the equation above, it is customary to augment variables such as a relative distance measure, GDP per capita, land area, a dummy variable to capture the country pairs sharing a land border, and dummy variables for countries surrounded by land or sea. Normally augmented also are a dummy variable for WTO member countries and a dummy variable for country pairs belonging to a common regional trade arrangement.

In addition, we introduce three kinds of variables to capture the effect

of cultural ties. First, the effect of linguistic similarity on trade is examined. Since Havrylyshyn and Pritchett (1991) and Foroutan and Pritchett (1993), a language dummy variable, which equals one if countries share a language, has been widely used as a proxy for linguistic similarity. Helliwell (1999) makes a comprehensive survey of earlier findings and concludes that bilateral merchandise trade flows are higher between pairs of countries that share a common language. More recently, a more comprehensive measure of linguistic similarity has been introduced (see, for example, Boisso and Ferrantino, 1997; Guo, 2004; Noland, 2005). To use a comprehensive measure is a difficult task because we cover many countries (165) in our sample, unlike other studies using a comprehensive measure. Therefore, we introduce a linguistic dummy variable, *Comlang_off*, that takes one if two countries share a common official language and zero otherwise.

Second, we introduce a dummy variable to capture the effect of religious similarity on trade. Some papers employ a comprehensive measure for religious similarity (see, for example, Guo, 2004; Hwang and Guo, 2004; Noland, 2005). While these papers cover only 23 countries at most, we cover 165 countries. Therefore, we chose in each country a religion, which covers the majority of the country, and then classified the representative religions into Buddhist, Taoist, Hindu, Jewish, Muslim, Orthodox, and Christian (see Appendix 1). Then, we introduced a *RELIGION* dummy variable, which takes unity if the two countries have the same representative religion and zero otherwise.

Third, we add three different dummy variables to capture colonial ties in history. The effect of colonial ties on trade has been examined for a long time, particularly since the 1970s (see, for example, Kleiman, 1976, 1977, 1978; Livingstone, 1976). Recently, scholars have increasingly performed quantitative studies on the role of colonial ties in trade by adding colonial ties-related dummy variables into a gravity equation and have found a positive relationship between the colonial ties and trade (see, for example,

Rauch, 1999; Estevaderorada *et al.*, 2002; Rauch and Trindade, 2002; Bhattacharjea, 2004). In this paper, *IMColonizer* and *EXColonizer* are introduced. *IMColonizer* (*EXColonizer*) is a binary variable which takes one if an importer (an exporter) was ever a colonizer of an exporter (importer) and zero otherwise. Introduced also is a binary variable, *Comcol*, which takes one if trading partners had a common colonizer and zero otherwise.

Consequently, we estimate the following gravity equation:

$$\begin{aligned} \ln T_{ij} = & \beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln perCapita_i + \beta_4 \ln perCapita_j + \beta_5 \ln Area_i \\ & + \beta_6 \ln Area_j + \beta_7 \ln REMOTENESS_i + \beta_8 \ln REMOTENESS_j + \beta_9 Contig_{ij} + \beta_{10} Island_i \\ & + \beta_{11} Island_j + \beta_{12} Landlocked_i + \beta_{13} Landlocked_j + \beta_{14} \ln DISTANCE_{ij} + \beta_{15} RELIGION_{ij} \\ & + \beta_{16} Comlang_off_{ij} + \beta_{17} Comlang_etho_{ij} + \beta_{18} IMColonizer_{ij} + \beta_{19} EXColonizer_{ij} \\ & + \beta_{20} Comcol_{ij} + \beta_{21} WTO_i + \beta_{22} WTO_j + \beta_{23} RTA_{ij} + \varepsilon_{ij}. \end{aligned}$$

The dependent variable is import values of agricultural or manufactured goods. *perCapita*, *Area*, and *REMOTENESS* are per capita GDP, land area (in square kilometers), and relative distance, respectively.¹

Contig is a binary variable, which takes one if the two countries share a common land border and zero otherwise. *Island* (*Landlocked*) takes unity if the country is an island (landlocked) country. *WTO* is a binary variable which takes one if the country is a member of the World Trade Organization and zero otherwise. Lastly, we include a binary variable *RTA*, which takes one if the partners belong to a common regional trade arrangement and zero otherwise.

By estimating this equation in manufacturing and agricultural trade separately, we examine differences between coefficients, particularly for cultural variables by conducting the Wald test with the null hypothesis that respective coefficients are identical in both equations. Here we use the

¹ REMOTENESS is calculated as $\log [1/\sum_{it} (GDP_{it}/GDP_{wt})/DISTANCE_{ij}]$, where GDP_{wt} = world GDP at time t.

method of ordinary least squares (OLS) by equation² because the same regressors show up in each equation and therefore the OLS estimates become equivalent to the generalized least squares estimates.³

After examining the differences in the role of cultural ties between agricultural and manufacturing trade, we employ the same method also into the imports of more detailed agricultural commodities.

This paper defines agricultural and manufactured goods as the goods categorized in 0/1 and 6/7/8 in SITC Rev. 3, respectively. In particular, we use the bilateral trade values in manufactured and agricultural goods in 2003 and in three years average (2002, 2003, and 2004) to smooth out possible instability of agricultural production as in Paiva (2005). Data on Area, GDP, and GDP per capita are obtained from World Development Indicator. Religions and languages in each country are taken from World FactBook (CIA). Information on WTO and RTA is from WTO homepage (<http://www.wto.org/>). The source of all other variables is CEPII (<http://www.cepii.fr/anglaisgraph/bdd/distances.htm#>).

The basic statistics are reported in Table 1. Correlation among variables is reported in Table 2. Countries in our dataset are listed in Appendix 2.

3. Empirical results

This section reports regression results for equations presented in the previous section. First, we investigate whether estimated coefficients for cultural variables are different between agricultural and manufacturing

² We perform generalized least squares estimation in order only to obtain the covariances between the estimates from different equations, which are needed to perform the Wald test.

³ In general, separate estimation of two regressions may be accompanied with correlated estimation errors. That is, the error term in the agricultural equation could possibly be non-orthogonal to that in the manufacturing equation. This correlation is plausible because the unobservable elements, such as nontariff barriers between trading partners, would simultaneously affect both trades. Therefore, we should usually apply the GLS method that gives us more efficient estimators than OLS estimators.

trade. Next, we also test how they are different among more detailed agricultural products.

3.1. Manufactured vs. agricultural goods

Table 3 reports baseline results for manufacturing and agricultural trade. To take the correlation between Comlang_off and Comcol into consideration, we introduce Comlang_off and Comcol separately (Eq (2) and Eq (3)).

In equations for both manufactures and agricultural products, trade is positively correlated with GDPs of exporter and importer, and is adversely affected by geographical distance between them. Estimated coefficients for most other augmented variables have expected signs and are significant at the 5 percent level. The only exceptions are the results for GDP per capita, and REMOTENESS.

Our main interest in this paper lies in the coefficients for cultural variables, *i.e.*, Comlang_off, RELIGION, IMColonizer, EXColonizer, and Comcol. They have the expected signs and are all statistically significant, but the followings are noteworthy.

First, the effect of language commonality is statistically larger for manufacturing trade than for agricultural trade. In Eq (1), the coefficients for Comlang_off dummy variable are 0.99 and 0.76 in manufacturing and agricultural trade, respectively. The same goes for the results in Eq (2). The Wald test rejects the hypothesis that coefficients are the same in both equations. This may be due to the fact that language commonality is not directly related with similarity of tastes, but is more closely related with ease of obtaining information.

Second, the effect of religious similarity seems much larger for trade in agricultural products than for trade in manufactures. The Wald test supports the observation at the one percent level.

Third, we find that coefficients for colonizer dummy variables

(IMColonizer and EXColonizer) in agricultural trade are larger than those in manufacturing trade in all three equations. In Eq (1), the estimated coefficients for IMColonizer (EXColonizer) are 1.28 (0.57) and 3.04 (1.94) in manufacturing and agriculture trade, respectively. Similar results are also obtained in Eq (2) and Eq (3). In all equations, the Wald test rejects the hypothesis that the coefficients are the same. These results indicate that the colonial relationship plays a more critical role in agricultural trade than in manufacturing trade. It is also noted that in both trades, the coefficient for IMColonizer is larger than that for EXColonizer. Therefore, we have evidence to say that ex-colony and ex-colonizer trade more goods with each other, but the degree to which ex-colony imports goods from its ex-colonizer is larger than the degree to which ex-colonizer imports goods from its ex-colony.

On the other hand, there is not so much of a statistical difference in coefficient for Comcol dummy variable between agricultural and manufacturing trade. The estimated coefficients in Eq (1) are 0.81 and 0.83 in manufacturing and agriculture trade, respectively. They are 1.31 and 1.22 in Eq (3). The Wald test does not reject the hypothesis that they are the same. Therefore, the effect of having had a common colonizer on trade is not different between agricultural and manufactured goods.

The results above are summarized as follows. Commonality of religion and a colonial relationship in history augment agricultural trade more than manufacturing trade. On the other hand, commonality of language boosts manufacturing trade more than agricultural trade. However, the elasticity difference is far larger for commonality of religion and colonial ties than for commonality of language. This result implies that trade in agricultural goods depends more heavily on cultural ties between trading partners than trade in manufactured goods.

To check the robustness of our results, we perform some other estimations. First, we estimate the same equation with the 3-year (2002, 2003, and 2004) average of the imports value in order to smooth out possible

instability of agricultural production (bad harvest, zero production, *etc.*). OLS results are reported in Table 4. Similarly to the results in Table 3, the estimated coefficients for colonizer and religious dummy variables in agricultural goods are much higher than in manufactured goods, and this observation is confirmed by the Wald test. A difference is that even though the coefficient for common language is still larger in manufactured goods than in agricultural goods, the Wald test for commonality of language coefficient is not rejected. Thus, we now have stronger evidence that cultural ties have a greater effect on trade in agricultural products than on trade in manufactured products.

It seems that differences in cultural effects between the two trades are time-unchangeable. Cassing and Husted (2004) find stability in merchandise trade between former colonies and their colonial mother countries, and Bhattacharjea (2004) obtains qualified support for the persistence of market shares for the former colonial powers in the trade by using panel data on imports by 119 developing countries for the period 1994-1999. We report the results only for the year 2003 and the average of 2002, 2003, and 2004. As another way to check the robustness of our results, we also estimated the above gravity equation using trade data of 1964 and 1984, respectively, and with the panel data of 1964, 1984, and 2004, and found that there were no qualitative differences in the regression results.⁴

3.2. Cultural ties by agricultural commodities

We also employ the same method to see whether the effect of cultural elements is different among more detailed agricultural products⁵. Table 5 reports the estimated results for cultural variables only.

⁴ The results are available upon request.

⁵ Disaggregated commodities are Beef (0111), Milk (0224), Butter (023), Eggs (0251), Wheat (0411), Rice (0422), Barley (043), Corn (044), Rye (0451), Oats (0452), Potato (0541), and Sugar (0612).

First, the common language dummy variable has a relatively large positive coefficient and is significant at the 1 percent level in Sugar (0.49), Butter (0.36), and Wheat (0.28) in Eq (2).

Second, the RELIGION dummy variable has a relatively large positive and significant coefficient in Milk (0.24) and Beef (0.23) in Eq (2) as well as Milk (0.25) and Beef (0.24) in Eq (3). Taking Beef for instance, we may understand that trade in these agricultural products depends more heavily on commonality of religion between countries.

Third, we can observe notable differences in coefficients for three colonial variables among the products. The estimated coefficients for IMColonizer dummy variable are positive, significant, and relatively large in Sugar (1.03) and Corn (0.79) in Eq (2) as well as Sugar (1.30) and Corn (0.90) in Eq (3). On the other hand, coefficients for EXColonizer dummy variable are estimated positively significant in almost all products. In particular, the coefficient is relatively large in Sugar (4.85), Butter (3.50), and Potato (2.76) in Eq (2) as well as Sugar (5.13), Butter (3.71), and Potato (2.84) in Eq (3). The coefficient for Comcol dummy variable is estimated positively significant and is relatively large in Wheat (0.43), Sugar (0.33), and Corn (0.31).

We also repeated the estimation using Tobit estimation to account for many country pairs with zero exports between them. The results are reported in Table 6 and are basically unchanged from the previous ones. That is, Sugar still has a relatively large coefficient for colonizer dummy variables, and the coefficient for common language is relatively large in Wheat, Egg, and Sugar. The estimated coefficient for Religion dummy variable is relatively large in Oats, Beef, and Milks as in the results by OLS.

4. Concluding remarks

Throughout history, the intercultural movement of crops and livestock breeds revolutionized diets all over the world. The recent “globalization”,

which refers to ever-increasing mobility of goods, services, labour, information, technology, and capital throughout the world, will accelerate the similarization of diets. Therefore, trade in agricultural goods may increase remarkably in the future, though recently much interest in the part of economists has been devoted to trade in manufacturing and service sectors.

We have investigated the relationship between trade and cultural ties and found that commonality of religion and a colonial relationship augment agricultural trade more than manufacturing trade. That is, we can say that trade in agricultural goods depends more heavily on cultural ties between trading partners than trade in manufactured goods.

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Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ln Manu	27,060	6.950	7.476	0	25.767
ln Agri	27,060	5.414	6.953	0	23.302
ln GDP	27,060	23.152	2.446	17.750	29.967
ln GDP per capita_i	27,060	7.539	1.548	4.608	10.738
ln Area	27,060	11.540	2.465	5.200	16.643
Island	27,060	0.170	0.375	0	1
Landlocked	27,060	0.206	0.404	0	1
Contig	27,060	0.018	0.132	0	1
Comlang_off	27,060	0.163	0.370	0	1
ln DISTANCE	27,060	8.744	0.783	4.088	9.899
ln REMOTENESS_i	27,060	8.602	0.528	7.136	9.404
WTO	27,060	0.776	0.417	0	1
RTA	27,060	0.069	0.253	0	1
IMColonizer	27,060	0.006	0.079	0	1
EXColonizer	27,060	0.006	0.079	0	1
RELIGION	27,060	0.363	0.481	0	1
Comcol	27,060	0.165	0.371	0	1

Table 2. Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	
ln Manu	1.00																								
ln Agri	0.80	1.00																							
ln GDP_j	0.52	0.48	1.00																						
ln GDP per capita_i	0.36	0.37	0.57	1.00																					
ln Area_i	0.21	0.16	0.58	-0.14	1.00																				
ln Area_j	-0.09	-0.07	-0.28	0.14	-0.50	1.00																			
Landlocked_i	-0.13	-0.13	-0.17	-0.28	0.10	-0.23	1.00																		
Landlocked_j	0.49	0.46	-0.01	0.00	0.00	0.00	0.00	1.00																	
ln GDP per capita_j	0.33	0.29	0.00	-0.01	0.00	0.00	0.00	0.57	1.00																
ln Area_j	0.21	0.22	0.00	0.00	-0.01	0.00	0.00	0.58	-0.14	1.00															
Island_j	-0.10	-0.07	0.00	0.00	0.00	0.00	-0.01	-0.17	-0.28	0.10	-0.50	1.00													
Landlocked_j	-0.12	-0.14	0.00	0.00	0.00	0.00	-0.06	0.03	0.04	-0.02	0.07	-0.06	0.03	1.00											
Contig	0.12	0.13	0.04	-0.02	0.07	-0.06	0.03	0.04	-0.11	-0.02	-0.11	-0.04	0.10	1.00											
Comlang_off	-0.01	0.01	-0.11	-0.02	-0.11	0.11	-0.04	-0.11	-0.02	-0.11	0.11	-0.04	0.10	1.00											
ln DISTANCE	-0.26	-0.25	-0.07	-0.03	-0.03	0.15	-0.06	-0.07	-0.03	-0.03	0.15	-0.06	-0.36	-0.07	1.00										
ln REMOTENESS_i	-0.36	-0.39	-0.52	-0.60	0.03	0.24	0.02	0.00	0.00	0.00	0.00	0.00	-0.02	0.14	0.24	1.00									
ln REMOTENESS_j	-0.32	-0.22	0.00	0.00	0.00	0.00	0.00	-0.52	-0.60	0.03	0.24	0.02	-0.02	0.14	0.24	0.00	1.00								
WTO_i	0.20	0.16	0.34	0.19	0.21	-0.14	-0.05	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.14	0.00	1.00								
WTO_j	0.18	0.19	0.00	0.00	0.00	0.00	0.00	0.34	0.19	0.21	-0.14	-0.05	0.00	0.00	-0.01	-0.14	0.00	1.00							
RTA	0.21	0.22	0.06	0.09	-0.01	0.01	0.02	0.06	0.09	-0.01	0.01	0.02	0.27	0.12	-0.44	-0.08	0.05	0.05	1.00						
IMColonizer	0.10	0.12	0.13	0.10	0.05	-0.03	-0.03	-0.01	-0.01	0.00	0.01	0.00	0.07	0.10	-0.05	-0.13	0.01	0.03	0.00	1.00					
EXColonizer	0.08	0.09	-0.01	-0.01	0.00	0.01	0.00	0.13	0.10	0.05	-0.03	-0.03	0.07	0.10	-0.05	0.01	-0.13	0.00	0.03	0.03	1.00				
RELIGION	0.07	0.09	0.01	0.16	-0.08	0.05	-0.03	0.01	0.16	-0.08	0.05	-0.03	0.08	0.16	-0.08	-0.03	0.07	0.07	0.17	0.04	0.04	1.00			
Comcol	0.01	0.02	-0.09	-0.04	-0.08	0.12	-0.06	-0.09	-0.04	-0.08	0.12	-0.06	0.09	0.56	-0.08	0.15	0.15	-0.01	0.13	-0.03	-0.03	0.05	1.00		

Table 3. Regression Results in 2003

	Eq (1)		Eq (2)		Eq (3)	
	manu	agri	manu	agri	manu	agri
Comlang_off	0.99** *	0.76**	1.42** **	1.20**		
	(0.10)	(0.10)	(0.09)	(0.08)		
RELIGION	0.07 **	0.35**	0.04 **	0.31**	0.15* **	0.40**
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
IMColonizer	1.28** **	3.04**	0.97* **	2.73**	1.84** **	3.47**
	(0.38)	(0.38)	(0.38)	(0.37)	(0.38)	(0.37)
EXColonizer	0.57 **	1.94**	0.27 **	1.63**	1.13** **	2.37**
	(0.38)	(0.38)	(0.38)	(0.37)	(0.38)	(0.37)
Comcol	0.81**	0.83**			1.31**	1.22**
	(0.10)	(0.10)			(0.08)	(0.08)
ln DISTANCE	-1.42**	-1.32**	-1.45**	-1.36**	-1.45**	-1.35**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
ln GDP_i	1.69**	1.21**	1.69**	1.21**	1.69**	1.21**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
ln GDP_j	1.64**	1.54**	1.64**	1.54**	1.64**	1.54**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
ln REMOTENESS_i	-1.00**	-1.93**	-0.94**	-1.86**	-0.91**	-1.86
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
ln REMOTENESS_j	-0.27**	1.09**	-0.21*	1.16**	-0.18*	1.16*
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
ln GDP per capita_i	-0.18**	0.00	-0.18**	0.00	-0.18**	0.01**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
ln GDP per capita_j	-0.08**	-0.09**	-0.08*	-0.09**	-0.07*	-0.08**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
ln Area_i	-0.27**	-0.10**	-0.27**	-0.10**	-0.28**	-0.11**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
ln Area_j	-0.27**	-0.25**	-0.28**	-0.26**	-0.28**	-0.26**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Contig	0.60*	1.19**	0.66**	1.25**	0.63*	1.21**
	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)
Island_i	1.06**	1.40**	1.08**	1.42**	1.05**	1.39**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Island_j	0.47**	0.39**	0.50**	0.42**	0.47**	0.39**
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Landlocked_i	-0.55**	-0.61**	-0.58**	-0.64**	-0.54**	-0.60*
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Landlocked_j	-0.44**	-0.90**	-0.47**	-0.93**	-0.43**	-0.89**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
WTO_i	0.67**	0.11	0.67**	0.11	0.69**	0.12**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
WTO_j	0.37**	0.68**	0.37**	0.68**	0.39**	0.70**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
RTA	1.87**	1.85**	1.92**	1.90**	1.88**	1.86**
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
constant	-39.76**	-35.90**	-40.63**	-36.79**	-40.94**	-36.80**
	(1.41)	(1.40)	(1.41)	(1.40)	(1.41)	(1.40)
Obs.	27,060	27,060	27,060	27,060	27,060	27,060
R-sq	0.5934	0.5365	0.5923	0.5352	0.5919	0.5355

Notes: ** shows 1% and * shows 5% significant. In parentheses is a White consistent standard error. The column between “manu” and “agri” reports the result of the Wald test with the null hypothesis that each coefficient (only for cultural variables) is identical in manufacturing and agricultural trade equations.

Table 4. Regression Results in average of 3 years

	Eq (1)		Eq (2)		Eq (3)	
	manu	agri	manu	agri	manu	agri
Comlang_off	0.87** (0.09)	0.72** (0.10)	1.36** (0.08)	1.24** (0.08)		
RELIGION	0.18** ** (0.06)	0.38** (0.06)	0.15* ** (0.06)	0.35** (0.06)	0.25** ** (0.06)	0.44** (0.06)
IMColonizer	0.37 ** (0.35)	2.21** (0.36)	0.02 ** (0.35)	1.85** (0.36)	0.86* ** (0.35)	2.62** (0.36)
EXColonizer	0.76* ** (0.35)	1.86** (0.36)	0.41 ** (0.35)	1.50** (0.36)	1.25** ** (0.35)	2.27** (0.36)
Comcol	0.93** (0.09)	0.97** (0.09)			1.37** (0.08)	1.33** (0.08)
ln DISTANCE	-1.40** (0.05)	-1.41** (0.05)	-1.43** (0.05)	-1.45** (0.05)	-1.42** (0.05)	-1.43** (0.05)
ln GDP_i	-1.83** (0.03)	1.33** (0.03)	1.83** (0.03)	1.34** (0.03)	1.83** (0.03)	1.33** (0.03)
ln GDP_j	1.56** (0.03)	1.54** (0.03)	1.57** (0.03)	1.55** (0.03)	1.57** (0.03)	1.54** (0.03)
ln REMOTENESS_i	-1.07** (0.08)	-2.13** (0.09)	-1.00** (0.08)	-2.05** (0.09)	-0.99** (0.08)	-2.06** (0.09)
ln REMOTENESS_j	-0.29** (0.08)	1.05** (0.09)	-0.22** (0.08)	1.12** (0.09)	-0.21* (0.08)	1.11** (0.09)
ln GDP per capita_i	-0.44** (0.03)	-0.23* (0.03)	-0.44** (0.03)	-0.23* (0.03)	-0.43** (0.03)	-0.22** (0.03)
ln GDP per capita_j	-0.09** (0.03)	-0.08* (0.03)	-0.09** (0.03)	-0.08* (0.03)	-0.09** (0.03)	-0.08* (0.03)
ln Area_i	-0.31** (0.02)	-0.11** (0.02)	-0.32** (0.02)	-0.12** (0.02)	-0.32** (0.02)**	-0.12** (0.02)
ln Area_j	-0.25** (0.02)	-0.22** (0.02)	-0.25** (0.02)	-0.23** (0.02)	-0.26** (0.02)	-0.23** (0.02)
Contig	0.87** (0.23)	1.19** (0.23)	0.94** (0.23)	1.26** (0.23)	0.89** (0.23)	1.21** (0.23)
ISLAND_i	1.21** (0.09)	1.60** (0.10)	1.24** (0.09)	1.63** (0.10)	1.21** (0.09)	1.60** (0.10)
ISLAND_j	0.46** (0.09)	0.42** (0.10)	0.49** (0.09)	0.45** (0.10)	0.46** (0.09)	0.41** (0.10)
Landlocked_i	-0.76** (0.07)	-0.95** (0.08)	-0.80** (0.07)	-0.98** (0.08)	-0.75** (0.07)	-0.94** (0.08)
Landlocked_j	-0.47** (0.07)	-0.89** (0.08)	-0.50** (0.07)	-0.92** (0.08)	-0.46** (0.07)	-0.88** (0.08)
WTO_i	0.89** (0.07)	0.18* (0.07)	0.89** (0.07)	0.19* (0.07)	0.91** (0.07)	0.20** (0.07)
WTO_j	0.42** (0.07)	0.78** (0.07)	0.42** (0.07)	0.78** (0.07)	0.44** (0.07)	0.79** (0.07)
RTA	1.44** (0.12)	1.64** (0.13)	1.50** (0.12)	1.70** (0.13)	1.45** (0.12)	1.65** (0.13)
constant	-37.63** (1.31)	-33.71** (1.36)	-38.63** (1.31)	-34.75** (1.36)	-38.66** (1.31)	-34.57** (1.36)
Obs.	27,060	27,060	27,060	27,060	27,060	27,060
R-sq	0.6235	0.5653	0.6220	0.5636	0.6223	0.5644

Note: See notes on Table 3.

Table 5. OLS Results by Agricultural Commodities

	Milk	Butter	Eggs	Wheat	Rice	Bareley	Corn	Rye	Oats	Potato	Sugar	Beef
Eq (1)												
Comlang_off	0.15* (0.06)	0.28** (0.08)	0.17** (0.05)	0.06 (0.07)	0.16** (0.05)	0.03 (0.06)	0.00 (0.07)	-0.01 (0.04)	0.08 (0.04)	0.21** (0.07)	0.43** (0.09)	0.12 (0.06)
IMColonizer	-0.44 (0.27)	-0.38 (0.34)	0.11 (0.30)	0.08 (0.30)	0.31 (0.33)	-0.20 (0.28)	0.91* (0.39)	-0.09 (0.21)	0.04 (0.22)	0.56 (0.37)	9.00* (0.45)	0.03 (0.35)
EXColonizer	1.86** (0.43)	3.55** (0.49)	0.66 (0.37)	0.92* (0.43)	0.55 (0.32)	1.93** (0.44)	1.41** (0.42)	0.41 (0.27)	0.92** (0.31)	2.73** (0.47)	4.89** (0.52)	1.20** (0.35)
RELIGION	0.24** (0.04)	0.13** (0.49)	0.14** (0.03)	0.07 (0.03)	0.07* (0.03)	0.09** (0.03)	0.17** (0.04)	0.05** (0.02)	0.13** (0.02)	0.05 (0.04)	0.04 (0.05)	0.23** (0.04)
Comcol	0.03 (0.06)	0.14* (0.49)	0.01 (0.05)	0.40 (0.08)	0.02 (0.05)	-0.09 (0.05)	0.32** (0.07)	-0.08* (0.03)	0.00 (0.04)	-0.09 (0.07)	0.11 (0.05)	0.10 (0.04)
Obs.	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182
R-Sq	0.2022	0.2400	0.1328	0.1262	0.1414	0.1754	0.1481	0.1354	0.1404	0.2582	0.2544	0.1494
Eq (2)												
Comlang_off	0.17** (0.05)	0.36** (0.06)	0.18** (0.05)	0.28** (0.06)	0.17** (0.05)	-0.02 (0.04)	0.17 (0.06)	-0.05 (0.03)	0.08** (0.04)	0.16** (0.06)	0.49** (0.07)	0.17** (0.06)
IMColonizer	-0.45 (0.27)	-0.43 (0.34)	0.10 (0.30)	-0.07 (0.30)	0.31 (0.33)	-0.17 (0.28)	0.79* (0.39)	-0.06 (0.21)	0.04 (0.22)	0.59 (0.36)	1.03* (0.45)	0.00 (0.35)
EXColonizer	1.84** (0.43)	3.50** (0.49)	0.65 (0.37)	0.77 (0.43)	0.54 (0.32)	1.96** (0.44)	1.29** (0.41)	0.44 (0.27)	0.92** (0.31)	2.76** (0.47)	4.85** (0.52)	1.16** (0.41)
RELIGION	0.24** (0.04)	0.12** (0.04)	0.14** (0.03)	0.05 (0.03)	0.07* (0.03)	0.10** (0.03)	0.16** (0.04)	0.06** (0.02)	0.13** (0.02)	0.05 (0.04)	0.03 (0.05)	0.23** (0.04)
Obs.	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182
R-Sq	0.2022	0.2398	0.1328	0.1238	0.1414	0.1753	0.1469	0.1352	0.1404	0.2551	0.2543	0.1493
Eq (3)												
IMColonizer	-0.36 (0.26)	-0.22 (0.33)	0.20 (0.30)	0.12 (0.30)	0.40 (0.33)	-0.19 (0.28)	0.90* (0.39)	-0.09 (0.20)	0.08 (0.22)	0.67 (0.36)	1.30** (0.45)	0.10 (0.35)
EXColonizer	1.94** (0.43)	3.71** (0.49)	0.75* (0.37)	0.95* (0.42)	0.63* (0.32)	1.95** (0.44)	1.40** (0.41)	0.41 (0.27)	0.96** (0.31)	2.84** (0.47)	5.13** (0.52)	1.27** (0.41)
RELIGION	0.25** (0.04)	0.15** (0.04)	0.15* (0.03)	0.07* (0.03)	0.08** (0.03)	0.10** (0.03)	0.17** (0.04)	0.05** (0.02)	0.14** (0.02)	0.06 (0.04)	0.06 (0.05)	0.24** (0.04)
Comcol	0.11* (0.05)	0.28** (0.06)	0.10* (0.04)	0.43** (0.06)	0.10** (0.04)	-0.08* (0.04)	0.31** (0.06)	-0.08** (0.02)	0.04 (0.03)	0.02 (0.05)	0.33** (0.07)	0.16** (0.05)
Obs.	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182
R-Sq	0.2019	0.2393	0.1322	0.1261	0.1410	0.1754	0.1481	0.1354	0.1402	0.2578	0.2532	0.1493

Notes: See notes on Table 3. Reported here are the results of cultural variables only.

Table 6. Tobit Results by Agricultural Commodities

	Milk	Butter	Eggs	Wheat	Rice	Bareley	Corn	Rye	Oats	Potato	Sugar	Beef
Eq (1)												
Comlang_off	0.77 (0.88)	2.15** (0.73)	4.37** (1.15)	1.99 (1.31)	3.05** (1.02)	-0.29 (1.22)	0.78 (0.94)	-0.89 (1.71)	1.83 (1.20)	2.56** (0.75)	3.17** (0.63)	2.61* (1.24)
IMColonizer	0.85 (2.25)	-0.55 (2.04)	2.80 (2.77)	4.41 (3.29)	4.60* (2.31)	-0.22 (2.82)	7.86** (2.16)	3.46 (3.37)	4.81 (2.64)	6.22** (1.74)	7.20** (1.55)	0.28 (2.96)
EXColonizer	5.68** (1.51)	8.89** (1.39)	1.54 (2.17)	4.17 (2.46)	5.06* (1.97)	7.92** (2.00)	8.29** (1.86)	2.91 (2.74)	8.26** (1.99)	5.72** (1.38)	9.39** (1.29)	11.38** (2.29)
RELIGION	2.52** (0.59)	0.94 (0.50)	1.12 (0.82)	-0.65 (0.98)	-0.05 (0.75)	0.85 (0.86)	1.48* (0.65)	-0.49 (1.35)	3.80** (0.94)	-0.51 (0.52)	-0.57 (0.44)	3.06** (0.83)
Comcol	2.83** (0.89)	3.84** (0.72)	2.51* (1.18)	9.00** (1.28)	2.51* (1.01)	2.22 (1.21)	4.12** (0.91)	2.15 (1.81)	2.56* (1.27)	1.61* (0.75)	2.96** (0.62)	1.49 (1.24)
Obs.	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182
Pseudo R2	0.2516	0.2019	0.2064	0.2216	0.2249	0.2552	0.1836	0.3064	0.2730	0.2293	0.1866	0.2102
Eq (2)												
Comlang_off	2.21** (0.76)	4.14** (0.63)	5.62** (1.00)	6.35** (1.18)	4.33** (0.88)	0.65 (1.10)	2.97** (0.81)	-0.15 (1.60)	3.03** (1.05)	3.30** (0.66)	4.68** (0.54)	3.47** (1.01)
IMColonizer	-0.01 (2.23)	1.73 (2.02)	2.04 (2.75)	1.87 (3.32)	3.81 (2.28)	-0.77 (2.80)	6.38** (2.15)	3.01 (3.35)	4.10 (2.62)	5.73** (1.73)	6.16** (1.53)	-0.35 (2.93)
EXColonizer	4.69** (1.48)	7.49** (1.37)	0.67 (2.13)	1.26 (2.45)	4.19* (1.93)	7.29** (1.97)	6.84** (1.84)	2.37 (2.70)	7.44** (1.94)	5.19** (1.36)	8.33** (1.27)	10.81** (2.24)
RELIGION	2.45** (0.59)	0.82 (0.50)	1.11 (0.82)	-0.94 (0.99)	-0.11 (0.75)	0.79 (0.86)	1.39* (0.65)	-0.45 (1.35)	3.74** (0.94)	-0.55 (0.52)	-0.66 (0.44)	3.02** (0.83)
Obs.	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182
Pseudo R2	0.2509	0.2005	0.2059	0.2168	0.2244	0.2549	0.1823	0.3062	0.2724	0.2291	0.1857	0.2101
Eq (3)												
IMColonizer	1.17 (2.22)	0.34 (2.03)	4.60 (2.75)	5.17 (3.25)	6.11** (2.26)	-0.31 (2.79)	8.28** (2.11)	3.26 (3.34)	5.57* (2.61)	7.37** (1.72)	8.86** (1.52)	1.90* (2.85)
EXColonizer	6.10** (1.44)	10.06** (1.34)	3.87 (2.08)	5.00* (2.40)	6.57** (1.91)	7.79** (1.93)	8.68** (1.81)	2.63 (2.68)	9.17** (1.90)	7.00** (1.34)	11.11** (1.25)	12.79** (2.20)
RELIGION	2.57** (0.59)	1.10* (0.50)	1.42 (0.81)	-0.42 (0.97)	0.21 (0.74)	0.83 (0.85)	1.54* (0.64)	-0.57 (1.34)	3.98** (0.94)	-0.31 (0.52)	-0.35 (0.44)	3.27** (0.82)
Comcol	3.23** (0.76)	4.92** (0.62)	4.76** (1.02)	9.88** (1.15)	4.04** (0.88)	2.10 (1.10)	4.51** (0.78)	1.81 (1.68)	3.50** (1.11)	2.79** (0.67)	4.53** (0.54)	2.99** (1.01)
Obs.	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182	19,182
Pseudo R2	0.2515	0.2015	0.2409	0.2214	0.2242	0.2552	0.1836	0.3064	0.2727	0.2287	0.1855	0.2098

Note: See notes on Table 5.

Appendix 1. Representative Religion

Buddhist

Bhutan, Cambodia, Japan, Lao People's Dem. Rep., Mongolia, Rep. of Korea, Singapore, Sri Lanka, Thailand, Viet Nam

Christian

Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Belgium, Belize, Bolivia, Botswana, Brazil, Burundi, Canada, Cape Verde, Cayman Isds, Chile, Colombia, Congo, Costa Rica, Croatia, Czech Rep., Cote d'Ivoire, Denmark, Dominica, Dominican Rep., Ecuador, El Salvador, Equatorial Guinea, Estonia, Fiji, Finland, France, Gabon, Georgia, Germany, Ghana, Grenada, Guatemala, Guyana, Haiti, Honduras, Hungary, Iceland, Ireland, Italy, Jamaica, Kenya, Kiribati, Latvia, Lesotho, Lithuania, Luxembourg, Mozambique, Namibia, Netherlands, New Zealand, Nicaragua, Norway, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Sao Tome and Principe, Seychelles, Slovakia, Slovenia, Solomon Isds, Spain, Sweden, Switzerland, Tonga, Trinidad and Tobago, Uganda, United Kingdom, United Rep. of Tanzania, Uruguay, USA, Vanuatu, Venezuela, Zambia

Daoist

China

Hindu

India, Mauritius, Nepal, Suriname

Jewish

Israel, South Africa, Swaziland

Muslim

Albania, Algeria, Azerbaijan, Bangladesh, Bosnia Herzegovina, Chad, Comoros, Djibouti, Egypt, Eritrea, Ethiopia, Gambia, Guinea, Indonesia, Iran, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Libya, Malaysia, Maldives, Mali, Mauritania, Morocco, Niger, Nigeria, Pakistan, Saudi Arabia, Senegal, Sierra Leone, Sudan, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, Uzbekistan, Yemen

Orthodox

Belarus, Bulgaria, Cyprus, Greece, Rep. of Moldova, Russian Federation, TFFR of Macedonia, Ukraine

Indigenous beliefs

Angola, Benin, Burkina Faso, Cameroon, Central African Rep., Hong Kong SAR, Guinea-Bissau, Liberia, Madagascar, Togo

Note: We specified as a representative religion in each country a religion that covers the majority of the country.
Source: Authors' specification based on World Factbook (CIA).

Appendix 2. Country list

Africa

Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Rep., Chad, Comoros, Congo, Cote d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Togo, Tunisia, Uganda, United Rep. of Tanzania,

America

Antigua and Barbuda, Argentina, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominican Rep., Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, USA, Venezuela

Asia

Armenia, Azerbaijan, Bangladesh, Bhutan, Cambodia, China, Hong Kong SAR, Georgia, India, Indonesia, Iran, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Lao People's Dem. Rep., Lebanon, Malaysia, Maldives, Mongolia, Nepal, Pakistan, Philippines, Russian Federation, Rep. of Korea, Saudi Arabia, Singapore, Sri Lanka, Syria, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Viet Nam,

Europe

Albania, Austria, Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Cyprus, Czech Rep., Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Rep. of Moldova, Slovakia, Slovenia, Spain, Sweden, Switzerland, TFYR of Macedonia, Turkey, Ukraine, United Kingdom

Pacific

Australia, Fiji, Kiribati, Marshall Isds, New Zealand, Palau, Papua New Guinea, Samoa, Solomon Isds, Tonga, Vanuatu
