An Empirical Investigation of the Relationship between the Quality of Food and the Direction of Trade

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Abstract

This study questions whether a systematic relationship between the quality of food and the direction of trade exists. In order to answer this question, I rely on the theoretical framework developed by Hallak (2010), who has shown that countries differ in their valuation of quality. I argue that the quality of food produced and consumed by a country varies systematically with the income level. This interaction of demand for and supply of quality results in a gravity-type specification, which is the empirical framework utilized in this study. The relationship is investigated for 737 agricultural and food products at the 6-digit HS code level. My sample comprises data on bilateral trade flows between 152 countries for 1995-2012. The gravity equation is estimated year by and year and sector by sector. I am able to show that similar demand structures are an important determinant of bilateral export trade. My findings indicate that the similarity effect is strongest for processed products and weakest for bulk products. From those results I come to the conclusion that similar aggregate preferences are an important determinant of export trade in final consumption goods.

Background & Motivation

- Global food trade has become a diverse and complex business in which most countries participate
- Major driving forces of trade growth and diversification are:
  (1) Technological progress (e.g., safer food, lower probability of perishing and higher attractiveness to customers),
  (2) Lower transport cost and risk (e.g., access to remote markets and wider product variety), and
  (3) Changing taste and eating habits (e.g., income growth puts emphasis on the permanent availability of high quality food and a greater supply variability)
- Trade expansion has helped to provide greater quantity, wider variety and better quality of food to an increasing number of people → Limited and contradicting literature on the relation between food quality and bilateral trade!
- Hypothesis: "A systematic relationship between the quality of food and the direction of trade exists."

Identification Strategy

Empirical Model

- Sectoral gravity equation based on the theoretical framework in Hallak (2010):

$$X_{ij}^s = \exp(e_i^s - \theta \log \tau_{ij}^s + m_j^s) + \epsilon_{ij}^s \quad (1)$$

  , where X_{ij}^s are bilateral export flows of product s from country i to country j in year t
- Accounting for multilateral trade resistances with sector-specific fixed effects for exporters e_i^s and importers m_j^s
- Trade cost function is denoted by τ_{ij}^s (symmetric and of the iceberg form)

Table 1: Descriptive statistics of trade cost variables

Variables	Mean	Standard deviation	Minimum	Maximum
Similarity index	4.999	5.880	0.002	35.300
Weighted distance	8.692	0.790	3.572	9.886
Shared border	0.019	0.135	0.000	1.000
Economic integration	0.231	0.388	0.000	1.000
WTO membership	0.623	0.424	0.000	1.000
Common language	0.145	0.352	0.000	1.000
Common legacy	0.010	0.097	0.000	1.000
Colonial link	0.013	0.112	0.000	1.000
Common colonizer	0.096	0.295	0.000	1.000

Notes: The descriptive statistics are based on the mean for each variable by country pair for 1995-2012. Only statistics for the trade cost variables are presented.

- Similarity index s_{ij} (measures the effect of product quality):

$$s_{ij} = (\ln y_i - \ln y_j)^2 \quad (2)$$

  , where s_{ij} stands for the similarity index, y_i is the income per capita in the exporting country and y_j is that in the importing country

Estimation Issues

- Bilateral export trade data at the sectoral level include a large portion of zero trade events → Excluding them would bias the parameter estimates!
- Poisson pseudo-maximum-likelihood (Poisson PML) estimator used to identify the parameters of the sectoral gravity model:
  (1) Only consistent and efficient one-stage estimator of the gravity equation when zeros are present in the data (Santos Silva and Tenreyro, 2006), and
  (2) Poisson PML handles heteroskedasticity with a robust covariance matrix

Results

- Equation 1 was estimated by Poisson PML separately for each of the 737 agricultural and food sectors and for each year of the observation period
- 83.5% of the estimates for the similarity index have a negative sign and 57.1% of them are significant and have a negative sign
- Median effect is -0.090, which is in line with the literature (Hallak, 2010)

Table 2: Median parameter estimates of the sectoral gravity model

	Sign			Significance (10%)	
Variables	Positive	Negative	Median effect	Significant	Not significant
Similarity index	120	606	−0.090 (0.026)	−0.141 (0.031)	−0.024 (0.021)
Weighted distance	170	556	−0.539 (0.281)	−0.928 (0.244)	−0.162 (0.312)
Shared border	690	36	1.443 (0.413)	1.635 (0.374)	0.728 (0.520)
Economic integration	688	38	1.051 (0.272)	1.230 (0.251)	0.425 (0.315)
WTO membership	705	21	1.796 (0.332)	1.954 (0.334)	0.710 (0.325)
Common language	467	259	0.244 (0.281)	0.844 (0.265)	0.074 (0.293)
Common legacy	47	679	−1.946 (0.736)	−2.591 (0.708)	−0.989 (0.780)
Colonial link	604	122	0.842 (0.463)	1.627 (0.374)	0.453 (0.527)
Common colonizer	28	698	−2.951 (0.574)	−3.222 (0.593)	−0.709 (0.490)

Notes: The summary statistics are based on the mean parameter estimates for 1995-2012. Column 1 and 2 break down the parameter estimates by sign. Column 3 reports the median size of the parameter estimate and columns 4-5 provide a breakdown by significance. The corresponding median standard error is reported in parenthesis. Standard errors are robust to heteroskedasticity and clustered by country pair.

- Compare the parameter estimates of the similarity index for different types of agricultural and food products (defined according to Regmi et al., 2005)
- Highest share of significant estimates with a negative sign is found for processed products, which usually have a higher per unit value and are of better quality
- Similarity effect is strongest for processed products, which are followed by products that are semi-processed or from aqua-farming

Table 3: Median parameter estimates of the sectoral gravity model for different categories of agricultural and food products

	Sign		Significance (10%)			
Sectors	Positive	Negative	Positive	Insignificant	Negative	Median effect
Aquaculture	19	82	5	50	46	−0.073 (0.032)
Bulk	15	38	7	25	21	−0.041 (0.019)
Horticulture	42	173	14	96	105	−0.060 (0.024)
Semi-processed	28	87	9	40	66	−0.088 (0.025)
Processed	16	226	8	58	176	−0.127 (0.030)

Notes: The summary statistics are based on the mean parameter estimates for 1995-2012. Column 1 and 2 provide a breakdown of parameter signs by sector. Column 3 to 5 provide a breakdown by sector, sign and significance and column 6 reports the median size of the parameter estimate. The corresponding median standard error is reported in parenthesis. Standard errors are robust to heteroskedasticity and clustered by country pair.

Conclusion

- Sectoral gravity equation utilized to test for a systematic relationship between the quality of food and the direction of trade
- Results show that aggregate preferences are an important determinant of bilateral export trade in agricultural and food products
- Effect is strongest for processed products and weakest for bulk products

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