



The Impact of Exchange Rate Volatility on World Poultry Trade Flows

by

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Presentation Outline

- Background Information
- Poultry Trade Leaders
- Method and Data
- Results
- Closing Remarks





Objectives

- Following Sun et al. (2002), and Karemera et al. (2011) this study will use a modified gravity model to evaluate the impact of exchange rate volatility on commodity trade flows.
- More specifically, this project will determine the short- and long-run effects of exchange rate volatility on U.S. poultry trade.





Related Studies

Anderson and Garcia (1988)

Langley et al. (2000)

Awokuse and Yuan (2006)

Bonroy, Gervais, and Larue (2007)



Table 1. Major Broiler Exporters Countries, 2008

| Country | Quantity | | Value | |
|---------------|--------------|--------------|-------------------|--------------|
| | (Million kg) | % of Total | (\$1,000) | % of Total |
| United States | 2,530 | 37.6 | 3,483,201 | 28.3 |
| Brazil | 2,386 | 35.5 | 4,726,739 | 38.4 |
| EU-27 | 667 | 9.9 | 1,011,996 | 8.2 |
| Thailand | 348 | 5.2 | 1,460,146 | 11.8 |
| China | 268 | 4.0 | 815,002 | 6.6 |
| Hong Kong | 262 | 3.9 | 329,616 | 2.7 |
| Canada | 120 | 1.8 | 239,732 | 1.9 |
| Argentina | 79 | 1.2 | 108,481 | 0.09 |
| Chile | 19 | 0.03 | 49,263 | 0.04 |
| Australia | 11 | 0.02 | 20,941 | 0.02 |
| Other | 37 | 0.06 | 79,969 | 0.06 |
| Total | 6,731 | 100.0 | 12,325,086 | 100.0 |

Source of Data: U.S. Department of Commerce, Bureau of Census



Table 2. Major Broiler Importers Countries, 2008

| Country | Quantity | | Value | |
|--------------|--------------|--------------|-------------------|--------------|
| | (Million kg) | % of Total | (\$1,000) | % of Total |
| Russia | 942 | 14.2 | 1,305,280 | 10.8 |
| China | 829 | 12.5 | 1,033,608 | 8.5 |
| Japan | 753 | 11.4 | 2,415,370 | 19.9 |
| Hong Kong | 693 | 10.5 | 1,003,193 | 8.3 |
| EU-27 | 575 | 8.7 | 1,695,561 | 14.0 |
| Saudi Arabia | 501 | 7.6 | 909,065 | 7.5 |
| UAE | 278 | 4.2 | 483,017 | 4.0 |
| Ukraine | 227 | 3.4 | 261,024 | 2.2 |
| Canada | 166 | 2.5 | 399,514 | 3.3 |
| Mexico | 164 | 2.5 | 268,906 | 2.2 |
| Other | 1,498 | 22.6 | 2,338,361 | 19.3 |
| Total | 6,624 | 100.0 | 12,112,899 | 100.0 |

Source of Data: U.S. Department of Commerce, Bureau of Census



Table 3. Major Turkey Exporters Countries, 2008

| Country | Quantity | | Value | |
|---------------|--------------|--------------|------------------|--------------|
| | (Million kg) | % of Total | (\$1,000) | % of Total |
| United States | 234 | 47.1 | 462,245 | 32.0 |
| Brazil | 139 | 28.2 | 523,083 | 36.2 |
| EU-27 | 81 | 16.4 | 269,493 | 18.6 |
| Chile | 20 | 4.1 | 84,094 | 5.8 |
| Canada | 15 | 2.9 | 26,157 | 1.8 |
| Hong Kong | 6 | 1.1 | 10,236 | 0.07 |
| Peru | 0.751 | 0.02 | 4,689 | 0.03 |
| Croatia | 0.180 | 0.00 | 3,109 | 0.02 |
| Turkey | 0.145 | 0.00 | 2,772 | 0.02 |
| Australia | 0.135 | 0.00 | 5,080 | 0.04 |
| Other | 0.188 | 0.00 | 54,281 | 0.38 |
| Total | 496 | 100.0 | 1,445,239 | 100.0 |

Source of Data: U.S. Department of Commerce, Bureau of Census



Table 4. Major Turkey Importers Countries, 2008

| Country | Quantity | | Value | |
|---------------|--------------|--------------|------------------|--------------|
| | (Million kg) | % of Total | (\$1,000) | % of Total |
| Mexico | 131 | 26.5 | 282,610 | 22.5 |
| EU-27 | 114 | 23.2 | 391,252 | 31.2 |
| Russia | 68 | 13.7 | 95,868 | 7.6 |
| China | 35 | 7.0 | 49,232 | 3.9 |
| Benin | 19 | 3.8 | 62,180 | 5.0 |
| Hong Kong | 18 | 3.6 | 25,793 | 2.1 |
| Taiwan | 13 | 2.5 | 12,915 | 1.0 |
| Canada | 8 | 1.7 | 30,951 | 2.5 |
| Angola | 7 | 1.4 | 10,636 | 0.08 |
| United States | 6 | 1.2 | 25,140 | 0.02 |
| Other | 76 | 15.3 | 268,558 | 21.4 |
| Total | 495 | 100.0 | 1,255,135 | 100.0 |

Source of Data: U.S. Department of Commerce, Bureau of Census



Broiler Gravity Model

$$X_{ij} = \beta_0 Y_{ij}^{\beta_1} N_{ij}^{\beta_2} D_{ij}^{\beta_3} V_{ij}^{\beta_4} \times \exp(\beta_5 \text{NAFTA}_{ij} + \beta_6 \text{EU}_{ij} + \beta_7 \text{AC}_{ij} + \beta_8 \text{L}_{ij} + \beta_9 \text{BO}_{ij} \\ + \beta_{10} \text{US}_{ij} + \beta_{11} \text{BZ}_{ij} + \beta_{12} \text{TH}_{ij} + \beta_{13} \text{CH}_{ij}) \varepsilon_{ij},$$

where,

X_{ij} = the quantity of broilers exported by country i to country j;

Y_{ij} = the real gross domestic product of country i and country j;

N_{ij} = the population of country i and country j;

D_{ij} = the distance between country i and country j;

L_{ij} = the dummy variable equal 1 if countries i and j speak the same language and 0 otherwise;

BO_{ij} = the dummy variable border equals 1 if countries i and j are neighbors and 0 otherwise;

V_{ij} = the real exchange rate volatility;

NAFTA = the dummy variable equals 1 if both trading countries are members of North American Free Trade Agreement, and 0 otherwise;

EU = the dummy variable equals 1 if both trading countries are members of EU-27 and 0 otherwise;

US_{ij} = the dummy variable equals 1 if the exporting or importing country is the U.S. and 0 otherwise;

BZ_{ij} = the dummy variable equals 1 if the exporting or importing country is Brazil and 0 otherwise;

TH_{ij} = the dummy variable equals 1 if the exporting or importing country is Thailand and 0 otherwise;

CH_{ij} = the dummy variable equals 1 if the exporting or importing country is China and 0 otherwise;

ε_{ij} = the error term.



Turkey Gravity Model

$$X_{ij} = \beta_0 Y_{ij}^{\beta_1} N_{ij}^{\beta_2} D_{ij}^{\beta_3} V_{ij}^{\beta_4} \times \exp(\beta_5 NAFTA_{ij} + \beta_6 EU_{ij} + \beta_7 L_{ij} + \beta_8 BO_{ij} + \beta_9 APEC_{ij}) \varepsilon_{ij},$$

where,

X_{ij} = the quantity of turkeys exported by country i to country j;

Y_{ij} = the real gross domestic product of country i and country j;

N_{ij} = the population of country i and country j;

D_{ij} = the distance between country i and country j;

L_{ij} = the dummy variable equals 1 if countries i and j speak the same language and 0 otherwise;

BO_{ij} = the dummy variable border equals 1 if countries i and j are neighbors and 0 otherwise;

V_{ij} = the real exchange rate volatility;

NAFTA = the dummy variable equals 1 if both trading countries are members of North American Free Trade Agreement, and 0 otherwise;

EU = the dummy variable equals 1 if both trading countries are members of EU-27 and 0 otherwise;

APEC = the dummy variable equals 1 if both trading countries are members of Asia-Pacific Economic Cooperative and 0 otherwise;

ε_{ij} = the error term.



Measures of Volatility

$$V_{ij,t} = \left[\left(\frac{1}{m} \right) \sum_{k=1}^m (\log XR_{ij,t+k-1} - \log XR_{ij,t+k-2})^2 \right]^{1/2}$$

The currency exchange rate between countries i and j at time t is denoted as $XR_{ij,t}$. Following Koray and Lastrapes (1989) and Chowdhury (1993), short-run exchange rate volatility is measured as a moving standard deviation: where m is the order of the moving average.

$$V_{ij,t} = \frac{\max XR_{ij,t-4} - \min XR_{ij,t-4}}{\min XR_{ij,t-4}} + \left[1 + \frac{|XR_{ij,t} - XR_{ij,t}^P|}{XR_{ij,t}} \right]$$

where max(min) denotes the maximum(minimum) values of the exchange rate within the time period t and k ; and $XR_{ij,t}^P$. This is the measurement for the long-run exchange rate volatility.





Data

- Broiler and turkey trade flows were provided by the United Nations Commodity Trade Statistics, United Nations Statistics Division for years the 1990 – 2008.
- Real gross domestic products data were obtained from the World Bank World Development Indicators, International Financial Statistics of the IMF, HIS Global Insight, and Oxford Economic Forecasting.
- Real exchange rates were obtained from the Economic Research Service macroeconomic data set.
- The population data used in the analysis were collected from the U.S. Census Bureau.
- A direct line distance is calculated from the exporter's port to the importing country's port (<http://www.distancefromto.net>).



Table 5. Gravity model estimations results: Dependent variable is the log of broiler trade

| Variable | <i>Fixed Effect</i> | | <i>Random Effect</i> | |
|---------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|
| | Short-run volatility | Long-run volatility | Short-run volatility | Long-run volatility |
| Constant | | | 4.805*** (6.626) | 4.898*** (6.753) |
| Log exporter's real GDP | 0.037 (0.524) | 0.044 (0.613) | 0.026 (0.371) | 0.031 (0.440) |
| Log importer's real GDP | 0.075*** (3.105) | 0.075*** (3.104) | 0.076*** (3.165) | 0.076*** (3.167) |
| Log exporter's population | 0.269*** (9.494) | 0.266*** (9.374) | 0.270*** (9.527) | 0.267*** (9.415) |
| Log importer's population | 0.192*** (7.757) | 0.191*** (7.725) | 0.192*** (7.750) | 0.191*** (7.714) |
| Log distance | -0.053 (-1.210) | -0.057 (-1.306) | -0.053 (-1.205) | -0.057 (-1.300) |
| Border dummy | 0.787*** (6.895) | 0.814*** (7.122) | 0.789*** (6.922) | 0.813*** (7.126) |
| Language dummy | -0.009 (-0.052) | 0.032 (0.186) | -0.011 (-0.061) | 0.028 (0.166) |
| NAFTA dummy | 1.449*** (3.693) | 1.406*** (3.587) | 1.448*** (3.694) | 1.411*** (3.607) |
| EU-27 partner dummy | 0.645*** (6.163) | 0.649*** (6.235) | 0.642*** (6.139) | 0.648*** (6.237) |

Note: Level of statistical significance - *** - 1% level and T-Statistics are in parentheses.



Continued... Table 5. Gravity model estimations results: Dependent variable is the log of broiler trade

| Variable | <i>Fixed Effect</i> | | <i>Random Effect</i> | |
|--------------------------|---------------------------------|--------------------------------|---------------------------------|--------------------------------|
| | Short-run volatility | Long-run volatility | Short-run volatility | Long-run volatility |
| Brazil dummy | 1.449*** (5.491) | 1.406*** (12.813) | 1.448*** (12.873) | 1.411*** (12.922) |
| U.S. dummy | 1.670*** (5.464) | 1.673*** (5.495) | 1.712*** (5.620) | 1.719*** (5.668) |
| Thailand dummy | 2.817*** (11.195) | 2.837*** (11.278) | 2.809*** (11.179) | 2.829*** (11.263) |
| China dummy | -0.129 (-0.446) | -1.115 (-0.398) | -0.109 (-0.380) | -0.092 (-0.321) |
| Exchange rate volatility | -0.648 (-0.948) | -0.039*** (-3.132) | -0.828 (-1.220) | -0.039*** (-3.122) |
| Hausman test statistic | | | 8.41 | 8.60 |

Note: Level of statistical significance - *** - 1% level and *- 10%. T-Statistics are in parentheses.



Table 6. Gravity model estimations results: Dependent variable is the log of turkey trade

| Variable | <i>Fixed Effect</i> | | <i>Random Effect</i> | |
|---------------------------|-----------------------|----------------------|-----------------------|-----------------------|
| | Short-run volatility | Long-run volatility | Short-run volatility | Long-run volatility |
| Constant | | | -0.312 (-0.301) | 0.022 (0.021) |
| Log exporter's real GDP | 0.281*** (4.800) | 0.275*** (4.694) | 0.285*** (4.872) | 0.281*** (4.822) |
| Log importer's real GDP | 0.103*** (2.973) | 0.091*** (2.646) | 0.103*** (3.000) | 0.094*** (2.748) |
| Log exporter's population | 0.190*** (3.413) | 0.191*** (3.420) | 0.190*** (3.407) | 0.188*** (3.378) |
| Log importer's population | 0.437*** (10.504) | 0.433*** (10.420) | 0.436*** (10.509) | 0.431*** (10.401) |
| Log distance | -0.096 (-1.510) | -0.112* (-1.768) | -0.098 (-1.547) | -0.116* (-1.830) |
| Border dummy | 0.909*** (6.481) | 0.895*** (6.382) | 0.909*** (6.495) | 0.892*** (6.376) |
| Language dummy | -0.691*** (-3.104) | -0.684*** (3.079) | -0.692*** (-3.116) | -0.683*** (-3.082) |
| NAFTA dummy | 1.758*** (3.726) | 1.750*** (3.712) | 1.750*** (3.719) | 1.741*** (3.705) |
| EU-27 dummy | 0.677*** (4.378) | 0.641*** (4.188) | 0.664*** (4.307) | 0.633*** (4.147) |
| Hausman test statistics | | | 8.28 | 8.17 |

Note: Level of statistical significance - *** - 1% level and - *- 10% level ,T-Statistics are in parentheses.



Continued Table 6. Gravity model estimations results: Dependent variable is the log of turkey trade

| Variable | <i>Fixed Effect</i> | | <i>Random Effect</i> | |
|--------------------------|---------------------------------|--------------------------------|---------------------------------|--------------------------------|
| | Short-run volatility | Long-run volatility | Short-run volatility | Long-run volatility |
| APEC dummy | 0.106 (0.546) | 0.160 (0.823) | 0.108 (0.558) | 0.163 (0.839) |
| Exchange rate volatility | 0.756*** (2.279) | 0.017*** (3.457) | 0.828** (1.970) | 0.018*** (3.682) |
| Hausman test statistics | | | 8.28 | 8.17 |

Note: Level of statistical
significance - *** - 1% level
and - ** - 5% level ,T-Statistics
are in parentheses.



Broiler Results

- Results show that an increase in real GDP in importing countries will have a positive effect on broiler exports.
- Increases in the population of importing countries will increase the import demand for broiler meat.
- Findings also suggest that sharing a border has a positive impact on broiler meat trade flows.
- Being a member of NAFTA and EU-27 have a positive impact on broiler meat trade flows.
- Results suggest that broiler meat trade flows are positively impacted by trade from Brazil, U.S., and Thailand.
- Long-run exchange rate volatility is statistically significant and has a negative impact on broiler trade flows.



Turkey Results

- Results suggest that growth in real GDP and population will increase turkey trade flows in both importing and exporting countries.
- Increasing distance between importing and exporting countries port has a negative effect on turkey trade flows.
- Findings also suggest that sharing a border has a positive impact on turkey trade flows between the two countries sharing the border.
- Being a member of NAFTA and EU-27 has positive impacts on turkey trade flows, while APEC countries also has a positive effect on turkey trade flows, but the effect is statistically insignificant.
- Exchange rate volatility is statistically significant and has a positive impact on turkey trade flows.



Closing Remarks

- A rise in international income and population will increase trade flows of turkeys and, in most instances, of broilers.
- The distance from exporting and importing ports has a negative effect on all poultry trade, but was statistically significant in only two of the models.
- Bordering countries have a positive influence on poultry trade, and similar language spoken by trade partners had a negative impact on turkey trade.
- Exchange rate volatility among trade partners have negative effect on broiler trade flows and positive effect on turkey trade flows.
- Regional relationships, particularly NAFTA and EU-27 have a positive influence on poultry trade flows.

