Estimation of Export Demand for U.S Meat Products

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Selected paper prepared for presentation at the Southern Agricultural Economics Association's 2015 Annual Meeting, Atlanta, Georgia, January 31-February 3, 2015

Abstract

With the productivity of US agriculture growing faster than domestic food and fiber demand, U.S farmers and agricultural firms rely heavily on export markets, to sustain price revenues. U.S agricultural exports have been larger than imports since 1960, generating a surplus in agricultural trade. The surplus helps counter the persistent deficit in non-agricultural merchandise trade, ERS - USDA (2013). From its modest beginning during the nineteenth century as a niche market, Asia has grown enormously in importance as a trading partner for the United States, (Foreign Trade Statistics, U.S Census Bureau). For example, by mid-2008, China accounted for 11.2% of all U.S trade behind Canada's 17.9% share but ahead of Mexico's 10.7%.

This paper econometrically analyzes the export demand of U.S. meat products into these countries using the Export demand model. The model is applied to yearly aggregated data of U.S. meat product exports to some Asian countries from1980 to 2013. Export values were regressed on the per capita GDP of the countries in question, Exchange rates of the currencies of these countries to the U.S. dollar and WTO Membership.

Results indicated that, per capita GDP and exchange rates positively affect the quantity of export.

INTRODUCTION

U.S agriculture exports have been larger than its imports since 1960, generating a surplus in its agricultural trade. (Economic Research Services – USDA 2013). The surplus helps counter the persistent deficit in non-agricultural U.S merchandise trade. Even if there were trade deficits in agricultural products, this does not imply a lack of competitiveness on the part of U.S consumers' food choices and changing relative exchange rate, which makes U.S goods, relatively more/less expensive in international markets and import goods relatively less/more expensive (USDA Economic Research Services 2013).

Historically, bulk commodities such as wheat, rice, coarse grains, oil seeds, cotton and tobacco, accounted for most of U.S agricultural exports. However, in the 1990s U.S exports of High Value Products (HVP) – meats, poultry, live animals, oil seed meals, vegetable oils, fruits, vegetables and beverages, showed steady growth, while export of bulk commodities tended to fluctuate more widely, particularly in response to global supplies and prices.

In 2006,The People's Republic of China surpassed Mexico as the United States' number one trading partner. By mid 2008 China accounted for 11.2% of all U.S trade behind Canada's 17.9% share but ahead of Mexico's 10.7% share. U.S trade with Japan decreased to 6.2% in mid 2008, assuaging Americans' fear of Japanese economic domination. Three more Asian nations were among the top fifteen U.S trading partners. South Korea held a share of 2.5% and was ranked seventh, followed by Saudi Arabia with 2% and a rank of ninth and Taiwan ranking eleventh with 1.9 %.(Foreign Trade Statistics U.S Census Bureau 2012).

From its modest beginning during the nineteenth century as a niche market, Asia has enormously grown in importance as a trading partner for the United States. This is indicative of the shift of Asian countries as providers of raw material commodities to exporters of the latest in consumer electronics. Although Malaysia had formerly been known for its export of rubber and palm oil, the greater part of its $32billion export to the United States in 2007 consisted of consumer electronics and electrical appliances. This is the major underlining reason why the. Through this agreement, they are seeking to support the creation and retention of high quality jobs at home by increasing American exports to a region that includes some of the world's most robust economies and that represents more than 40% of global trade. The United States along with the TPP countries intend to create a high standard agreement that addresses new emerging trade issues and 21st-century challenges. It will feature a new cross-cutting issues which were not previously included in trade agreement; such as making the regulatory system of TPP countries more compatible, so United States companies can operate more seamlessly in TPP markets and help small and medium-sized enterprises.(USTR 2014).

Global trade is greatly affected by the growth and stability of world markets, including changes in world population, economic growth and income. Other factors affecting agricultural trade are global supplies and prices, changes in exchange rates, government support for Agriculture, foreign government's laws regarding international trade, and foreign government's trade policies such as trade protectionism . With the productivity of US agriculture growing faster than domestic food and fiber demand, U.S farmers and agricultural firms rely heavily on export markets to sustain price revenues.

Economic volatility in the Asian – Pacific regions also often results in changes in demand for U.S. agricultural products. Through exchange rate variability and changing incomes, a few empirical studies have suggested that, increases in exchange rate risk, reduce trade (Clark; Hooper and Kohlhagen; Cashman 1983, 1998; Akhtar and Hilton; Kenen and Rodrik; Thursby and Thursby). Strong imperical support is found in Cashman(1988) and Bahmani-Oskoee and Lfaifa. The Asian financial crisis of 1997 exemplified the risk problem, as severe currency depreciation commensurate with declining Asian stock markets, and incomes increased the cost of purchasing U.S. meat products.

Ligeon, Jolly and Jackson (1996) used the traditional import demand function to evaluate the effect of increased exports from North America Free
Trade Agreement (NAFTA) member countries on U.S. domestic catfish industry. Asche et al (2005) studied the swordfish import demand of the United States and found that demand is inelastic for all products, indicating a limited degree of substitution possibilities. Ligeon et al (2007) used a source-differentiated AIDS model to examine the import demand for tilapia and tilapia products in the United States.

Muhammad and Jones (2011) examined the United States demand for salmon imports differentiated by country of origin, product cut and form. The study of the United States fishery demand is motivated by the above statistics. It estimates both static and dynamic version of the Almost Ideal Demand System (AIDS) model for U.S. import of fishery products which are differentiated by source.

Source differentiation is important in demand analysis. Product aggregation, under which the demand system does not differentiate product by source, seems too strong in international agricultural trade.

Yang and Koo (1994) used a Source Differentiated Almost Ideal Demand System (SDAIDS) model to estimate Japanese meat import demand. Product aggregations are tested and rejected at conventional levels of significance. Ramirez and Wolf (2008) estimated the demand for dairy products imported in Mexico and examined the competition among exporting from countries, using a Restricted Source- Differentiated AIDS model. Muhammad and Jones (2011) used the Rotterdam model to examine the U.S. demand for salmon imports, performed source aggregation tests and found that import preferences were not homogeneous across exporting countries; illustrating that, there was a significant information loss, when source - differentiation was not known as long-run AIDS model, assumes that consumption is always in equilibrium, which is not always true, especially within time series data.

Seale, Sparks and Buxton (1992) evaluated geographical demand estimates of U. S. fresh apples imported by four important partners, Canada, Hong Kong, Singapore and the United Kingdom using the Rotterdam model.

In reality, consumers' behavior can be affected by various factors such as habit persistence, adjustment cost, imperfect information, incorrect expectations and policy interventions. These factors might interfere with instant expenditure adjustment to price and income or revenue changes (Wan, Sun and Grebner, 2010; Nzaku, Houston and Fonsah 2012).

It is for this reason that export demand model was chosen to do the econometric estimation and analysis ofthe export demand of U.S. meat products to the countries in question.

REVIEWED LITERATURE

Early studies have touched on elasticities of import demand, using different specifications of demand models, but perhaps the most important in current use, apart from the original linear expenditure system are the Rotterdam model (Henri Theil, 1995, 1976; Alton Barten) and translog model (Laurits Christensen, Dale Jorgenson and Lawrence Lau; Jorgenson and Lau). Both of these models have been extensively estimated and have in addition been used to test the homogeneity and symmetry restrictions of demand theory.

Other import demand models include the linear and quadratic expenditure functions, the working models (J-Y Lee, M. Brown and J. Seale Jr., 1994). The Armington trade model is theoretically consistent and has been widely used (Abbtt&Paarberg, 1986; Babula, 1987; Penson&Babula, 1984; Sarris, 1982). The advantage of Armington trade model is that it differentiates goods and sources; in other words, the model allows imperfect substitution among goods from different origins (Armington 1978).However this model forms the restrictive assumptions of homotheticity and single constant elasticity of substitution (Alston et al, 1993;

Winter, 1984; Yang and Koo, 1994). A simultaneous equation model is used to estimate export demand and supply functions U.S. soybeans. Ligeon, Jolly and Jackson (1996) used the traditional import demand function to evaluate the effect of increased exports from North American Free Trade Agreement (NAFTA) member countries on U.S. domestic catfish industry. Asche et al (2005) studied the swordfish import of the United States and find that demand is inelastic for all products, indicating a limited degree of substitution possibilities. Ligeon et al (2007) used a source –differentiated AIDS model to examine the import demand for tilapia and tilapia products in the U.S.

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Some studies have estimated import demand and consumer demand using the Rotterdam system. For instance, Seale, Sparks and Buxton (1992) evaluate geographical demand estimates of U.S. fresh apples imported by four important partners; Canada, Hong Kong, Singapore and the United Kingdom using the Rotterdam model. Faroque (2008) uses both Rotterdam and AIDS model to study Canadian consumption of alcoholic drinks such beer, wine and spirit from 1950 through 2003. His findings indicate that statistically the Rotterdam system fits the data better than the AIDS model.

Other studies apply all four differential approaches, the Rotterdam, AIDS (CBS) to determine demand elasticities. J-Y. Lee, M.Brown and JL. Seale,Jr.(1994) use these four non-nested demand system to study the effect of price and income on consumer demand for twelve commodity groups in Taiwan from 1970 to1989. Other researches were done on elasticities of demand involving the AIDS model. Nzaku, Houston and Fonsah(2011) examine the U.S. consumer demand for ten fresh tropical fruits and vegetables imports over the period 1998 to 2008 using the Almost Ideal Demand System(AIDS) and include seasonal trigonometric variables, trend and a policy dummy variables (NAFTA variables) in the budget shares of the AIDS model.

Likewise Seale, Merchant and Basso (2002) apply the Almost Ideal Demand System (AIDS) model to evaluate U.S. import for red wine along with U.S. with U.S. with U.S. domestic demand for red wines. Findings show that U.S. consumes more domestic red wines than imported ones. Also conditional expenditure elasticities of foreign red wines are all inelastic, while they are elastic for domestically produced wines.

The paper is organized as follows:

First, a model of export demand for U.S. meat products is specified; then the model is estimated by the ordinary least squares (OLS) and panel regressions. The variables of interest incorporated in the model are export price, per capita GDP exchange rate and WTO membership. We analyze the economic and policy implications of the results

METHODOLOGY

The Empirical Model

In export demand, linking real export with a measure of foreign real income and relative price is an important element in most conventional trade models. Export demand specification is crucial for meaningful export forecast, international trade planning and policy formulation.Arize,(2001) Export demand function is expressed as a log-log model, where the coefficients will show the own and cross price elasticities. Mathematically the export demand equation is specified as:

$$\text{Log } X_{it}^{d} = b\_0 + b_1 \log (PX_i/\text{PW})_t + b_2 \log W_t + V_t$$

Where X_i is the quantity of export of country i, PX_i is the unit value of export of country i, PW is world price level, and W is the real world income (represented by OECD real GNP). Since each variable is defined in logarithmic terms, the estimated coefficients are the elasticities exports with respect to the corresponding variables.Warner and Kreiner (1983) employed an import and export demand model. The model for the export demand function is as follows:

$$\text{Log } X_{it}^{d} = b_0 + b_1 \log (PX_i/\text{PW})_t + b_2 \log W_t + V_t$$

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The commercial export demand for U.S meat products is the aggregate of individual countries' import demand. Thus, as a first step in the specification of a U.S. export demand function, the variables that go into the individual countries' import demand function must be analyzed.

The commercial export of U.S. meat products in question over the period under review to the importing countries, is a function of the relative price, per capita GDP, exchange rate, WTO membership. This can be expressed as:

$$logX_{ijt} = \beta_0 + \beta_1\, logP_{ijt} + \beta_2\, logGDP_{ijt} + \beta_{3\,log}\, Xrate_{ijt} + \beta_4 \text{ WTO} + E_{ijt}$$

Where:

X = quantity of exports over the period under review

i = the countries in question (Japan,Mexico,Canada,Australia,Malaysia,Singapore,Vietnam,Brunei,Chile,Peru and New Zealand)

t = the time period (the period under review; year by year)

j = the meat products (beef, pork, chicken and turkey)

P = export price

β_0 = the intercept term

β_1= the coefficient of the price(P)

β_2= the coefficient of the GDP per capita

β_3= the coefficient of the exchange rate

$\beta_{4\,=}$ the coefficient of WTO membership

E_{ijt} = the error term

The monetary variables were expressed in common currency basis (that is the U.S dollar),which is the base rate for the exchange rates, GDP per capita and the export prices. Although the need for currency commonality has been cited in most literatures, it is commonly overlooked in econometric estimations e.g (Bjarnasonet al.)

U.S. has exported large quantities of the meat products under concessionary terms during this period under analysis. This has influenced commercial sales, either by substituting for commercial exports or alternatively by facilitating the development of U.S. commercial markets.

Trade is expected to flow between U.S and the importing countries due to their WTO membership and established trade connections and agreements, regardless of the direction of changes in the current factors. Trade agreements, political affiliations, common language, etc, could prevent an importing country from reaching the desired level of meat products imports from U.S within the period.

Data Availability and the use of prior information

Annual observations from 1980 – 2013 for U.S meat export was used in the estimation. Since consistent series of domestic meat prices of the importing countries for the purpose of relative price estimation were not available, those lapses were captured in the error term of the outlined model, and export prices were used instead. The data on the various meat products export quantities and their price values were obtained from USDA database in Global Agricultural Trade Systems (GATS). Data on the exchange rate and per capita GDP of the countries in question, were sourced from the World bank development indicators.

A set of dummy variables (WTO membership) were used in the equation to analyze their levels of significance on the quantity of export during the period under the analysis. After gathering all the data relevant for the research, for all the countries in question over the period under the analysis, Ordinary Least Squares (OLS), Random effect and Fixed effects regressions were used to run the data and compared and contrasted their results on the coefficients of the variables and their levels significance.

The above model was used to do the econometric estimation and analysis of the export demand for all the four meat types for all the eleven countries under the research. The variables were export quantity, price, per capita GDP, exchange rate and WTO membership, where export quantity was the dependent variable.

RESULTS AND DISCUSSION

The results in Ordinary Least Squares (OLS) regression had positive coefficients for all the variables in beef, chicken and pork; and had a negative coefficient for exchange rate in turkey.

Random effect regression results also had positive coefficients for all the variables in chicken, beef and pork; and a negative coefficient for exchange rate in turkey just like the (OLS) results.

Fixed effect regression results had negative coefficient for WTO membership in beef and chicken; and negative coefficients for exchange rate and WTO membership in turkey, while pork had positive coefficients for price, per capita GDP and exchange rate;but the results for WTO membership was omitted due to collinearity.

The next step was to check for the levels of significant effects of the variables on the quantity of export of each of the meat types:

Pork

OLS regression results were indicating that, all the variables had significant effect on the quantity of pork export. Random effect regression results were indicating same and fixed effects regression results were also indicating same.

Chicken

OLS and random effect regression results were both indicating significant effects of all the variables on the quantity of chicken export.

Fixed effect regression results were indicating an insignificant effect of exchange rate and WTO membership on the quantity of chicken export.

Beef

Price has no significant effect on beef export by the U.S. in all the three results.

WTO membership had no significant effect the quantity of beef export in the OLS and Random effect regression results in addition to price.

Fixed effects results indicated an insignificant effect of exchange rate on beef export, in addition to price.

Turkey

OLS and Random effect regression results were indicating an insignificant effect of exchange rate and per capita GDP on the quantity of turkey export. Fixed effects results indicated an insignificant effect of exchange rate and WTO membership on the quantity of turkey export.

Random effect and the Ordinary Least Squares regression results for all the meat types were finally used for the thorough discussion; the simple reasons are that, they were giving favorable results and moreover the results were about the same, rather than the Fixed effects regression results.

The results of both Random effect and Ordinary Least Squares regression for chicken in table 1.1 and 1.2 were indicating positive coefficients for all the variables and their significant effects on the quantity of chicken export by U.S. A positive coefficient of price and its huge significant effect on the quantity of chicken export, implies that, price has a positive relationship with the export quantity of chicken; the higher the price of chicken in the domestic markets of the countries in question, the more the quantity of chicken being exported and vice versa.

A positive coefficient of the per capita GDP and a significant effect of this variable, implies that, per capita GDP has a positive relationship with the quantity of the chicken export; as the per capita income of the countries increases, import demand of chicken by these countries in question increases and hence export quantity also increases and vice versa.

A positive coefficient of the exchange rate and the significant effect of this variable on the quantity of chicken export, implies that, as the U.S. currency appreciates against the local currencies of the countries in question, U.S. export revenue on chicken to these countries increases and therefore it induces more export of the commodity to the countries.

A positive WTO membership of the countries and the significant effect of this variable on the quantity of chicken export by the U.S., implies that, joining the WTO membership enhanced trade flow between U.S. and these trading partners and hence enhanced the quantity of chicken export by U.S.

Results of both Random effect and the Ordinary Least Squares regression for pork in table 2.1 and 2.2 were indicating positive coefficients for all the variables and significant effects of all these variables on the quantity of pork export. A positive coefficient of price and the huge significant effect of price on the quantity of pork export also implies that price has a positive relationship with the quantity of pork export; the higher the price of pork goes in the domestic markets of the countries in question, the more the quantity of pork export by U.S. to these countries and vice versa.

A positive coefficient of the per capita income and the significant effect of this variable on the quantity of pork exportequally implies that per capita income has a positive relationship with the quantity of pork export to these countries; as the per capita income increases, import demand quantity of pork will increase; all things being equal and hence export quantity of pork will also increase and vice versa.

A positive coefficient of exchange rate and a significant impact of exchange rate on the quantity of pork export, also indicates that, as the U.S currency appreciates against the local currencies of the countries in question, U.S export revenues on chicken from these countries will increase, because imported chicken by these countries from U.S. will gain good price; this would induce more chicken export and therefore increase the quantity of the export.

A positive coefficient of the WTO membership of the countries and the significant effect of this variable on the quantity of export, equally implies that, joining WTO membership enhanced trade flow between U.S and the countries in question and therefore export quantity of pork would increase.

Both results of Random effect and Ordinary Least Squares regression for beef in table 3.1 and 3.2, were indicating positive coefficients for all the variables but an insignificant effect of price and WTO membership of the countries; and significant effect of per capita GDP and exchange rate on the quantity of beef export. The insignificant impact of the price on the quantity of the beef export might be attributed to so many factors; some of which might be due to the fact that U.S. might be having concessionary trade terms on beef with some of these countries, or beef has a perfect competitive market on international market and other similarly related situations. Positive coefficients and significant effects of both per capita GDP and exchange rate indicate the same situation as discussed in the other meat types.

There were positive coefficients for all the variables in all the two results for turkey in table 4.1 and 4.2, except exchange rate. Price and WTO membership of the countries were having significant impact on the quantity of turkey export by the U.S., while per capita GDP and exchange rate were having insignificant impact on the quantity of turkey export. A negative coefficient of the exchange rate could have implied that, as the currencies of the importing countries in question depreciate, turkey import price would have increased and hence import expenditure on turkey would have increased; this could have reduced import quantity of turkey and for that matter reduced export quantity. Also the per capita GDP having no significant impact on the quantity of turkey export by the U.S., might be attributed to so many factors, some of which might be due to the concessionary trade terms of U.S with some of these countries and other similarly related situations.

CONCLUSION AND RECOMMENDATION

We have analyzed the export demand of the United States' meat products to some Asian Pacific countries and some other major trading partners of U.S. on meat trade; it has shown that, price, per capita GDP, exchange rate and WTO membership of countries are significant determinants of the quantity of export of chicken and pork in the Asian countries.

Though price and WTO membership of countries appear to have a positive relationship with the quantity of beef export by the U.S., they are not significant determinants of the quantity of beef export by the U.S. to these countries.

Exchange rates and per capita GDP are not significant determinants of the quantity of turkey export by U.S. to these countries.

Price, per capita GDP, exchange rates and WTO membership of countries are generally determining factors of the quantity of meat product export, by the U.S. to their trading partners.

By using the Ordinary Least Squares(OLS) and the Random effects regression techniques, we obtain favorable results to the hypothesis that, price, per capita income, exchange rate and WTO membership of countries, are some of the determinants of the quantity of meat export by the United States to their trading partners.

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Appendix

Table 1.1: Random Effects Results for Chicken

Random-effects GLS regression					
Group variable:		year	Number of groups	=	34
R-sq: within	=	0.5109	Obs per group: min	=	11
between	=	0.7161	avg	=	11.0
Overall	=	0.5322	max	=	11
Wald chi2(4)	=	419.83	corr(u_i, X)		= 0 (assumed)
Prob> chi2	=	0.0000			

ly	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf. Interval]**	
lp	1.475913	.0842028	17.53	0.000	1.310878	1.640947
lgdp	.2633781	.1052674	2.50	0.012	.0570578	.4696984
lxrat	.0977425	.0914043	1.07	0.285	-.0814067	.2768916
wto	.9822589	.420692	2.33	0.020	.1577178	1.8068
_cons	.9262094	1.114269	0.83	0.406	-1.257717	3.110136

sigma_u	0
sigma_e	3.9375481
rho	0 (fraction of variance due to u_i)

Table 1.2: Ordinary Least Squares (OLS) Results for Chicken

Source	SS	df	MS		
Model	6388.02547	4	1597.00637	Number of obs = 374	R-squared = 0.5322
Residual	5614.62005	369	15.2157725	F(4, 369) = 104.96	Adj R-squared = 0.5271
Total	12002.6455	373	32.1786743	Root MSE = 3.9007	Prob> F = 0.0000

ly	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
lp	1.475913	.0842028	17.53	0.000	1.310335	1.64149
lgdp	.2633781	.1052674	2.50	0.013	.0563789	.4703773
lxrat	.0977425	.0914043	1.07	0.286	-.0819962	.2774811
wto	.9822589	.420692	2.33	0.020	.1550044	1.809513
_cons	.9262094	1.114269	0.83	0.406	-1.264904	3.117323

Table 2.1: Random Effects Results for Pork

Random-effects GLS regression					
Group variable:		year	Number of obs	=	306
R-sq: within	=	0.4277	Number of groups	=	34
between	=	0.5635	Obs per group: min	=	9
Overall	=	0.4515	avg	=	9.0
Wald chi2(4)	=	243.66	max	=	9
Prob> chi2	=	0.0000	corr(u_i, X)		= 0 (assumed)

ly	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf.**	**Interval]**
lp	1.087258	.101345	10.73	0.000	.8886256	1.285891
lgdp	.8017992	.1363137	5.88	0.000	.5346291	1.068969
lxrat	.2911785	.1262667	2.31	0.021	.0437004	.5386566
wto	2.074634	.5488303	3.78	0.000	.9989464	3.150322
_cons	-3.20874	1.555292	-2.06	0.039	-6.257056	-.1604241
sigma_u			.68508793			
sigma_e			4.0955185			
rho			.02722008	(fraction of variance due to u_i)		

Table 2.1: OLSResult for Pork

Source	SS	df	MS		
Model	4336.87793	4	1084.21948	Number of obs = 306	R-squared = 0.4515
Residual	5269.52741	301	17.5067356	F(4, 301) = 61.93	Adj R-squared = 0.4442
Total	9606.40534	305	31.496411	Root MSE = 4.1841	Prob> F = 0.0000

ly	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf.**	**Interval]**
lp	1.081903	.1019867	10.61	0.000	.8812062	1.282601
lgdp	.7982039	.1380641	5.78	0.000	.5265108	1.069897
lxrat	.2879035	.1279818	2.25	0.025	.0360512	.5397558
wto	2.082026	.5014009	4.15	0.000	1.095331	3.068721
_cons	-3.134341	1.565765	- 2.00	0.046	-6.215574	-.0531094

Table 3.1**:** Random Effects Results for Beef

Random-effects GLS regression

Group variable:		year	Number of obs	=	336
R-sq: within	=	0.2603	Number of groups	=	34
between	=	0.4945	Obs per group: min	=	6
Overall	=	0.2693	avg	=	9.9
Wald chi2(4)	=	121.97	max	=	11
Prob> chi2	=	0.0000	corr(u_i, X)	=	0 (assumed)

ly	**Coef.**	**Std. Err.**	**z**	**P>|z|**	**[95% Conf.**	**Interval]**
lp	0773604	.0811351	0.95	0.340	-.0816615	.2363822
lgdp	.5565999	.0746213	7.46	0.000	.4103449	.7028549
lxrat	.1456488	.0738498	1.97	0.049	0.009058	.2903917
wto	.637475	.3544911	1.80	0.072	-.0573147	1.332265
_cons	8.793604	.6153634	14.29	0.000	7.587514	9.999694

sigma_u	0
sigma_e	3.1633308
rho	0 (fraction of variance due to u_i)

Table 3.2OLS results for beef

Regly lp lgdp lxrat wto

Source	**SS**	**df**	**MS**			
				Number of obs	=	336
+				F(4, 331)	=	30.49
Model	1171.89175	4	292.972938	Prob> F	=	0.0000
Residual	3180.32656	331	9.60823735	R-squared	=	0.2693
+				Adj R-squared	=	0.2604
Total	4352.21831335		12.9916965	Root MSE	=	3.0997

ly |	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf.**	**Interval]**
+						
lp	.0773604	.0811351	0.95	0.341	-.0822451	.2369658
lgdp	.5565999	.0746213	7.46	0.000	.4098081	.7033917
lxrat	.1456488	.0738498	1.97	0.049	.0003746	.2909229
wto	.637475	.3544911	1.80	0.073	-.0598645	1.334814
cons	8.793604	.6153634	14.29	0.000	7.583088	10.00412

Table 4.1
Random effects results for turkey
Xtreglylplgdplxratwto

Random-effects GLS regression

		Number of obs =	374
Group variable: year		Number of groups =	34
R-sq: within =	0.4789	Obs per group: min =	11
between =	0.0602	avg =	11.0
overall =	0.4166	max =	11
		Wald chi2(4) =	267.96
corr(u_i, X) = 0 (assumed)		Prob> chi2 =	0.0000

ly	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lp	1.187247	.07784	15.25	0.000	1.034683	1.33981
lgdp	.1680575	.129489	1.30	0.194	-.0857362	.4218513
lxrat	-.0014508	.1144192	-0.01	0.990	-.2257084	.2228068
wto	1.065987	.536098	1.99	0.047	.0152543	2.11672
cons	1.771591	1.404885	1.26	0.207	-.9819339	4.525116
sigma_u	.39881058					
sigma_e	4.6473591					
rho	.00731029	(fraction of variance due to u_i)				

Table 4.2
OLS results for turkey

Regly lp lgdp lxrat wto

Source	SS	df	MS		
				F(4, 369) =	65.88
Model	6451.40392	4	1612.85098	Prob> F =	0.0000
Residual	9034.07632	369	24.4825917	R-squared =	0.4166
				Adj R-squared =	0.4103
Total	15485.4802	373	41.5160328	Root MSE =	4.948

ly	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lp	1.179656	.078261	15.07	0.000	1.025763	1.33355
lgdp	.1681488	.1303895	1.29	0.198	-.0882508	.4245484
lxrat	-.0004051	.1151601	-0.00	0.997	-.2268574	.2260472
wto	1.085247	.5220758	2.08	0.038	.05863	2.111864
cons	1.800483	1.409887	1.28	0.202	-.9719389	4.572905