THE CUBAN EMBARGO AND SOUTHEASTERN AGRICULTURAL EXPORTS

Cassandra Copeland

Oglethorpe University
Atlanta GA 30319

Henry Thompson

Auburn University
Auburn AL 36849

Southern Economics and Business Journal, 2010

Thanks for comments and suggestions to Henry Kinnucan, Curtis Jolly, Parr Rossen, John Roufagalas, John Winters, and a referee of this journal.

ABSTRACT

The US Southeast stands to increase agricultural exports to Cuba substantially with a lifted embargo. The present paper estimates there will be noticeable gains from trade in Southeastern agricultural export markets. A brief review of Cuban trade and economic history motivates assumptions of the model. The model calibrates a novel application of linear excess supply and demand to observed prices, outputs, US exports, Cuban imports, and estimated price elasticities in the literature.

INTRODUCTION

Lifting the Cuban embargo will lead to gains from trade estimated in the present paper for agricultural markets in the Southeastern US. A market model of linear excess supply and demand provides estimates of gains in exporter surplus from trade in rice, grains, soybeans, poultry, pork, and meat. This direct application of excess supply and demand focuses on the international market surplus gains from trade. The model calibrates excess supply from the US, excess demand in Cuba, and excess supply from the rest of the world to prices, outputs, exports, and estimates of price elasticities of supply and demand in the literature. The paper utilizes proxy demand elasticities in the literature due to the lack of data and estimates for Cuba.

A short review of Cuban economic history stresses that the US was Cuba's major trade partner before the embargo, motivating the assumption that the US will supply Cuban excess demands in these agricultural markets with a lifted embargo. The largest percentage gains are for rice, grains, and soybeans with moderate gains for poultry and pork. The largest absolute gains are for meat. Total surplus will increase more than 3% across these markets due to lifting the embargo.

CUBAN ECONOMIC HISTORY AND TRADE POTENTIAL

Jolly and Thompson (2008) present a review of historical economic data on Cuba. Trade and geography dominate Cuban-US economic history as noted by

Whittlesey (1922). In the early 1800s the US expanded south acquiring Florida and turning attention toward the Caribbean. Cuba's location favored US trade, investment, and tourism but Cuba remained a Spanish colony through the 1800s. By the late 1800s the US was the major consumer of Cuban exports and there was an effective reciprocal free trade agreement between the US and Spain. Cuba traded sugar, tobacco, tropical products, copper, and iron for US grains, meats, manufactures, vegetable oils, and fuel as documented by Wakefield (1937).

Sugar dominated the Cuban economy. By the 1860s Cuba was the world's largest producer with over 1500 plantations according to Hitchman (1970). About half of Cuba's cultivated land was sugar cane but the international price was erratic leading to political and economic instability.

Tobacco was the second crop but was also erratic. Politics entered as well with the Foraker Act of 1899 that prevented US investment in Cuban tobacco production. High US tariffs made Cuban tobacco a luxury good. Export revenue from tobacco in Cuba rose from $96 million in 1889 to $526 million in 1920 before collapsing to $203 million in 1932.[1]

The US acquired Cuba in 1898 after the Spanish-American War. The Treaty of Paris assumed the US would occupy Cuba. The Platt Amendment in 1901

[1] These prices are in 2009 dollars. All prices and dollar figures throughout this paper are inflated to $2009.

sanctioned US troops in Cuba. The US established a land market, reduced taxes, expanded utilities, and reduced tariffs by over half. Cuba was poised to become a state in the US.

Cuba became independent due to sugar beet farmers in the western US who did not want the direct competition from Cuban sugar cane. Debate on annexation in Congress terminated with the Teller Amendment in 1898 that made it illegal, although the Platt Amendment in 1901 subsequently exerted some US control and established the Guantanamo Bay Naval Base. The Reciprocity Treaty in 1903 solidified Cuban independence as discussed by Deere (1998). Nevertheless, US immigration grew due to the economic incentives. By 1903 there were 37 colonies in Cuba and 64 colonies by 1913. The Underwood-Simmons Tariff Act of 1913 lowered US import duties on citrus. By 1914 Cuba accounted for 84% of US grapefruit imports, peaking in 1922. Hitchman (1970) estimates total US investment capital in Cuba amounted to $1.25 billion in 1914.

By the late 1920s isolation and protectionism began to surface. The Fordney-McCumber Tariff Act of 1922 raised the average US tariff from 9% to 14%, the tariff on grapefruits doubling from $.05 to $.10 per pound. The Smoot-Hawley Tariff Act of 1930 then essentially eliminated trade with average tariffs of 60%, raising the tariff on grapefruits to $.15 per pound.

The Great Depression of the 1930s led to an exodus of US immigrants. Military juntas vied for power in Cuba leading to periodic US military intervention to

protect investment, primarily in agriculture. The 1940s was politically stable but during the 1950s Batista became an unpopular dictator supported by the US leading to the rise of Castro in 1959. US assets in Cuba at that time were over three times that all of the rest of Latin America. US investments in Cuba included most of the utilities, half of the railways, and about half of the capital in sugar refining.

Castro seized the large plantations and established trade agreements with the Soviet Union and China to barter sugar for oil as noted by Johnson (1965). Castro then nationalized all US assets leading President Eisenhower to eliminate the sugar trade agreement that paid Cuba $.14 per pound above the world market price, a yearly premium worth $748 million. The ensuing embargo spotlighted Castro as the US continued trading with other Communist countries throughout the Cold War. The elimination of Soviet subsidies during the 1990s forced Castro into market initiatives but Cuba struggled. Castro admitted in 2010 that Cuba's communist economic model does not work.

Income per capita in Cuba remains near its 1959 level of $4,500, one of the lowest in the hemisphere according to the Library of Congress (2006). For comparison, real income per capita is $8,920 in Mexico and $47,240 in the US in 2009.[2] Sugar remains the primary export although it has become much less dominant since the 1980s. The largest other exports are cigars, fish, and citrus as

[2] These values are per capita gross national income from World Bank (2010) in 2009 dollars.

discussed by Messina, Bonnett, and Taylor (2007). Cuba also has the world's second largest proven reserves of nickel as well as significant reserves of cobalt, iron, copper, chromite, manganese, zinc, and tungsten, and unexplored petroleum potential.

Cuba is the world's third largest grapefruit producer and citrus accounts for 10% of Cuban export revenue. The Cuban citrus industry is undergoing adjustment as pointed out by Gonzalez, Spreen, and Jauregui (2007). The Florida citrus industry could gain through investment as suggested by Kost (2002).

The relaxed humanitarian embargo in 2001 greatly increased Southeastern agricultural exports. As an example Cuba accounted for a quarter of Alabama agricultural export revenue in 2006. Mobile is less than two day sail from Havana and was the dominant port for US/Cuban trade prior to the embargo. Figure 1 reports US agricultural exports of grains, poultry, soybeans, and meat to Cuba in 2006. Figure 2 shows the dominant position of US trade with Cuba in 1957 and that pattern promises to re-emerge with a lifted embargo.

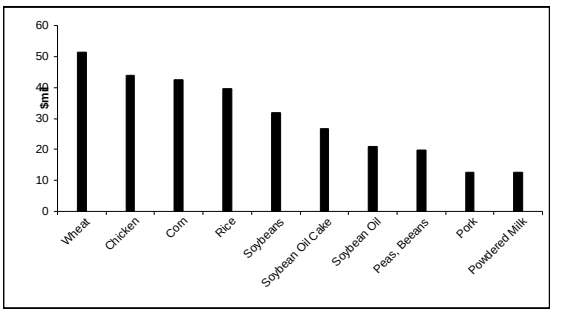

Figure 1. US Agricultural Exports to Cuba in 2006
US-Cuba Trade & Economic Council

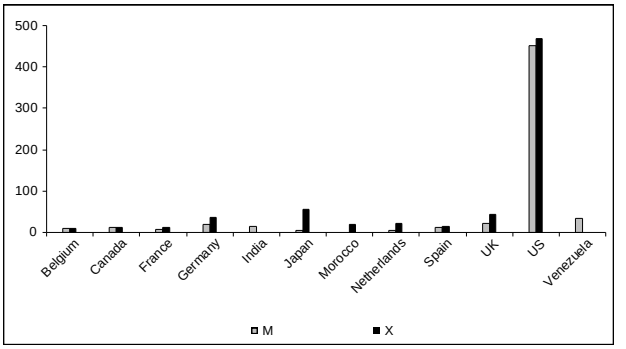

Figure 2. Cuban Pre-Embargo Trade Partners in 1957
International Historical Statistics

EXCESS SUPPLY SURPLUS GAINS FROM TRADE

Figure 3 shows the domestic linear export market with excess supply the difference between linear supply and demand,

$$XS(P) \equiv S(P) - D(P) = (a_0 + a_1P) - (b_0 - b_1P) = (a_0 - b_0) + (a_1 + b_1)P. \quad (1)$$

At the observed price P_0 in Figure 3 the export level is Q_0. The present approach derives supply and demand from elasticities, production, consumption, and observed price P_0 and export level Q_0. The elasticity of excess supply is $\varepsilon_{XS} = (dXS/dP)P/Q = (a_1 + b_1)P_0/Q_0$.

Derivation of excess demand XD assumes price elasticity ε_{XD} is the negative of the excess supply elasticity $\varepsilon_{XD} = -\varepsilon_{XS}$ leading to

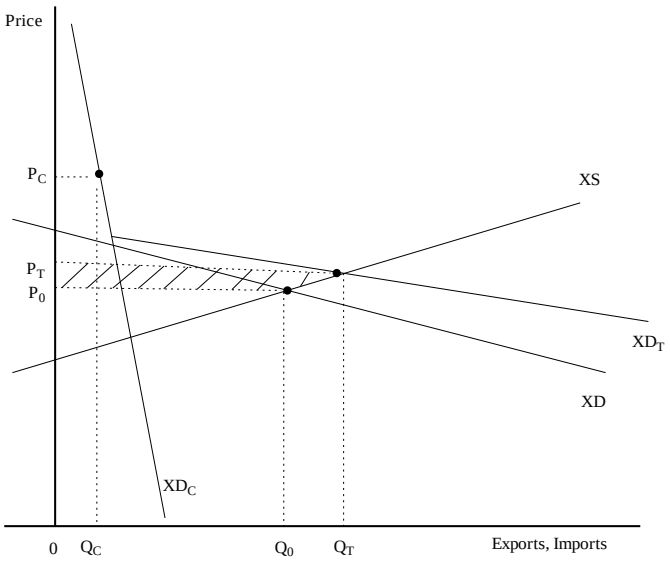

Figure 3. Excess Supply and Increased Excess Demand

$$XD(P) \equiv D_R(P) - S_R(P) = \alpha_0 - \alpha_1 P, \quad (2)$$

where $\alpha_0 = Q_0 - \alpha_1 P_0$ and $\alpha_1 = \varepsilon_{XD} Q_0/P_0 = a_1 + b_1$.

Cuban excess demand XD_C is based on import data from the USDA (2007) for proxy countries, Costa Rica for meat, Honduras for poultry, and Uruguay for pork. Demand elasticities are from the USDA (2008b). Supply elasticities from the literature summaries of Askeri and Cummings (1977) and Arnade and Kelch (2007) are primarily short run estimates. There is no data on prices in Cuba but gains from trade prove insensitive to wide ranges of prices across products. The embargo free market equilibrium at P_T and Q_T is the market equilibrium of total excess demand XD_T that equals the sum of importer excess demand XD and

Cuban excess demand XD_C as in Figure 3. Simulations assume no shift in importer excess demand XD.

Market specifications include the current price P_0, export level Q_0, output Q_S, Cuban price P_C, Cuban imports Q_C, and price elasticities of supply ε_S and demand ε_D. The gains from trade are the shaded area in Figure 3 with the underlying gain in producer surplus outweighing the lost consumer surplus. The scaling in Figure 3 is approximately the poultry market.

Prices in Table 1 from the IMF (2008) are standardized to $/metric ton. The US quantity produced Q_S, export level Q_0, and quantity imported in Cuba Q_C from the USDA (2007) are in thousands of metric tons. Price elasticities in Table 2 are from various sources as indicated.

SIMULATED MARKET SURPLUS GAINS FROM TRADE

Table 1 reports the price of poultry P_0 = $961 and US excess supply Q_0 = 2,967. In Table 2 the poultry demand elasticity is $\varepsilon_D = -0.56 = -b_1P_0/Q_0$ and the supply elasticity $\varepsilon_S = 1 = a_1P_0/Q_S$. The slope of the US poultry supply function is $a_1 = \varepsilon_SQ_S/P_0 = 23$ given US production of Q_S = 21,700 in Table 1. The price intercept of the US poultry supply function is then $a_0 = Q_S - a_1P_0 = 0$.

Table 1. Agricultural Commodity Market Prices and Quantities

	P_0	Q_0	Q_S	P_C	Q_C	P_T	$\%\Delta P$	Q_T	$\%\Delta Q$
rice	$215	1,420	8,800	$300	550	$221	2.7%	1,813	2.8%
grains	$151	6,141	67,700	$350	900	$152	0.6%	6,619	0.8%
soybeans	$220	8,244	86,800	$350	140*	$224	1.7%	9,379	1.4%
poultry	$961	2,967	21,700	$1,500	215**	$980	1.9%	3,594	2.1%
pork	$1,042	1,359	95,600	$1,500	20†	$1,048	0.6%	1,973	4.5%
meat	$1,886	5,832	11,900	$2,500	20†	$1,995	5.8%	6,379	0.1%

Notes: Market specifications for 2006
P_0 = average US price, $/metric ton
Q_0 = US exports, 000 metric tons
Q_S = total US output, 000 metric tons
P_C = average Cuban autarky price, $/metric ton, author assumption
Q_C = Cuban imports, 000 metric tons, proxies *Costa Rica **Venezuela †Uruguay
P_T and Q_T = free trade equilibrium price and quantity

Table 2. Agricultural Commodity Price Elasticities of Supply and Demand

	ε_S US	ε_D US	ε_{XS} Derived	ε_D Cuba	ε_S Cuba
rice	0.55**	-1.30*	7.55	-0.34*	0.50**
grains	0.89†	-0.25*	10.0	-0.34*	0.37**
soybeans	0.31†	-0.50††	13.7	-0.50††	0.50††
poultry	1.0**	-0.56*	7.19	-0.50††	0.50††
pork	0.24**	-0.82*	56.7	-0.56*	0.50††
meat	0.24**	-1.09*	1.32	-0.56*	0.50††

Notes:
Sources *USDA (2008b) **Askeri-Cummings (1977)
†Arnade-Kelch (2007) ††Author assumption
ε_S = price elasticity of supply for the product
ε_D = price elasticity of demand for the product
ε_{XS} = derived elasticity of excess supply

The slope of the US poultry demand function is $b_1 = \varepsilon_D Q_D/P_0 = -10.9$ where quantity demanded $Q_D = 18{,}733$ equals output $Q_S = 21{,}700$ less exports $Q_0 = 2{,}967$. The intercept of the US poultry demand function is $b_0 = Q_D + b_1 P_0 = 29{,}223$. The implied US autarky price is \$872. Exports increase the domestic price 10%.

The elasticity of US excess supply in Table 3 $\varepsilon_{XS} = (a_1 + b_1)P_0/Q_0 = 10.8$ is based on the slope of the excess supply function $(a_1 + b_1) = 33$. The quantity intercept of the poultry XS function is $a_0 - b_0 = -29{,}233$. The derived price intercept is \$812 as roughly pictured in Figure 3. Producer surplus in the US poultry market is \$131 million.

Table 3. Agricultural Commodity Market Slopes and Intercepts

	slope XS	P_{int} XS	slope XD_T	P_{int} XD_T	slope XD_C	P_{int} XD_C
rice	67	-13014	-69	17,053	-2.16	1,199
grains	501	-69502	-504	83,629	-2.70	1,845
soybeans	301	-57942	-301	74,780	-0.60	350
poultry	33	-29223	-34	36,532	-0.55	1,375
pork	96	-98863	-97	103,022	-0.39	1,441
meat	5	-3638	-5	16,743	-0.56	1,441

Notes:
slope XS = slope of the excess supply function for US as exporter P_{int} XS = price intercept for US excess supply function
slope XD_T = derived excess demand assuming free trade with Cuba
P_{int} XD_T = price intercept on derived excess demand function
slope XD_C = slope of the excess demand function for Cuba as importer
P_{int} XD_C = price intercept for the Cuban excess demand function

The elasticity ε_{XD} of importer excess demand XD is assumed to be the negative of the excess supply elasticity, $\varepsilon_{XD} = -\varepsilon_{XS}$. The slope of XD in (2) is then $\alpha_1 =$

$\varepsilon_{XD}Q_0/P_0$ = -33.5. The quantity intercept $\alpha_0 = Q_0 - \alpha_1 P_0$ = 35,157 implies the price intercept 1,049 as roughly pictured in Figure 3.

Cuban excess demand function XD_C begins with poultry imports of Q_C = 215 in Table 1 from the USDA (2007) with Venezuela as the proxy country.[3] Given the lack of data on consumption and production, assume Cuba produces half its consumption. Poultry production would then be 215 and consumption 430, a very low level implying a trivial impact on US exports and producer surplus.

As an alternative, the present simulations assume Cuba has half the US per capita consumption. Poultry imports and production would then each be 550. Simulations assume the same proportions for meat and pork given the very low import levels in proxy Uruguay. Rice and grain imports in Table 1 directly enter the simulations assuming Cuban production matches imports. Soybean imports are for the proxy Costa Rica. Import quantities Q_C are the average for all available years between 2000 and 2005.

The Cuban price of poultry P_C = \$1,500 in Table 1 is about 50% higher than the current price. Reasonable variation in P_C makes little difference in the gains from trade. Assumptions for poultry in Table 2 are ε_S = 0.50 and ε_D = -0.50.

[3] Given limited data on Cuban imports, several proxy countries provide estimates of import consumption. Venezuela, Uruguay, and Costa Rica are proxies given their general similarities to Cuba in terms of geography, economy, and trade behavior. Each country has a tropical, subtropical, or temperate climate, middle to low per capita income relative to the US, and trade in similar agricultural products. Each country also has a relatively significant and established trade relationship with the US (CIA, 2010).

Descriptions of other elasticities are in Table 2. The derived -1.50 elasticity of XD_C in Cuba leads to its slope -0.55 and quantity intercept 1,375 reported in Table 3 and roughly pictured in Figure 3.

Cuban excess demand XD_C plus importer excess demand XD equals total excess demand XD_T. Cuba imports from other countries but the presumption is that the US would dominate Cuban markets. The free trade equilibrium for poultry occurs where XD_T meets XS_{US} at P_T = \$980 and Q_T = 3,594 as in Table 1 and roughly illustrated in Figure 3. The international price of poultry increases 1.3% and exports increase 14% with a lifted embargo.

The surplus gain from trade is the shaded area in Figure 3 equal to \$2.6 million in the poultry market. This 2% gain in total surplus is in Table 4. The Southeast accounts for 39% of US poultry exports according to USDA (2008a), a proportion that implies a total surplus gain of \$1 million.

Table 4. Surplus Agricultural Commodity Market Surplus Gains

	gain	% gain
rice	\$0.97	6.5%
grains	\$0.51	1.4%
soybeans	\$0.02	0.02%
poultry	\$2.63	2.0%
pork	\$0.87	9.1%
meat	\$13.7	0.4%
Notes: gain = total US surplus gain in \$million % gain = percentage US surplus gain		

Analysis of the other export markets is similar. Total surplus gains are $19 million with 73% of that in the meat market and 14% in the poultry market. Surplus gains range from $13.7 million for beef, only 0.4% of the large beef market, to $0.02 million in soybeans. The largest percentage gains in producer surplus are 9.1% for pork and 6.5% for rice.

The present simulated gains from trade depend mostly on observed prices and export levels, and are insensitive to Cuban prices and reasonable price elasticities. The relatively small Cuban markets suggest approximation with linear excess supplies and demands is reasonable.

CONCLUSION

Lifting the Cuban embargo will generate noticeable surplus gains from trade for agricultural export markets in the Southeastern US. The largest percentage surplus gains will be for pork and rice with moderate gains for poultry and grains. The large meat market enjoys the largest absolute surplus gain.

Turning the reasoning around, the present model estimates yearly surplus loss of $19 million across these markets. The International Trade Commission (2007) conservatively estimates the embargo costs the US $1.2 billion lost exports of goods and services. The present estimates focus on the underlying market surplus for fundamental agricultural commodity markets.

The present linear excess supply and demand model should prove useful applied to other products and instances of proposed trade liberalization or protection. The advantages of the model are its focus on the international market equilibrium and the derivation of surplus gains from trade rather than export revenue or producer surplus versus consumer surplus.

REFERENCES

Arnade, Carlos and David Kelch, "Estimation of Area Elasticities from a Standard Profit Function", *American Journal of Agricultural Economics* 89, 2007, pp. 727-37.

Askari, Hossein and John Thomas Cummings, "Estimating Agricultural Supply Response with the Nerlove Model: A Survey," *International Economic Review*, 18, 1977, pp. 257-292.

Central Intelligence Agency, *World Factbook*, 2010.
https://www.cia.gov/library/publications/the-world-factbook/index.html

Deere, Carmen Diana, "Here Come the Yankees! The Rise and Decline of United States Colonies in Cuba, 1898-1930," *The Hispanic American Historical Review* 78, 1998, pp. 729-65.

Gonzalez, Armando, Thomas Spreen, and Carlos Jauregui, *The Citrus Industry in Cuba 1994-1999*, Cuban Research Center, University of Florida, Department of Food and Resource Economics, International Working Paper Number IW01-4, 2007.

Hitchman, James, "U.S. Control Over Cuban Sugar Production 1898-1902," *Journal of Interamerican Studies* 12, 1970, pp. 90-106.

International Monetary Fund, "Actual Market Prices for Non-Fuel and Fuel Commodities, 2005-2008," 2008.
http://www.imf.org/external/np/res/commod/index.asp.

International Trade Commission, "U.S. Agricultural Sales to Cuba: Certain Economic Effects of US Restrictions," International Trade Commission Publication 3932, 2007.

Johnson, Leland, "U.S. Business Interests in Cuba and the Rise of Castro," *World Politics* 17, 1965, pp. 440-59.

Jolly, Curtis and Henry Thompson, "Free Trade with Cuba: The Effects of a Lifted Embargo in Alabama," *Southern Business and Economics Journal* 30, 2008, pp. 82-93.

Kost, William, "Cuba's Citrus Industry: Trade and Growth Prospects," *Agricultural Outlook*, ERS/USDA, 2002.
http://www.ers.usda.gov/publications/agoutlook/JuneJuly2002/ao292.pdf.

Library of Congress, "Country Profiles: Cuba," Federal Research Division, 2006. http://memory.loc.gov/frd/cs/.

Messina, William, Eric Bonnett, and Timothy Taylor, "Cuba: A View of Revealed Export Advantage," Cuba in Transition, Association for the Study of the Cuban Economy, 11, Washington, D.C., 2007.

US Department of Agriculture Economic Research Service, "Total Agricultural Exports by State," United States Department of Agriculture, 2008a. http://www.usda.gov/wps/portal/usda/usdahome?navid=DATA_STATISTICS&parentnav=AGRICULTURE&navtype=RT.

US Department of Agriculture Economic Research Service, "Commodity and Food Elasticities: Demand Elasticities from the Literature," United States Department of Agriculture, 2008b.
http://www.ers.usda.gov/Data/Elasticities/query.aspx.

US Department of Agriculture National Agricultural Statistics Service, "Agricultural Statistics," United States Department of Agriculture, 2007.
http://www.nass.usda.gov/Publications/Ag_Statistics/2007/.

Wakefield, Roberta, "Some Factors in Cuba's Foreign Trade," *Economic Geography* 13, 1937, pp. 109-31.

Whittlesey, D.S., "Geographic Factors in the Relations of the United States and Cuba," *Geographical Review* 12, 1922, pp. 241-56.

World Bank, "World Bank Development Indicators," 2010.
http://data.worldbank.org/indicator.