2014

Coexistence of Genetically Modified, Conventional and Organic Food Products

Konstantinos Giannakas
University of Nebraska-Lincoln, kgiannakas2@unl.edu

CORNHUSKER ECONOMICS

University of Nebraska–Lincoln Extension

March 26, 2014

Institute of Agriculture & Natural Resources
Department of Agricultural Economics
http://agecon.unl.edu/cornhuskereconomics

Coexistence of Genetically Modified, Conventional and Organic Food Products

Market Report	Yr Ago	4 Wks Ago	3/21/14
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight	$124.93	$146.94	$152.50
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	165.52	215.40	221.82
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	131.54	173.41	179.37
Choice Boxed Beef, 600-750 lb. Carcass	193.57	212.98	242.41
Western Corn Belt Base Hog Price Carcass, Negotiated	72.30	92.06	125.62
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean	77.98	97.19	129.14
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct	90.00	151.00	155.00
National Carcass Lamb Cutout, FOB	293.42	369.22	371.16
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	7.11	6.48	7.22
Corn, No. 2, Yellow Nebraska City, bu.	7.46	4.33	4.39
Soybeans, No. 1, Yellow Nebraska City, bu.	14.56	13.34	13.84
Grain Sorghum, No. 2, Yellow Dorchester, cwt.	12.52	7.64	7.89
Oats, No. 2, Heavy Minneapolis, MN , bu.	4.26	4.72	4.47
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	+	162.50	182.50
Alfalfa, Large Rounds, Good Platte Valley, ton.	227.50	125.00	127.50
Grass Hay, Large Rounds, Good Nebraska, ton.	217.50	107.50	107.50
Dried Distillers Grains, 10% Moisture, Nebraska Average.	265.00	195.00	235.00
Wet Distillers Grains, 65-70% Moisture, Nebraska Average.	100.50	63.50	95.75

+ No Market

The coexistence of genetically modified (GM) products with their conventional and organic counterparts has been one of the most scrutinized issues surrounding the introduction of products of agricultural biotechnology into the agri-food marketing system. Fears that the widespread adoption of GM products will drive their conventional (and perhaps organic) counterparts out of the market, have been countered by arguments that their presence enhances the equilibrium product variety in the market. Central to the argument is, of course, the possibility of coexistence of GM, conventional and organic products, with the main focus having been on farm production systems and the prospect of coexistence of GM, conventional and organic crops.

While the coexistence of the three different cropping systems is certainly necessary for the existence of GM, conventional and organic food products in the final consumer markets, the availability of GM, conventional and organic crops is not sufficient for ensuring the coexistence of food products utilizing these crops. The coexistence of GM, conventional and organic food products will be determined, instead, by consumer attitudes towards these products, the food suppliers, and their interaction in the relevant food product markets. The possibility of coexistence of the three different types of food is at the heart of a research project completed recently at the University of Nebraska-Lincoln.

Specifically, this research develops an empirically relevant, integrated, multi-market framework of analysis of the coexistence of conventional, GM and organic food products. The framework builds upon the Giannakas and Fulton vertical product differentiation framework (presented formally in Giannakas (2011), and used in several market studies for GM, conventional and organic products cited therein), and it explicitly accounts for the well-documented (a) heterogeneity in consumer preferences for GM, conventional and organic food products, and (b) imperfect competition among the suppliers of these products.

Once developed, the framework is used to identify (1) the *determinants* of coexistence of GM, conventional and organic food products, and (2) the *exact conditions* under which this coexistence will occur. In addition to enabling the analysis of

coexistence of these important food product categories, this framework allows us to effectively capture the impacts of coexistence-affecting strategies and policies on equilibrium prices and quantities, the welfare of different consumers and the profits of the suppliers of these products. While most of the analysis focuses on the case where GM, conventional and organic food products are segregated and marketed separately, the issue of coexistence under a no GM labeling regime (where the GM and conventional products are marketed together as a non-labeled good, as is generally the case in the United States), is also considered and analyzed within this framework.

Our analysis reveals that the coexistence of GM, conventional and organic food products, and the welfare of the interest groups involved depend on (1) the market structure and nature of the strategic interactions among the participants in the different supply channels; (2) the costs associated with the supply of the three products; (3) the consumer attitudes towards GM, conventional and organic food products; and (4) the segregation and labeling regime governing the products of agricultural biotechnology.

Specifically, an increase in the cost and/or degree of market power in the supply channel of a (GM, conventional or organic) product increases the price and reduces the quantity of this product, while causing the equilibrium prices and quantities of its substitutes to increase. While the suppliers of the substitute products gain, the increased food product prices hurt all consumers. The effect on the suppliers of the product in question depends on whether it is the costs or the market power that have increased – while an increase in the costs of a product causes its supplier profits to fall, an increase in market power makes these suppliers better off.

Regarding the consumer preferences, an increase in the level of consumer aversion to GM products reduces the demand for the GM product, while increasing the consumer demand for its conventional and organic counterparts. The equilibrium quantity and supplier profits fall in the GM market while increasing in the markets for conventional and organic food products. All prices increase in this case, resulting in welfare losses for all consumers involved.

Finally, an increase in the consumer valuation of organic food products increases the demand for organic products, and reduces the demands for its GM and conventional counterparts. Price, quantity and profits increase in the organic market and fall in the markets for GM and conventional food products. All consumers gain in this case – consumers of the GM and conventional food products benefit as the prices of these products fall, while consumers of the organic food product benefit as the welfare gains associated with their increased valuation of the organic product outweigh the welfare loss caused by the increased price of this product.

When the GM and conventional products are marketed together as a non-labeled good (as is generally the case in the U.S.), their coexistence will depend on (a) the structure of the market for the non-labeled product and the nature of the strategic interaction among the suppliers of the GM and conventional products; (b) the relative costs faced by the suppliers of GM and conventional products; and (c) the ability of suppliers to switch to the production of a (cheaper) substitute. In particular, if the suppliers of the non-labeled product are perfectly competitive, then the product with the higher production costs will be driven out of the market, and the non-labeled product will be priced at the (lower) marginal cost of the product remaining in the market. For the GM and conventional products to coexist under perfect competition among the suppliers of the non-labeled food product, these products should have the same costs of production. This is quite unlikely, however, due to the agronomic benefits associated with the production of GM products (and the fact that costs are continuous variables, and the probability that they will take the same value is zero).

Similarly, if the suppliers of the non-labeled product are imperfectly competitive and involved in a strategic price competition, the lower cost firm(s) will drive their higher cost rival(s) out of the market by pricing the non-labeled product below their rivals' costs. Similar to the perfectly competitive case, for GM and conventional products to coexist in the market, the costs associated with the production of the GM and conventional food products should be the same.

For different cost suppliers of GM and conventional products to coexist in the market, they would have to compete in quantities and be unable (or find it unprofitable) to alter the type of the product they produce. Obviously, if the food suppliers could switch their production between the GM and conventional food products (i.e., if the switching costs were less than the efficiency gains associated with such a change), they would always do so, since changing their production would enable the high cost firms to increase their profitability by producing the (undifferentiated) non-labeled product at reduced costs. Consistent with Akerlof's *lemons theorem*, the marketing of GM and conventional products as a non-labeled good (as is currently the case in the U.S.), could then result in the low quality product driving the high quality product out of the market, jeopardizing the potential for the coexistence of GM, conventional and organic products in this market.

This article is based on:

Giannakas K. "Coexistence of Genetically Modified, Conventional and Organic Food Products: A Framework and Analysis." In Kalaitzandonakes N. (ed.) *The Coexistence of Genetically Modified, Organic and Conventional Foods*. Springer Academic Publishers, *forthcoming*.

Cited Study:

Giannakas K. "Consumer Demand in Vertically Differentiated Markets." Chapter 9 in Lusk J., J. Roosen, J. Shogren (eds.) *Oxford Handbook on the Economics of Food Consumption and Policy*, Oxford University Press, September 2011.

Dr. Konstantinos Giannakas, (402) 472-2041
Harold W. Eberhard Professor of Agricultural Economics
Department of Agricultural Economics
University of Nebraska-Lincoln
kgiannakas2@unl.edu