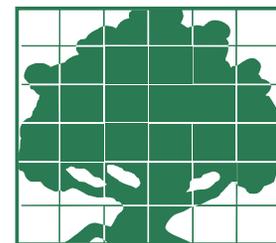


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The Role of Regional Trade Agreements in Trade Liberalization

Renée A. Vassilos and Alex F. McCalla

Multilateral trade liberalization is usually the first casualty of a recession. There has been a proliferation of Regional/Bilateral Trade Agreements (RTA's) in recent years. Are these a substitute for multilateral liberalization? This paper explores the recent evolution of RTA's and presents a case study of the U.S.-Malaysia Trade Agreement as it relates to fruit, nut, and vegetable exports. It argues that while there are benefits to the United States, multilateral liberalization still seems to be a better option.

History shows that a recession brings with it a national shift toward protectionist policies. In past recessions, such a shift has proven troublesome. The Smoot-Hawley Tariff Act of the 1930s raised U.S. tariffs on over 20,000 imported goods to record levels and had a disastrous effect for the United States and its trading partners. In fact, it was the significant negative impact of the protectionist trade policies of the United States and other nations which stimulated the creation of the General Agreement on Tariffs and Trade (GATT) in 1948, the predecessor organization to the World Trade Organization (WTO).

Trade liberalization has been shown to produce benefits to competitive producers. In the post WW II period trade has expanded much more rapidly than GDP, leading to growing prosperity. Agricultural trade, however, remains more protected. Most analyses done regarding agricultural trade liberalization suggest competitive producers, as are most U.S. producers, gain from having freer access to international markets.

There are three means by which a country can liberalize and expand international trade: multilateral, regional, and bilateral trade agreements. Multilateral trade agreements are the most efficient way to advance a free trade policy and thus promote open markets. Unfortunately, despite having been in discussion since 2001, the latest round

of multilateral trade talks at the WTO, the Doha Round, has stalled. Disagreements over domestic agricultural subsidies blocked an agreement in July 2006. In 2007, no agreement was reached due to conflicts regarding opening agricultural and industrial markets and farm subsidies of developed nations. A disagreement over a Special Safeguard Mechanism requested by certain developing countries blocked an agreement in July 2008. While multilateral trade agreements may be considered a better tool for reducing discriminatory trade practices and encouraging governance reform among member countries, current talks remain stalled.

However, in the interest of producers, it is important to continue talks. Of particular importance to the globally significant agricultural sector, is that such negotiations are critical to open and expanded trade relations. While multilateral negotiations are currently stalled, the opportunity exists for continued trade development at the bilateral and regional level. While not a substitute for multilateral negotiations, development can continue through regional trade agreements (RTAs) with fewer complications in the negotiations. Virtually all members of the WTO use regional trade agreements as a trade policy tool. Such agreements allow countries to open their markets to one another through the granting of preferential access.

These regional agreements are used as a policy tool in addition to

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Table 1. U.S. Free Trade Agreements: Implemented or Pending Implementation

Australia	January 2005
Bahrain	August 2006
Canada	January 1994 (NAFTA)
Chile	January 2004
Colombia	Pending Congressional Approval
Costa Rica	Pending Implementation (CAFTA-DR)
Dominican Republic	March 2007 (CAFTA-DR)
El Salvador	March 2006 (CAFTA-DR)
Guatemala	July 2006 (CAFTA-DR)
Honduras	April 2006 (CAFTA-DR)
Israel	August 1985
Jordan	December 2001
Mexico	January 1994 (NAFTA)
Morocco	January 2006
Nicaragua	April 2006 (CAFTA-DR)
Oman	September 2006
Panama	Pending Congressional Approval
Peru	Pending Implementation
Singapore	January 2006
Republic of Korea	Pending Congressional Approval
U.S. Free Trade Agreements: Under Negotiation	
Under the South African Customs Union (SACU): Botswana, Lesotho, Namibia, South Africa, and Swaziland	
Malaysia	
Thailand	
United Arab Emirates	

multilateral agreements because of their speed, the fact that they allow liberalization of specified markets at a faster pace than multilateral agreements, and their flexibility. Furthermore, RTAs are not as cumbersome, allowing interested parties to negotiate trade policy scope and choice of partner. The content of the negotiated trade policy often includes topics which present great difficulty in the multilateral arena, such as agriculture, and also includes topics not in the multilateral negotiations at all, such as government procurement,

competition policy, and investment. The influence of special interest groups is, however, more dominant in RTAs versus multilateral negotiations, resulting in sensitive trade areas being left out of RTAs completely. The major driver for the use of RTAs as a trade policy tool is the relative speed and flexibility possible in their negotiation.

The appeal of RTAs is evident in their proliferation over the last 13 years. The WTO (established 1995) has been notified of close to 300 RTAs, as compared to the GATT's 47-year existence when notifications only numbered 124. Currently, there have been over 400 regional trade agreement notifications sent to the WTO and 230 in force.

The United States has 14 trade agreements (TAs) in place, with four additional agreements under negotiation (Table 1). In order to maintain

and increase its position in global trade, it is desirable for the United States to continue to pursue TAs. Implementation of a TA positively benefits producers—gaining preferential access in international markets results in more competitive exports.

Case Study

A case study was conducted in November of 2007 that analyzed the U.S.–Malaysia TA, under negotiation since March 2006, and the impact it would have on the U.S. fruit, nut, and vegetable sector. Malaysia is a strategically important trading partner for the United States, as its tenth largest trading partner in the world and the largest in Southeast Asia. A TA with Malaysia would allow greater access to the Southeast Asia market, with annual trade valued at \$3 trillion.

U.S. agricultural exports to Malaysia totaled more than \$550 million in 2007, with \$100.3 million from fruit, nut, and vegetable exports (Table 2). The removal of tariffs and other restrictions on agricultural exports would result in gains for U.S. agriculture producers.

The study focused on grapes and apples—the largest (by value) fruit commodities exported to Malaysia—and raisins, the largest processed fruit product (by value) exported (Table 3). The three commodities had a combined export value of \$63 million in 2006. These three commodities were analyzed, with the results extrapolated to determine the potential gains from a TA for U.S. fruit, nut, and vegetable exporters to Malaysia.

Potential gains for exporters of these commodities were estimated through

Table 2: U.S. Fruit and Vegetable Exports to Malaysia, 2006

Fruit: fresh & prepared	\$86,221,000
Vegetable: fresh & prepared	\$6,101,000
Nuts	\$7,966,000
Total	\$100,288,000
<i>Source: USDA, Foreign Agricultural Service</i>	

Table 3: U.S. Grape, Apple, and Raisin Exports to Malaysia, 2006

Grapes, fresh	\$40,318,000
Apples, fresh	\$18,969,000
Raisins	\$3,946,000
Total	\$63,233,000
<i>Source: USDA, Foreign Agricultural Service</i>	

Table 4: Calculated Elasticities of Demand for U.S. Fruit Exports in Malaysia

Commodity	Price Elasticity of Demand	Standard Error	Observations
Grapes	-.977*	.382	107
Apples	-.946*	.375	120
Raisins	-.593*	.375	114

*Significant at the .01 level
Source: Authors' Calculations

the calculation of Malaysian demand for the commodities. Using the calculated demand in the Malaysian market, the price elasticities of demand for these commodities were estimated. The elasticities were then used to calculate the prospective monetary gains for U.S. exporters based on 2006 export levels.

U.S. exporters face increasing competition in the Malaysian market for their products. Through a TA, U.S. exporters would gain from the removal of the 5% tariff they currently face in the Malaysian market.

Competition for U.S. grapes comes mainly from Australia, whose annual export volume to Malaysia is nearly equal to that of the United States. Though Australia is in the Southern Hemisphere and has opposite growing seasons to the United States, it is aided by recent developments in production which have created longer growing seasons and increased storage capabilities. These developments minimize the impact of the different growing seasons. China is the major competitor in the apple market, with greater annual exports to Malaysia than the United States. However, U.S. apples maintain market share through their distinction as a higher quality product. Iran is the major competitor for raisins. The United States currently maintains the larger market share for raisins, although Iran is increasing its exports to Malaysia annually.

A U.S.–Malaysia TA is not only a strategic move to help increase U.S. market share in Southeast Asia, but also a potential defensive move, since

both Australia and China are currently negotiating TAs with Malaysia. Australia is in direct bilateral negotiations, while China is negotiating with Malaysia through the Association of South East Asian Nations (ASEAN) as part of a regional trade agreement initiative.

In the case study, Malaysian consumer demand for grapes, apples, and raisins was estimated using a double-log model. The elasticities of demand obtained from the demand estimates ranged from $-.593$ to $-.977$ (near unitary elastic demand) (Table 4). If the negotiated agreement removed the 5% tariff on the commodities and this was translated into a 5% price decrease on the market for Malaysian purchasers—U.S. apple sales would increase 4.7%, raisin sales would increase 3%, and table grape sales would increase 4.9%. At the 2006 value for export commodities, this would translate into an increased export value of nearly \$3.62 million for the three commodities analyzed. Total fruit, nut, and vegetable exports could increase by roughly \$4.1 million were tariffs removed. This calculation is based on an average of the elasticities for fresh grapes and apples applied to the fresh portion of exports and the elasticity for raisins applied to the processed portion of exports (Table 5).

Facing tough competition, any advantage in a market is important. In this specific case of grapes and apples, the TA may also prove to be a defensive move to hold current market share if Australia and China also sign TAs with Malaysia.

Implications

This study provides a narrow view of world trade: the U.S. fruit, nut, and vegetable exports to a relatively small export market, Malaysia. However, the results may be extrapolated to provide a wider look into the current state of international trade. The U.S. agricultural industry is facing, in certain sectors, increasing competition

Table 5: Fruit, Nut, and Vegetable Exports to Malaysia, Fresh versus Processed

Fresh: Fruits, Nuts, & Veg	\$88,204,000
Processed: Fruits & Veg	\$12,084,000
Total Exports	\$100,288,000

from both the developed and developing world. This competition is no longer simply limited to increased exports, but also includes TAs being negotiated and implemented between U.S. trade partners and third country competitor nations. The continual development of trade agreements is therefore critical for U.S. export interests. The potential gains for the agriculture sector can be significant with trade agreements opening markets to expanded U.S. production.

With every nation grappling with the impacts of the global recession, nations may find themselves pushing aside international trade agreements in favor of what are believed by some to be national interests. A move toward protectionism is not, however, in the interest of efficient producers in the United States. The U.S. economy has benefitted from trade expansion driven by the liberalization of trade in manufactured products. Agriculture has lagged behind and therefore has experienced less benefit. While the benefits of bilateral trade liberalization are likely to be less than for multilateral liberalization, they still are to be preferred to a reversion to increased protection. This is particularly true for U.S. producers who want to expand production beyond servicing domestic markets.

Renée A. Vassilos earned her M.S. degree in the Department of Agricultural and Resource Economics at UC Davis in 2007. She is a market analyst with John Deere (China) Investment Company in Beijing, China. Renée can be contacted by e-mail at ReneeVassilos@gmail.com. Alex F. McCalla is an emeritus professor of agricultural economics at UC Davis who can be contacted by e-mail at alex@primal.ucdavis.edu.

How Do the Recent Farm Price Fluctuations Affect Consumer Prices?

Richard Volpe

This study looks at the effects of the turbulent rise and fall of farm prices of 2008 and 2009 on retail food prices at a major U.S. supermarket. The results show that retail prices have been largely unresponsive to the movements of farm prices, though retailers are more apt to respond to price increases than decreases.



Researchers find that farm price increases are passed on to consumers more quickly and completely than are farm price decreases, which serve as cost decreases for retailers.

Food prices at the farm level embarked on a meteoric rise through 2007 and into late 2008, followed by a sharp fall that has continued into 2009. Economists have yet to reach a consensus regarding the causes of the boom and bust in farm prices, although these movements have closely mirrored those of energy prices, particularly crude oil. Therefore, energy prices are often found at or near the top of the list of potential determinants, along with the emergence of biofuels, the widening imbalance between supply and demand in certain parts of the world, the weak U.S. dollar, and various distortions in the global market. A recent special issue of the *Update* provided an in-depth exploration into these potential causes.

The purpose of this paper is not to examine the causes of the widespread boom and bust in food prices, but rather to investigate their effects on retail food prices in U.S. supermarkets. Researchers in economics and marketing have long been interested in the price transmission between the farmgate and the supermarket. The findings of such studies are of interest to participants at all stages of the agribusiness channel, from the producers who seek to know their share of the retail dollar to consumers who benefit from understanding the extent to which their food expenditures depend upon the dynamics of farm prices. Incomplete or delayed price transmission from the farm to the supermarket can result in market inefficiencies and the redistribution of profits within the production channel.

First and foremost, it is important to understand that economists have yet to agree on the best methodology to use when examining and testing

for price transmission. The overarching story from economists thus far, however, is that generally retail prices rise faster than they fall. Researchers find that farm price increases are passed on to consumers more quickly and completely than are farm price decreases, which serve as cost decreases for retailers. Moreover, even accounting for temporary price promotions, retail prices are significantly more rigid than farm prices. The average prices received for farm commodities within growing regions typically change on a weekly basis, even if modestly, while the average supermarket price may not change for four to five months at a time.

The pronounced swings of farm prices in recent times have resulted in unusually high farm price volatility, creating an excellent setting under which to test price transmission to the retail level. Large retailers such as supermarkets face marginal price adjustment costs and researchers have shown that it can be unprofitable for retailers to consistently respond to minor changes in costs, as measured by farm and manufacturer prices. Therefore, significant shifts in farm prices are necessary to differentiate statistically between retail price changes resulting from farm price changes and those related to other factors, such as shifts in manufacturer prices. The recent turbulence in the global food market has certainly provided us with sufficient price mobility.

Price Movement at the Farm and Retail Levels

This study examines farm-to-retail price transmission for nine commodities covering a ten-month period from March of 2008 through January 2009. These commodities include six vegetables: spinach, snow

peas, sugar snap peas, bok choy, and red and green cabbage, as well as three dairy products: cheddar cheese, butter, and dry milk. They were chosen due to the availability of weekly farmgate prices from the National Agricultural Statistics Service (NASS) of the USDA. The retailer prices used in this study come from a conventional supermarket chain operating in the western United States. This chain utilizes a pricing strategy known as high-low pricing (HLP), marked by frequent price changes through advertised, temporary price discounts. These price promotions are tools used by supermarkets to respond to competitive and input cost considerations. Therefore, this analysis takes into account promotional prices as well as standard shelf prices. This is an extension of previous price transmission research.

Table 1 shows the mean and coefficient of variation (CV) for each product at the farm and retail level. The CV is a percentage measure of the total variation seen in the price over the entire time period, calculated by dividing the standard deviation by the mean. It is a useful measurement for comparing the variability in price for commodities of different sizes. The farm prices are averages from shipping points in California's Central Valley and Central Coast, while the retail prices are averages from 15 supermarkets, 12 of which are found in the western United States. For every commodity, the farm price shows more variation than the retail prices and, on average, the prices for produce commodities are more volatile than those for dairy commodities. These preliminary statistics suggest that retail prices are not fully responsive to changes in farm prices, especially in the case of commodities such as spinach which feature high price variability at the farm level but very low price variability in supermarkets.

Table 1. Summary Statistics for Farm and Retail Prices

Commodity		Farm Price	Retail Price incl. Promotions	Retail Price not incl. Promotions
Spinach	Mean	\$10.00/carton	\$1.75/lb.	\$1.75/lb.
	CV	28.4%	1.6%	1.6%
Snow Peas	Mean	\$15.88/carton	\$2.76/lb.	\$3.7/lb.
	CV	28.7%	6.6%	0.7%
Sugar Snap Peas	Mean	\$17.52/carton	\$2.04/lb.	\$2.79/lb.
	CV	26.2%	8.7%	1.4%
Bok Choy	Mean	\$7.94/carton	\$1.23/lb.	\$1.29/lb.
	CV	18.1%	7.1%	7.8%
Green Cabbage	Mean	\$8.02/carton	\$0.76/lb.	\$0.80/lb.
	CV	24.9%	11.1%	3.0%
Red Cabbage	Mean	\$12.75/carton	\$1.13/lb.	\$1.13/lb.
	CV	23.3%	12.8%	12.8%
Butter	Mean	\$1.43/lb.	\$3.31/lb.	\$3.95/lb.
	CV	13.4%	7.4%	2.0%
Nonfat Dry Milk	Mean	\$1.27/lb.	\$7.76/25.6 oz.	\$7.76/lb.
	CV	13.3%	1.1%	1.0%
Cheddar Cheese	Mean	\$1.87/lb.	\$4.76/lb.	\$5.70/lb.
	CV	7.5%	6.9%	1.8%

Figures 1 and 2 show the paths of the farm and retail prices for butter and spinach, respectively, over time. The relationships portrayed are typical among the nine commodities featured in table 1 in that there appears to be little relationship between farm and retail prices. The farm price for butter in figure 1 shows a sustained increase throughout much of 2008, followed

by a swift drop beginning at the end of 2008 and into the beginning of 2009. The retail shelf price, not including promotional activity, shows very little variation, while the retail price including promotional activity shows considerably more movement. However, the promotional dips in price do not appear, on the surface, to be related to the farm price. It is interesting to

Figure 1. Farm and Retail Prices for Butter Over Time, 2008–2009

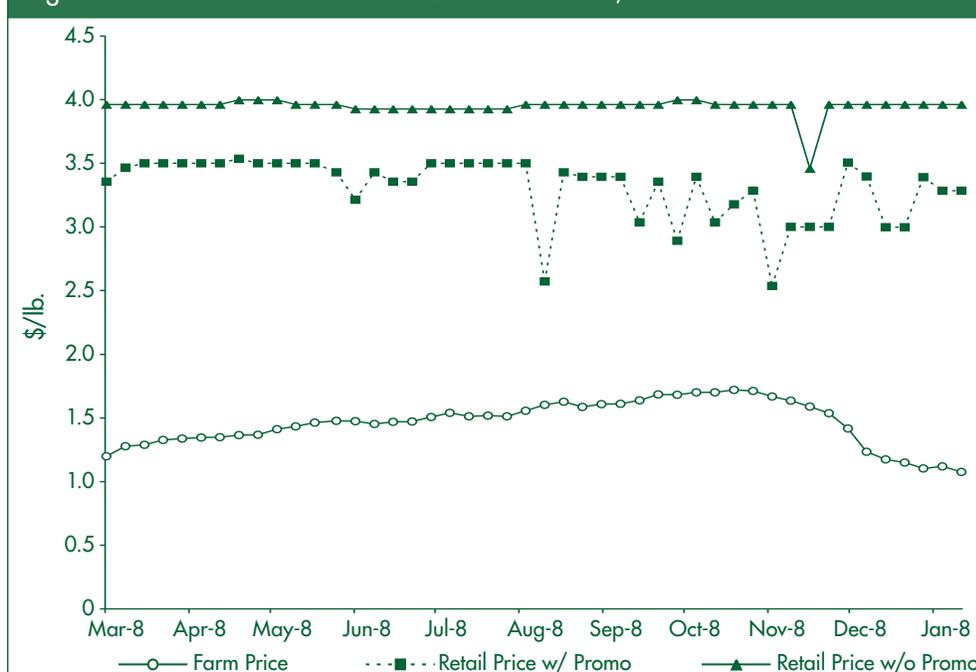


Table 2. Results of Application of Ward Model to Farm and Retail Prices

Commodity	Timing	Model 1: Weekly Price Changes				Model 2: Cumulative Effects			
		Promo	Shelf	Difference between increases & decreases?		Farm price impact on retail price?	Difference between increases & decreases?		
Spinach	Current	No	No			Yes	No		
	One Lag	No	No	No	No	No	No	No	Yes (+)
	Two Lags	No	No			No	No		
	Three Lags	No	No			No	Yes		
Snow Peas	Current	Yes	No			Yes	No		
	One Lag	No	No	No	No	No	No	Yes (+)	No
	Two Lags	No	No			No	No		
	Three Lags	No	No			Yes	No		
Sugar Snap Peas	Current	No	No			No	No		
	One Lag	No	No	No	No	No	No	No	No
	Two Lags	Yes	Yes			No	No		
	Three Lags	No	No			No	Yes		
Bok Choy	Current	No	No			No	Yes		
	One Lag	No	No	No	No	No	No	No	No
	Two Lags	No	No			No	No		
	Three Lags	No	No			No	No		
Green Cabbage	Current	No	No			No	Yes		
	One Lag	No	No	No	No	No	No	No	Yes (+)
	Two Lags	No	No			No	No		
	Three Lags	No	No			No	Yes		
Red Cabbage	Current	Yes	No			Yes	No		
	One Lag	No	No	No	No	No	No	No	No
	Two Lags	No	No			No	No		
	Three Lags	No	Yes			No	Yes		
Butter	Current	No	No			No	No		
	One Lag	No	No	No	No	No	No	No	No
	Two Lags	No	No			No	No		
	Three Lags	No	No			No	No		
Nonfat Dry Milk	Current	No	No			No	No		
	One Lag	No	No	No	No	No	No	No	Yes (+)
	Two Lags	No	No			No	No		
	Three Lags	No	No			No	No		
Cheddar Cheese	Current	No	No			No	Yes		
	One Lag	No	No	No	No	No	No	No	No
	Two Lags	No	No			No	No		
	Three Lags	No	No			No	No		

note, however, that promotional activity picked up in great force about midway through the sustained rise in the price of butter at the farm level. For nearly all of the commodities listed in table 1 there was greater promotional activity, in terms of both the number and depth of the price cuts, in the latter half of the time period.

An exception to the pattern of greater promotional activity in the latter half of the time period is spinach,

which featured absolutely no promotional prices at any point. As figure 2 demonstrates, the farm price for spinach did not follow the same sustained rise and swift drop as did the farm price for butter, but it did feature a great deal of variability. Though the *E. coli* scare was essentially over by 2008, spinach sales had yet to recover from the lingering doubts over safety while consumers and producers alike were coming to terms with irradiation as

a new practice to prevent future outbreaks. Nevertheless, the retail price for spinach remained constant throughout nearly the entire time period.

Decomposing the Retail Response

In order to tell the complete story of how the recent roller coaster ride of farm prices has affected retail prices, it is insufficient to simply test for price responsiveness among supermarket prices. Researchers have long argued that retailers have strong incentives to pass through price increases to consumers while not responding to price decreases. The 2008-2009 path followed by U.S. farm prices includes sharp increases and decreases, allowing for the direct testing of the impacts of both.

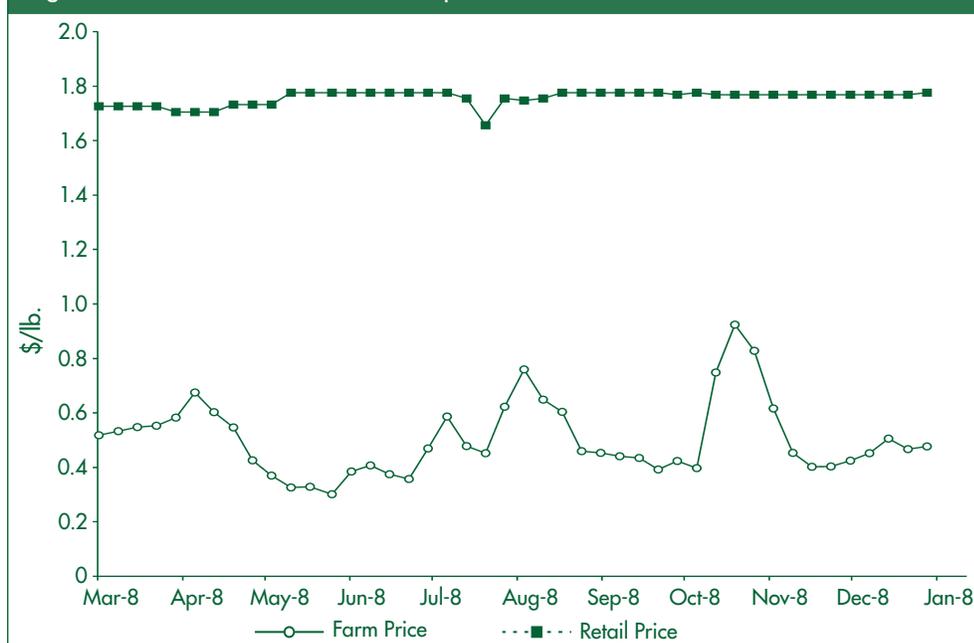
This study utilizes one of the relatively recent econometric methods to test for and decompose price transmission from the farm to the supermarket—the Ward model. The model separates the farm price into increases and decreases over time and then allows for lagged price swings to have effects on the retail price. Two major applications of the Ward model have emerged to test for price transmission. One relies upon weekly price changes to test directly for differences in the effects of upturns and downturns, while the other uses recursively summed price increases and price decreases to examine for the cumulative effects of farm price changes. This study features both applications in the interest of obtaining robust results. Furthermore, the Ward model is run on two sets of retail prices: one that includes promotional activity and one that does not, to allow for the possibility that retailers respond to farm price changes through temporary price promotions.

The results of the estimations are summarized in table 2. For the most part, retail prices do not show a high degree of responsiveness to the changes in farm prices. Even allowing for farm prices to have lagged and cumulative

effects on retail prices, the results show that the relationship between farm and retail prices is not statistically significant in the majority of cases. These findings support the notion that retail prices tend to be rigid, changing only infrequently over time. Such retail price rigidity, particularly during times of turbulent farm prices, is worrisome in that it is suggestive of market inefficiencies that can be particularly damaging to farmer welfare. When retail prices do not respond to changes in the farm price, meaning that they offer prices to farmers that do not necessarily match the conditions of the market, farmers are forced to sell to alternative outlets in order to clear the market. This leads to even greater price volatility for farmers, reducing income certainty and increasing the likelihood of debt accumulation.

A couple of interesting trends emerge in the results. The only instances of significant differences in responsiveness between price increases and decreases are related to model 2, which tests for cumulative effects. In each case, retail prices respond more sharply to farm price increases, which supports the general theory on retail price responsiveness. In general, model 2 shows a greater degree of price transmission, implying that the effects of farm price swings build upon each other over time to drive retail price changes. Additionally, for every commodity except for sugar snap peas, price transmission is only associated with current price changes and changes lagged three weeks. This finding motivates the importance of considering the lagged effects of farm price changes, which may stem from the costs associated with changing the prices at large supermarket chains. Included in these costs is the time needed for communication and coordination across large numbers of stores and cities. Finally, there appears to be no major difference in responsiveness if promotional activity is taken into consideration, though

Figure 2. Farm and Retail Prices for Spinach Over Time, 2008–2009



there may yet be a story to tell with respect to increased promotional activity beginning about midway through the sustained rise of farm prices.

Conclusions

A recent report from the Farm Foundation focused on the determinants of the heavy variation in farm prices as of late, but noted that while farm commodity prices are plummeting, real food prices are falling very little. The results presented in this study strongly corroborate that finding. Though the causes and effects of the dramatic rise and fall of farm prices in recent times remain a topic for discussion and research, this study takes an important first step in exploring the impacts of the farm price swings on retail food prices for a variety of commodities. Thus far, it seems that retailers are maintaining a general strategy of rigid shelf prices interrupted occasionally by sharp price promotions. The farm price roller coaster has had little discernible effects on retail prices, though retailers are more likely to respond to increases in farm price, rather than decreases.

Richard Volpe is a Ph.D. candidate in the Department of Agricultural and Resource Economics at UC Davis. He can be contacted by e-mail at volpe@primal.ucdavis.edu.

For additional information, the author recommends:

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ARE Faculty Profile: C.-Y. Cynthia Lin



C.-Y. Cynthia Lin
Assistant Professor
Agricultural and Resource Economics
UC Davis

Cynthia Lin has been an assistant professor at University of California, Davis since 2006, with a joint appointment in the agricultural and resource economics department and the environmental science and policy department. Cynthia is also a research associate of the Harvard University John F. Kennedy School of Government and the Fossil Fuels Tract Director of the Sustainable Transportation Energy Pathways Program of the UC Davis Institute of Transportation Studies.

Cynthia is one of the seven economists selected to serve on the California State Controller's Council of Economic Advisors. As part of her work on the council, she has been proposing an increase in the California gasoline tax. The optimal gas tax for California is the subject of a paper she is writing with graduate student Lea Prince.

Cynthia's fields of interest are environmental and natural resource

economics, energy economics, industrial organization, and applied microeconomics. Among her current areas of research are the petroleum industry, renewable energy, natural resources, environmental regulation, and air quality. She enjoys working on projects that are technically sound, innovative, challenging, and that are of interest to academics, business practitioners and policy-makers alike.

Cynthia received her bachelor's degree, *summa cum laude*, in Environmental Science and Public Policy from Harvard College in 2000. Her undergraduate atmospheric chemistry thesis on trends in ozone smog was awarded a Thomas Temple Hoopes Prize and culminated in two journal publications. She was elected to Phi Beta Kappa in her junior year.

Cynthia received her Ph.D. in Economics from Harvard University in 2006. Her graduate honors include a Repsol YPF–Harvard Kennedy School Pre-Doctoral Fellowship in energy policy, the Stone Fellow Award for the Best Paper Written by a Doctoral Student in Environmental and Resource Policy, and the International Society for New Institutional Economics Award for the Best Ph.D. Dissertation.

For her Ph.D. dissertation, Cynthia analyzed the investment timing game played by petroleum-producing firms in the Gulf of Mexico. When individual petroleum-producing firms make their exploration and development investment timing decisions, positive information externalities and negative extraction externalities may lead them to interact strategically with their neighbors. Her research examines whether these inefficient strategic interactions take place on federal lands in the Gulf of Mexico. In particular, it analyzes whether a firm's production decisions and profits depend on the decisions of firms owning

neighboring tracts of land. The empirical approach is to estimate a structural econometric model of the firms' multi-stage investment timing game. Although the model only permits the identification of the net effect of the two countervailing externalities, and not each individually, theory suggests that the importance of the extraction externality relative to the information externality should be greater on small tracts than on large tracts, and the data are consistent with this theory. Also as expected, the externalities intensify as the tract size decreases.

Cynthia is currently working on several research projects. With graduate student David Corderi, she is estimating the social rate of return to research and development in the energy industry. Their model quantifies the positive contribution that lagged R&D has on Total Factor Productivity growth in the manufacturing of coal, petroleum products, and nuclear fuel sector for a number of OECD countries.

With graduate student Wayne Leighty, Cynthia is modeling the economically optimal dynamic oil production decisions for seven production units (fields) on Alaska's North Slope and simulating the impact of tax policy on production rate. Cynthia is also working on a project using spatial econometrics to analyze air pollution externalities. She just started a project analyzing the entry and exit decisions of ethanol plants with graduate student Karen Thome, and a project analyzing the supply and demand of hybrid vehicles with graduate student Joeri de Wit.

In her free time, Cynthia enjoys walking, swimming, reading novels and playing the piano.

C.-Y. Cynthia Lin can be contacted by e-mail at cclin@primal.ucdavis.edu.

Impact of Quality Characteristics on Demand for Chicken in Viet Nam

Jennifer Ifft, David Roland-Holst, and David Zilberman

We estimate the demand for different varieties of chicken in Viet Nam. We find that higher incomes are linked to consumption of traditionally produced free-range chicken; and that, in general, there is price substitution between different varieties of chicken. These findings indicate that quality plays a large role in demand for chicken in Viet Nam.



Informal or open air markets account for 95% of chicken purchased in Hanoi.

The difference between traditional, extensive and modern, intensive livestock production systems has several economic and environmental dimensions, and the debate over these two systems covers issues of global concern. The growing demand for meat will have major implications for crop systems, environmental quality, and food security. Livestock systems can generate large negative side effects such as diseases like highly pathogenic avian influenza (HPAI) that can be passed to humans.

Gaining a better understanding of consumers' preferences that are driving not only demand for meat quantity but also meat quality in Asian

countries, can improve predictions of the dynamics of the livestock sectors and policies to affect them to improve human and environmental health.

The growth of intensive livestock production can be largely attributed to income and population growth increasing demand for protein. However, demand for quality characteristics can also impact the development of livestock production systems. The differences between livestock production systems can have a significant impact on meat quality. In several wealthy countries, the past growth of intensive livestock systems has been followed by a current trend of growing demand for meat that is produced in systems similar to traditional livestock systems, such as free-range, local, and organic. Consumer meat choices are often motivated not only by demand for environmental sustainability, but also demand for food quality. Demand for meat quality in Viet Nam is often linked to the type of production system, with a strong preference for meat from more traditional, or less intensive, production systems.

Food demand research in Asia often focuses on a trend toward increasing demand for food from modern production systems. Modern foods have largely been defined as those that are more processed or closer to "ready-to-eat" form, or foods that are purchased in modern retail outlets such as supermarkets. Many researchers have observed that increased income levels were associated with significant increases in the demand for such food types in developing countries in Asia, including Viet Nam. Along with increasing demand for protein, this has led to the idea that consumers in Asian countries are shifting consumption to modern food products, or that preferences are being "westernized." Although

this certainly is the case for several types of food, we have found evidence from Viet Nam that small-scale poultry production systems, which often support poor rural households, produce differentiated products that command a significant premium in urban areas.

Addressing demand for quality in chicken is especially relevant for Viet Nam. Viet Nam has experienced several HPAI outbreaks, and HPAI is now endemic in local wild and domestic poultry populations. The major quality difference in chicken (as well as other types of poultry), as perceived by consumers in Viet Nam, is related to the variety of chicken. Native breeds that are produced free-range on a scavenging diet (backyard chickens) have a 100% retail premium in Hanoi, the capital and second largest urban area in Viet Nam. As evidenced by the price differential, backyard chickens are considered to be superior in terms of flavor and texture to exotic varieties that are raised on concentrate feed (translated as "industrial chicken"). A third variety of chicken is "crossbred chicken," which is a cross between backyard and industrial varieties, both in terms of breeding and production methods. Industrial chicken is sold in a more processed form, while backyard chicken is generally sold with minimal processing and is rarely available in supermarkets.

Production characteristics of all these types of chicken are directly linked to quality characteristics for which urban consumers have demonstrated a large willingness to pay. Backyard chickens are more resistant to disease, but are also more likely to be exposed to wild birds that carry HPAI viruses. Industrial chickens might be more protected from the spread of viruses due to being raised in a confined environment, but that confined environment (crowding,

Table 1. Impact of Chicken Characteristics on Average Prices per Kg, in U.S. Cents

	Backyard Chicken	Crossbred Chicken	Industrial Chicken
Purchased at Supermarket	0.1	0.09	0.3**
Purchased in Countryside	-0.3***	-0.03	0.09
Purchased Live	-80.1***	3.3	
Purchased in Cuts	-7.9*	-21.7***	
Purchased Whole			14.2**
Weekly Total Food Expenditure	0.5	1.0	0.7**

* significant at 10%, ** significant at 5%, *** significant at 1%

dampness, and lack of sunlight) also can contribute to the multiplication and spread of HPAI viruses.

Awareness of how different breeds of chickens are raised is high amongst urban households, with consumers (correctly) linking breed and production environment to desired meat quality characteristics. Supermarkets have grown in Hanoi, but are still not popular places to purchase meat. The vast majority of households prefer to consume fresh meat that is purchased daily in small markets near their home. Little research on chicken demand has been undertaken in Viet Nam, although avian influenza outbreaks have led to increased interest in the development of the poultry sector in Vietnam.

Data

Most existing market-level datasets available for Viet Nam are not appropriate for measuring chicken demand. Open air or informal markets account for 95% of chicken purchased in Hanoi, so household survey data is essential for demand analysis. Census and living standards (LSMS) surveys tend to group together all types of poultry consumption, or do not distinguish between different types of chicken. To estimate a demand for chicken that takes quality into account, we utilize a unique survey undertaken for a Food and Agricultural Organization (FAO) project in 2007. This survey has 1,200 observations, and used spatial and systematic sampling to obtain a sample that is representative of all households living in the urban districts of Hanoi.

Households were surveyed for demographic characteristics, attitudes toward chicken, shopping habits, chicken consumption habits, and willingness to pay for safety-guaranteed chicken.

The survey differentiated between consumption of backyard, crossbred, and industrial chicken, which together make up most of the quality-related variation in chicken in Viet Nam. Households indicated average weekly consumption and average prices paid for each type of chicken. Although chicken is a relatively homogeneous product in Hanoi, a few additional characteristics were also collected. Households also indicated their weekly expenditure on all types of food eaten both inside and outside of the home, which is a good measure of income. Because a large portion of households in our sample consume more than one type of chicken, we are able to estimate a demand system for different types of chicken, and separating varieties of chicken will control for a large source of quality in chicken consumption.

Empirical Analysis

Our demand system analysis covers the factors influencing chicken prices, choice of chicken variety, and quantity of chicken purchased. Analysis of reported prices indicates that whole chicken, which is the least processed of all slaughtered cuts, is the most expensive. Likewise, buying chicken cuts decreases price. Industrial and crossbred chickens are rarely purchased live, but purchase of live backyard chickens appears to significantly lower the price.

Although slaughter costs are reflected in prices, whole chicken is more valuable than chicken parts. Wealth and family structure are not correlated with price, which indicates that chicken is a fairly homogenous product. Otherwise, differentiated meat characteristics marketed toward specific age groups or wealth levels would be reflected in prices. Processed chicken parts appear to be the least valuable of all forms of chicken being sold, which indicates that households on average have not shifted preferences to more processed chicken.

Although household size and age structure appear not to impact choice of chicken variety—preferences, attitudes, and wealth have a large impact. Households that indicate a greater concern for taste are more likely to purchase backyard chicken, and less likely to purchase industrial chicken. Households that report being concerned about prices are more likely to purchase industrial and crossbred chicken, and less likely to purchase backyard chicken. Vietnamese households, on average, clearly prefer backyard chicken as long as they can afford it.

Households were also surveyed on their attitudes toward different factors related to food safety of chicken, but the results regarding choice of variety are somewhat ambiguous. Households that are more concerned about marketplace hygiene are more likely to buy backyard chicken, which is almost exclusively sold in open air markets. These households are also less likely to purchase crossbred and industrial chicken. This might reflect a belief that backyard chickens are healthier than other varieties. Households that report buying privately labeled chicken are less likely to buy backyard chicken and more likely to purchase crossbred chicken, which indicates that private companies tend not to work with backyard chicken farmers. A multiplicative index for risk, which gave greater weight to households that were highly concerned

about safety risks across several categories, was also used to predict the type of chicken purchased. Households with a higher score are slightly more likely to purchase crossbred and industrial chicken, and less likely to purchase backyard chicken, although all coefficients were of relatively low magnitude.

We estimate a demand system for chicken that allows us to calculate the impact of price and income on quantity of chicken purchases. The results of the demand-system estimation are contained in Table 2, which reports own-price, cross-price, and expenditure (income) elasticities of demand for the alternative chicken products available to Vietnamese households. Each elasticity measures the percent change in chicken consumption associated with a 1% increase in the explanatory factor. Thus, the own-price elasticities (indicated in italics in the table) represent the estimated percent change in consumption for a 1% increase in price, and the cross-price elasticities estimate the percent change in consumption of product X for a 1% increase in the price of product Y. For example, an increase of 1% in the price of industrial chicken is predicted to increase demand for backyard chicken by 1.4%. Finally, the expenditure elasticities in the bottom row indicate that Vietnamese consumers purchase more backyard and crossbred chicken at higher income levels, but buy less industrial chicken.

We proxy education for total food expenditure in a different specification, as a robustness check for any potential endogeneity issues, and find consistent results. Although unlikely, it might be possible that households that like chicken will increase food expenditure. Education is highly correlated with total food expenditure in our sample. We also address potential remaining quality variation in prices as a further robustness check. This is done by identifying the portion of prices that is related to quality factors, and removing this amount to calculate “quality-adjusted prices.” With

Table 2. Results of Systems Demand Estimation, % Change (Elasticities)

	Backyard Chicken	Crossbred Chicken	Industrial Chicken
	-----Kg/Week-----		
<i>Backyard Chicken Price</i>	-1.4***	0.7***	0.5***
<i>Crossbred Chicken Price</i>	1.3***	-6.1***	0.7
<i>Industrial Chicken Price</i>	1.4***	1.1	0.9**
<i>Total Food Expenditure</i>	0.93***	1.18***	-0.48*

* significant at 10%, ** significant at 5%, *** significant at 1%

this quality adjustment, income effect and cross-price effects maintain a similar sign and magnitude, but own-price effects become statistically insignificant.

The loss of significance in own-price coefficients is likely due to our quality adjustment procedure, or the discreteness of chicken in Hanoi as well as overall consumption. Households above a certain minimum income would likely consume a certain amount of protein in each meal. For whatever meat (or protein) is selected, a certain quantity would be necessary. If this type of behavior pattern is true, then we may see more of a substitution effect than an own-price effect. This is especially true for chicken, which is often either purchased whole or in half. Further, our quality adjustment of price may net out within-variety quality substitution. The robustness of our model is strengthened by the persistence of income and cross-price effects.

Conclusion

Our results indicate that households regularly differentiate between different varieties of chicken, and that consumption of backyard chicken is correlated with higher incomes. Backyard chicken is prepared in a “traditional” manner in Viet Nam, and tends to be sold in a less processed form. It is also rarely purchased at grocery stores or other formal outlets. Most households in Hanoi have refrigerators, and it is common for women to work outside of the home. This contradicts findings that “modern” and more convenient foods from more formal supply chains are

more income elastic, and also indicates that the trend of increasing demand for protein and convenient and “modern” foods may not apply to all types of foods.

Our findings also indicate that incorporating small poultry producers into modern supply chains is necessary for ensuring safe movement of poultry. The chicken from these producers is a premium product, and any price increases could lead to increasing informality. The private sector might also be interested in finding ways to cost-effectively procure and market higher quality chicken. Chicken from smallholders already controls a large market share due to its quality advantage. Like fair trade, organic, and other food labels, a credible labeling scheme in Viet Nam could take advantage of an existing market to increase rural incomes and improve public health.

Jennifer Ifft is a Ph.D. candidate, David Roland-Holst is an adjunct professor, and David Zilberman is a professor, all in the Department of Agricultural and Resource Economics at UC Berkeley. The authors can be contacted by e-mail at jiff@are.berkeley.edu, dwrh@are.berkeley.edu, and zilber@are.berkeley.edu, respectively.

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Co-Editors

Steve Blank
David Roland-Holst
Richard Sexton
David Zilberman

Managing Editor
and Desktop Publisher

Julie McNamara

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Julie McNamara, Outreach Coordinator
Department of Agricultural and Resource Economics
University of California
One Shields Avenue, Davis, CA 95616
E-mail: julie@primal.ucdavis.edu
Phone: 530-752-5346

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Department of Agricultural and Resource Economics
UC Davis
One Shields Avenue
Davis CA 95616
GPBS