Sumner, D. A., W. A. Matthews, J. A. Mench, and J. T. Rosen-Molina. 2010. The economics of regulations on hen housing in California. J. Appl. Agric. Econ. In press.
Sumner, D. A., J. T. Rosen-Molina, W. A. Matthews, J. A. Mench, and K. R. Richter. 2008. Economic Effects of Proposed Restrictions on Egg-laying Hen Housing in California. http://aic.ucdavis.edu/publications/eggs/egg_initiative.htm Accessed Nov. 2009.
USDA. 2009. 2007 Census of Agriculture. USDA, Washington, DC.
USDA. 2010. Chicken and Eggs Annual Summary. USDA, Washington, DC.
USDA-AMS. 2010. Weekly Retail Shell Eggs and Egg Products Feature Activity Report. http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateR&navID=MarketNewsAndTransportationData&leftNav=MarketNewsAndTransportationData&page=PYMarketNewsReportsEggRetail&acct=pmn Accessed Mar. 2010.
USDA-NASS. 2009. Eggs Products Report. National Agricultural Statistics Service, Washington, DC.
USDA-ERS. 2009. Organic Production: Data Sets. http://www.ers.usda.gov/Data/Organic/ Accessed Apr. 2009.
Watt Poultry. 2009. Top company ratings: Million layers in production on 12/31/2007. Egg Ind. 113:4–5.
Yen, S., B. Lin, and D. Smallwood. 2003. Quasi- and simulated likelihood approaches to censored demand systems: Food consumption by food stamp participants. Am. J. Agric. Econ. 85:458–478.
You, Z., J. Epperson, and C. Huang. 1996. A composite system of demand analysis for fruits and vegetables in the United States. J. Food Distrib. 27:11–22.

APPENDIX

An Example Algebraic Model of the Egg Market Response to National Layer Housing Restrictions

This appendix develops a standard economic model of US egg supply and demand. [See also Sumner et al. (2008, 2010) for an application to California hen housing regulations.] Consider first the specification of a demand function that depends on price and consumer preferences or willingness to pay for eggs produced using an alternative housing system. For simplicity, consider a demand function for eggs of log differential form so that the percentage or proportional change in the US demand for eggs is given by

$$\text{dlnQ} = \eta(\text{dlnP} - \text{dlnB}), \quad [1]$$

where Q^d is the quantity of US eggs demanded; P is price; η is the price elasticity of demand for eggs in the United States, which is negative; and B represents the additional willingness to pay for eggs produced using a particular noncage housing system. The term dlnB represents a percentage or proportional increase in the willingness to pay or demand price that would be experienced in the market. Notice that as willingness to pay under the alternative increases, the quantity demanded increases.

Analogously, consider a simple supply function where the percentage or proportional change in the quantity of eggs supplied to the US market takes the form

$$\text{dlnQ}^s = \varepsilon(\text{dlnP} - \text{dlnC}), \quad [2]$$

where Q^s is the quantity of eggs supplied to the US market and dlnC is a vertical cost shifter reflecting the added marginal cost of producing eggs using the noncage alternative to the conventional cage environment. The elasticity of supply, ε, is positive because the higher the price, the more eggs will be supplied to the market. Notice that as costs increase, the quantity of eggs supplied decreases.

To determine the effects of the shift to the alternative system, we use the equilibrium condition

$$\text{dlnQ}^d = \text{dlnQ}^s = \text{dlnQ}, \text{ and insert}$$

equations [1] and [2]. [3]

Solving this equation for the proportional change in price as a function of the US egg market elasticities of demand and supply and the cost shifters yields

$$\text{dlnP} = [-\varepsilon/(\eta - \varepsilon)](\text{dlnC}) + [-\eta/(\eta - \varepsilon)]\text{dlnB}. \quad [4]$$

This expression shows that the more that costs increase with the increase in the cost of production due to the alternative housing system, the more the price of eggs in the United States increases. This term is positive because the elasticity of supply is positive and the elasticity of demand is negative so the denominator is negative.

Finally, using the expression for dlnP in equation [4] to insert into either equation [1] or equation [2] yields the following equation for the effects of the change in housing system on the new quantity of eggs:

$$\text{dlnQ} = [-\eta\varepsilon/(\eta - \varepsilon)](\text{dlnC} - \text{dlnB}). \quad [5]$$

In equation [5], we see that the larger the cost increase from the new housing system, the fewer eggs will be sold ($[-\eta\varepsilon/(\eta - \varepsilon)]$ is negative). However, the larger the increase in the willingness to pay for eggs produced under the alternative system, the more eggs will be sold. Overall, the quantity effect will be negative not as a matter of the algebra but because the eggs produced under the alternative system are available currently and command a very small share of the market. That means the additional willingness to pay by consumers must be small relative to the additional cost of production for the eggs under the alternative housing system.