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**“Consumers’ Willingness to Pay for Genetically Modified Foods in
China”**

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ABSTRACT

China's biotech regulations, which were put in place in March 2002, potentially have important implications for U.S. grain exports (particularly for soybeans) to that country and U.S. competitiveness in the world market. The regulations require that foods containing biotech ingredients be labeled. Whether food manufacturers and retailers would avoid using biotech ingredients in their food products (as is the case in the EU and Japan) or simply elect to label their products as may contain biotech ingredients, however, eventually depend on consumer attitudes toward genetically modified (GM) foods and their willingness to pay for non-GM and GM foods relative to the cost of identity preservation.

There have been an increasing number of studies on consumer attitudes toward GM foods in China (Envionics International; Li *et al.*; Zhong *et al.*; and Lin *et al.*). Information obtained from these previous surveys suggested that the majority of Chinese consumers have favorable opinions about the use of biotechnology in crop production, livestock and poultry products fed with biotech feed grains, and the use of biotech ingredients in processed food production. Based on a large-scale consumer survey in 11 urban cities, for example, Lin *et al.* found that 46-67 percent of all respondents in China were supportive of biotech foods, depending on the kind of biotech foods. In contrast, 5-15 percent of urban consumers were opposed to biotech foods. However, there are only few studies available that address consumers' willingness to pay (WTPs) for non-GM and GM foods in China (Li *et al.*). Surveys for these studies are small-scale

and tend to be city-specific (such as in Beijing). In addition, only a few GM foods with either *product-enhancing* or *process-enhancing* trait are included in the previous studies. Even though there have been an increasing number of studies that address consumers' WTPs for GM foods in Japan, Norway, Taiwan and the United States (Chern and Rickertsen; Kaneko and Chern; Chiang), it is not certain that results of WTPs obtained from these countries are applicable to consumers' WTPs for non-GM and GM foods in China.

The main purposes of this paper are: 1) to use the contingent valuation method (e.g., Kanninen, 1993; Li *et al.*, 2003; Chern and Rickertsen, 2002) to estimate the mean WTPs for various GM and non-GM foods based on a large-scale survey in China's 11 urban cities, and 2) to estimate the effects on WTPs that are attributable to demographic factors, socio-economic characteristics, awareness, and consumer attitudes. A survey of 1,100 consumers in 11 small-to-large cities (including Beijing and Shanghai) along China's eastern coast was conducted by the National Bureau of Statistics through personal interviews in fall 2002. The samples were first stratified by demographic and socio-economic characteristics at the city level and then randomly selected within each of the sampled cities. Altogether, the survey resulted in 1,005 usable samples, of which 669 have heard about GM foods. In general, the survey samples are representative of the population under study in terms of demographic and socio-economic variables. The survey covers 8 kinds of GM foods--1) insect-resistant fruits or vegetables, 2) delayed-ripening fruits or vegetables, 3) soybean oil made from herbicide-tolerant soybeans, 4) tofu made from herbicide-tolerant soybeans, 5) noodles made from insect-resistant wheat, 6) insect-resistant rice, 7) neutraceutical biotech rice, and 8) livestock products fed with biotech corn.

An important contribution from this study is its estimation of WTPs for non-GM and GM foods through contingent valuation, using the semi-double-bounded dichotomous choice model (McClaskey *et al.*, 2001). The survey questionnaire was carefully designed to elicit consumers' bid prices through successive bids, starting with an initial bid where prices of GM foods are assumed to be identical as for non-GM foods. If consumers were willing to purchase GM foods at no price discount, they would respond to the first bid by saying "yes". Otherwise, except the case of neutraceutical biotech rice, they were asked if they would purchase GM foods if a random price discount is offered to them. A set of price discounts were distributed randomly across the respondents in the survey, which permit us to place both an upper and a lower bound on the respondent's unknown true WTP (Hanemann *et al.*, 1991). The random price discounts are inclusive of all the possible values, ranging from a minimal value to as much as 80 percent. Finally, the survey questionnaire captures consumers who would accept only non-GM foods regardless of price discounts.

As a result, there are three discrete outcomes of the bidding process that are observable: 1) a "yes" to the initial bid—WTP is equal or less than the initial bid (no price discount), 2) a "no" followed by a "yes" in the second bid (WTP lies between the initial bid and a random price discount in the second bid), and 3) "no" to both bids (WTP is greater than the random price discount in the second bid). The WTP function is estimated by maximum likelihood method, which estimates the choice probabilities by maximizing the log-likelihood function for the three discrete outcomes. WTPs, measured in terms of price differentials between GM and non-GM foods, are thus regressed against variables including the random bid offered to each respondent in the second bid, awareness of GM foods, consumer attitudes toward GM foods, and a set of

demographic and socio-economic attributes. The mean WTP is estimated by restricting the coefficients for all variables except the random bid to be zero (e.g., Hanemann *et al.*, 1991; Li *et al.*, 2003)

Measurement of WTPs is based on survey data relating to consumers' willingness to purchase, instead of willingness to accept, in a context of price differential between non-GM and GM foods. If the prices of non-GM and GM foods are the same, the survey in this study found that a majority of Chinese urban consumers—58.3-74.1 percent—were willing to purchase biotech foods, depending on the kind of foods. An even greater majority—67.0-80.9 percent—were willing to purchase biotech foods if a 10-percent price discount was offered to them. In the case of output-enhancing biotech rice, about 6-10 percent more consumers were willing to purchase neutraceutical biotech rice than for input-trait biotech rice, depending on the price differential. A small but significant minority—about 20 percent—of urban consumers were not willing to purchase biotech foods regardless of any price discounts.

Preliminary results on the WTP analysis suggest that the mean price discounts needed to induce the respondents to purchase GM foods were less than 10 percent, considerably smaller than the 60-62 percent discount reported by McCluskey, Ouchi, Grimsrud, and Wahl in their study on consumer response to GM foods in Japan. Like consumers in the EU, Japanese consumers have strong preference for using non-biotech ingredients in food production governed by its biotech labeling regulations. In contrast, a majority of urban consumers in China are willing to purchase GM foods even if there are no price discounts for GM foods.

In addition, the multinomial logit model suggests that most demographic and socio-economic variables are not statistically significant in affecting consumers' willingness to purchase GM foods. As expected, random bid offered to each respondent is inversely related to the WTP, and is statistically significant. Positive attitudes toward GM foods significantly reduce the price discounts for GM foods. Also, a greater awareness of GM foods leads to a higher acceptance of GM foods, and thus lowers the price discounts for GM foods.