

Consumers' Willingness to Pay for Biotech Foods in China

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2005. The views expressed herein are those of the authors, who do not
necessarily reflect official USDA or CCAP-CAS policy.**



Purposes of Study

- **Understand consumers' willingness to pay (WTP) for biotech foods in China**
- **Estimate the mean WTPs for biotech foods in China using the contingent valuation method (CVM)**
- **Estimate the effects on the likelihood of purchasing biotech foods of:**
 - price discounts for biotech foods
 - demographic and socio-economic factors
 - awareness of biotech foods



Previous Related Studies

- The Li-Curtis-McCluskey-Wahl study in Beijing, China (2003)

	<u>Mean WTP(%)</u>
– <i>product-enhancing</i> biotech rice	38 (premium)
– <i>product-enhancing</i> or <i>process-enhancing</i> biotech soybeans	16.3 (premium)

- The McCluskey-Ouchi-Grimsrud-Wahl study in Japan (2001)

	<u>Mean WTP(%)</u>
– noodles made from biotech wheat with a <i>process attribute</i>	60 (discount)
– tofu made from biotech soybeans with a <i>process attribute</i>	62 (discount)



Previous Related Studies (Cont.)

- **The Chern-Rickertsen study in Japan, Taiwan, Norway, and the U.S. (2002)**

	Mean WTP (% of premium)
— Non-biotech vegetable oil	
Japan	33-40
Taiwan	17-21
Norway	55-69
U.S.	50-62

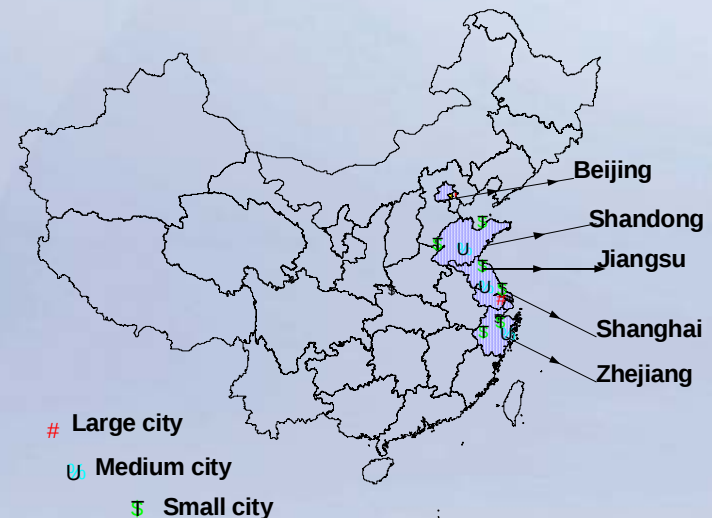
- **The Chiang study in Taiwan (2004)**

	Mean WTP (% of premium)
— Non-biotech soybean oil	21.19
— Non-biotech tofu	37.42
— Non-biotech-fed salmon	108.4



The Consumer Attitudes Survey

- **A large-scale survey:**
 - 11 small-to-large cities
 - including Beijing and Shanghai
- **Surveyed 1,100 consumers:**
 - sample randomly selected
 - conducted by China's National Bureau of Statistics in fall 2002
- **Survey questionnaire:**
 - jointly developed and pre-tested by CCAP/CAS and ERS analysts
 - assisted by Carl Pray of Rutgers Univ.
 - comparable with other studies
 - covers household demographic/ socio-economic characteristics, awareness, and attitudes



Basic Statistics

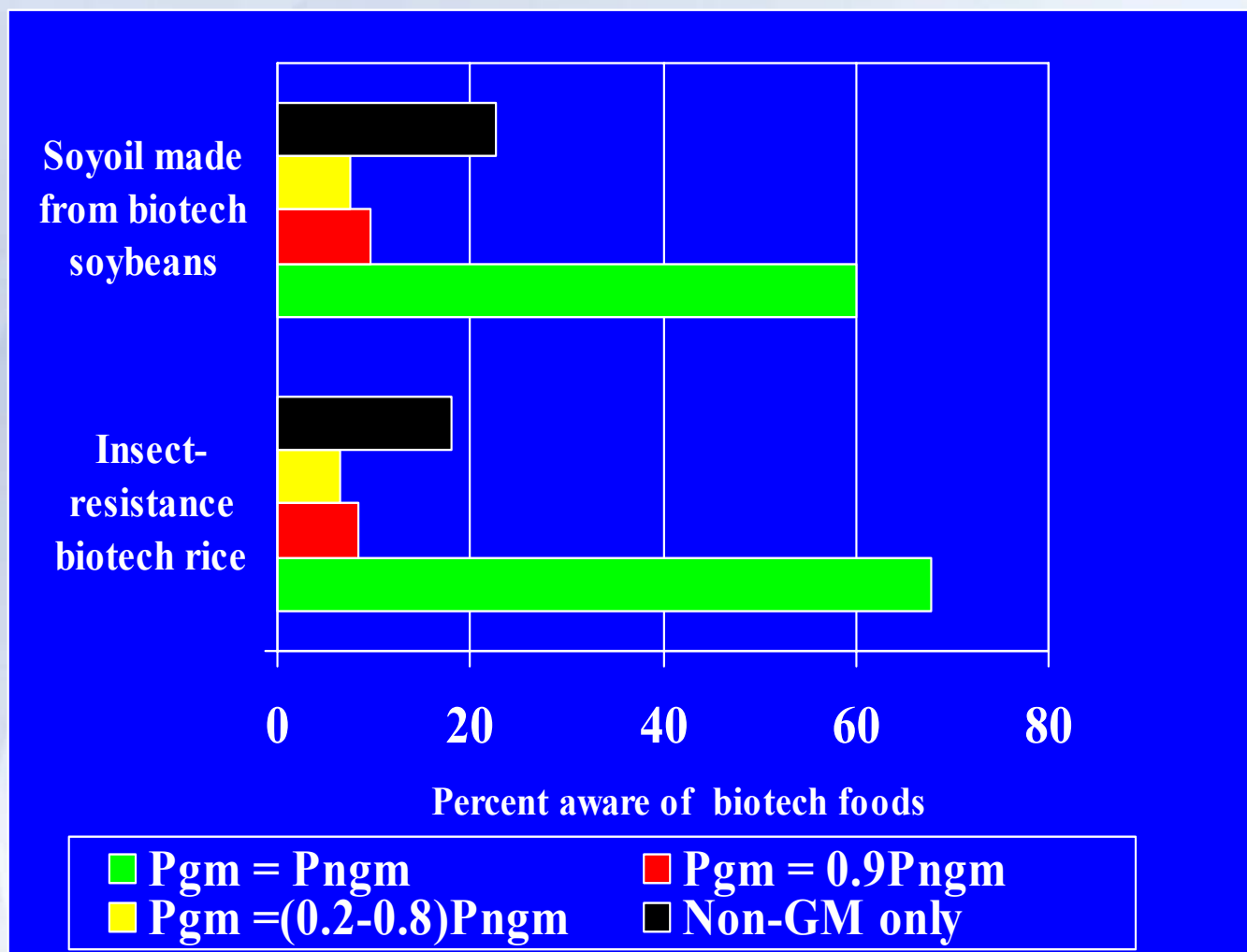
Male-female ratio:	0.71:1
Ave. age:	46.6
Yrs. of education:	11.1
Household size:	3.0
Per capita monthly disp. Income (rmb):	844.2

Awareness :

- two-thirds of the urban consumers have heard of biotech foods
- of the 669 respondents who have heard of biotech foods, average length of awareness is 2.65 yrs



Chinese consumers' willingness to pay for biotech foods: survey data



Profile of Survey Respondents: Soyoil

<i>Variable</i>	<i>Consumers with Pgm = Pngm</i>	<i>Consumers who accept non-GM only</i>
Gender	0.426	0.389
Age	46.4	48.7
Edu	11.03	10.99
City	1.94	1.90
Yinc	9,645	10,763
Newsfood	40.8	31.9
Awareness	1.75	1.78
No-soyoil	9.95	25.0

Gender: female--0; male--1

Age : reported number of years

Edu : number of years receiving education

City : size of residing city (large=1; midsize=2; small=3)

Yinc : annual per capita disposable income (rmb)

Newsfood: media access through newspapers (%)

Awareness: Number of years that consumers, on average, have heard of biotech foods

No-soyoil : consumers who do not consume soybean oil (%)



The Semi-Double-Bounded Dichotomous Choice Model

- Initially, consumers were asked if they would be willing to purchase biotech foods when the prices of biotech and non-biotech foods are identical
- Consumers with a response of “no” were then asked if they would purchase biotech foods when a random price discount (10%, 20%, 30%, 40%, 60%, or 80%) is offered
- Three discrete outcomes of the bidding process emerge (both WTP and BID are expressed in absolute values):
 - a “yes” to the initial bid (B_0) — no price discount, $WTP \leq B_0$
 - a “no” followed by a “yes” in the 2nd bid, $0 < WTP < BID$
 - “no” to both bids, $WTP > BID$ in the 2nd bid



The Dichotomous Choice Model (cont.)

- The qualitative dependent variable is expressed in terms of the probability of purchasing biotech foods to a bid amount. This model takes the form:

$$Pr (WTP \leq BID) = \Phi (\alpha - \rho BID + \lambda'Z)$$

where *BID* : the bid price (in percent discount) offered to biotech foods,

Z : a set of observable characteristics for consumers,

Φ : a cumulative normal or logistic distribution function, and

ρ and λ : unknown parameters

- Maximum likelihood approach is used to estimate the parameters by maximizing the log-likelihood function of the three discrete outcomes (Qaim and De Janvry, *AJAE* 2003)
- The mean WTP is computed as the ratio of $(\alpha + \lambda'Z)/\rho$ (Qaim and De Janvry, *AJAE* 2003; Kaneko and Chern 2003; Chiang 2004)



Model Results: Soybean Oil

<i>Variable</i>	<i>Coefficient</i>	<i>Standard error</i>
Intercept	1.586	0.182***
Bidoil	-2.711	0.154***
Smallcity	0.234	0.126*
Unempl	0.373	0.217*
Belinf	0.157	0.112
Awareness	-0.106	0.107
Yinc	-0.029	0.011***
Gender	0.193	0.108*
No-soyoil	-0.631	0.145***

Bidoil : Ultimate bid prices (in percent discounts) offered for soyoil

Smallcity: Residents in small cities

Unempl: Unemployed consumers

Belinf: Trust in mass media

Awareness: Consumers who have heard of biotech foods

*, **, *** Statistically significant at 10%, 5%, and 1% level



Result Interpretations: Soybean Oil

- **Mean WTP—average price premium (in percent terms) for non-biotech foods relative to biotech foods**
 - Lies in the range from 23.4% to 52.6%
 - Would be lowered if respondents with higher bid prices were excluded from the sample

<u>Bid Price (%)</u>	<u>Mean WTP (%)</u>
Under 60	16.6
Under 40	16.5
Under 30	12.9
Under 20	10.0



Model Results: Biotech Rice

<i>Variable</i>	<i>Coefficient</i>	<i>Standard error</i>
Intercept	1.507	0.172***
Bidrice	-1.846	0.142***
Smallcity	0.269	0.121**
Unempl	0.436	0.219**
Belinf	0.091	0.105
Awareness	-0.166	0.100*
Yinc	-0.027	0.010***
Gender	0.121	0.102

Bidrice : Ultimate bid prices (in percent discounts) offered for biotech rice

Smallcity: Residents in small cities

Unempl: Unemployed consumers

Belinf: Trust in mass media

Awareness: Consumers who have heard of biotech foods



Result Interpretations: Biotech Rice

- **Mean WTP**—average price premium (in percent terms) for non-biotech foods relative to biotech foods
 - Lies in the range from 41.5% to 74.0%
 - Would be lowered if respondents with higher bid prices were excluded from the sample

<u>Bid prices (%)</u>	<u>Mean WTP (%)</u>
Under 60	28.7
Under 40	22.3
Under 30	16.3
Under 20	11.5



Conclusions

- About 60% or higher of China's urban consumers were willing to purchase biotech foods without any price discounts
- But 20% of them would only purchase non-biotech foods regardless of any price discounts
- Mean price premium is higher for non-biotech rice than that for non-biotech soyoil
 - *Biotech soyoil* 23.4 – 52.6%
 - *Biotech rice* 41.5 – 74.0%
- Mean WTP values in this study most likely are overstated due to *hypothetical* nature of survey data (Lusk, *AJAE* 2003)



Conclusions (cont.)

- Positive factors contributing to consumers' willingness to purchase biotech foods
 - Biotech soyoil*: residents of small cities, male, and unemployed
 - Biotech rice* : residents of small cities and unemployed
- Negative contributing factors
 - Biotech soyoil*: income and respondents do not consume soyoil
 - Biotech rice* : income and awareness

