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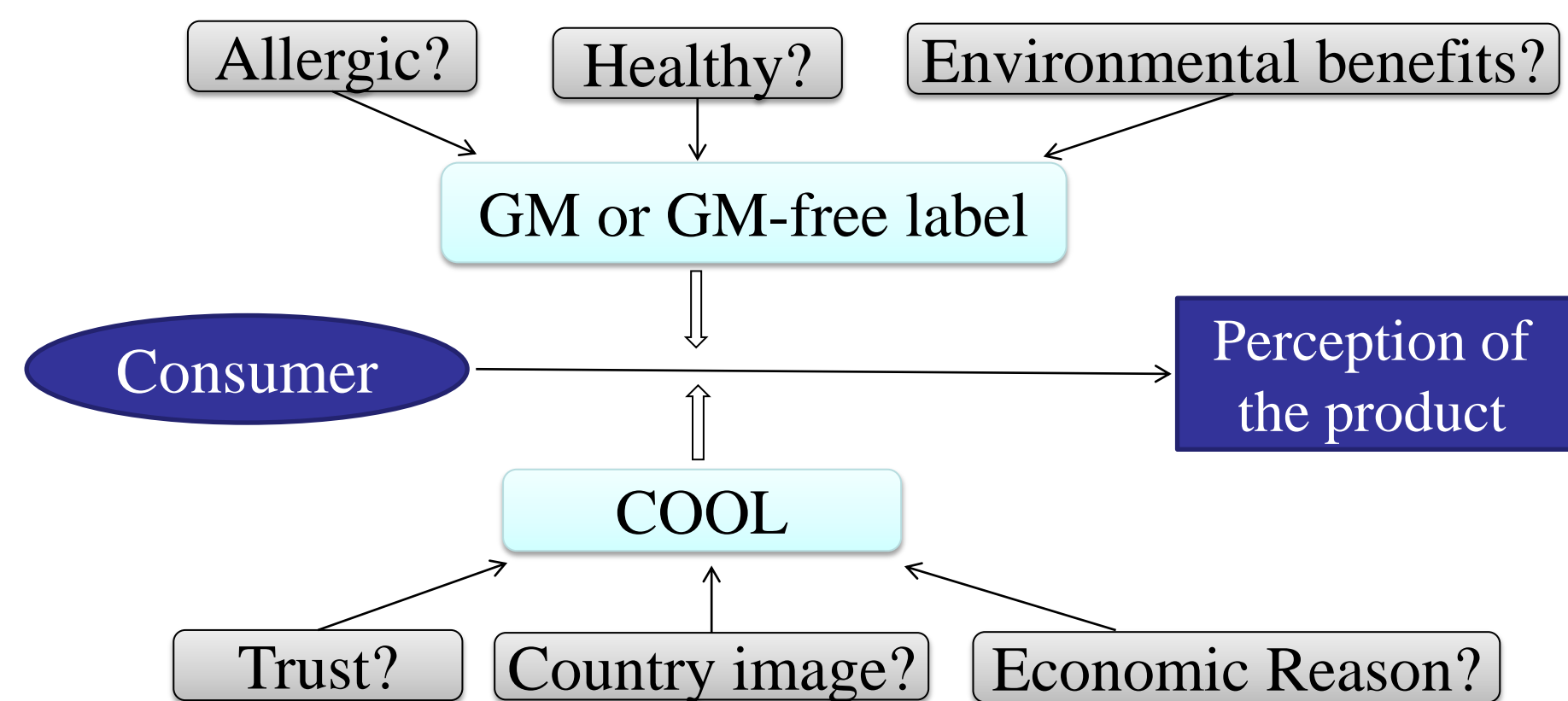
Introduction and Motivations

Many researchers have studied the value of extra information that is provided on genetically modified (GM) food. For example, Lusk et al. (2004)^a find that information on health and environmental benefits of biotechnology significantly reduces the amount of monetary compensation that consumers require to purchase GM foods instead of traditional food. They also find that the effect of information varies with the type of information and the location of where the information is released.

^aLusk, J.L., L.O. House, C. Valli, S.R. Jaeger, M. Moore, B. Morrow, W.B. Traill. "Effect of Information about Benefits of Biotechnology on Consumer Acceptance of Genetically Modified Food: Evidence from Experimental Auctions in United States, England, and France." *European Review of Agricultural Economics*. 31(2004): 179-204.

Why in the presence of COOL?

One potential problem is that in the market consumers are faced with considering multiple attributes at the same time. For example, in the European Union (EU), regulations call for labeling food products containing authorized GM ingredients as well as country-of-origin labeling (COOL) for certain foods (such as fresh fruits and vegetables). However, previous study on consumer perception of GM foods focuses on the technology used but does not include information on country of origin.



Since both the GM label and location attribute can be used as a proxy for food safety and quality by consumers, the availability of COOL in the market may change consumers' attitudes towards GM foods, both with respect to their willingness to pay (WTP) for GM foods and to their response to the positive information on why producers use biotechnology.

Possible reasons for interactive effects between GM label and COOL

- 1) public trust in biotechnology in foreign countries
- 2) Less trust in beneficial announcement of GM products from foreign producers
- 3) Less care about foreign benefits from GM products

The goal of this paper is to contribute to the literature by investigating the interactive effect between information on COOL and production methods (GM, traditional, and organic). We use different information treatments to determine if the consumers' reaction to positive information on reasons for the use of biotechnology varies with country of origin.

Survey Design



We used choice experiment (CE) to analyze the interaction effects between GM labels and COOL. We randomly recruited adult primary grocery shoppers from six countries:

Belgium^a, France^b, Germany^b, Spain^a, Japan^b, and the United State^a

^atraditionally NOT very strongly opposed to GM food ^btraditionally strongly opposed to GM food

Table 1. Attribute levels (fresh apples)

| | |
|-------------------|---|
| Apply type | GM, Traditional, and organic apples |
| Price levels | 3 levels price for each type of apple (GM, GM free, and organic fresh apples) |
| Country of Origin | Domestically produced, Produced in China, Produced in New Zealand |

Information treatment

We divided respondents into three treatment groups and a comparison group. For each treatment group, we provided one of the following information regarding the benefits of using biotechnology; for comparison group, no explanation was provided. In each country, the participants were randomly divided into one of four groups.



- 1) **Consumer benefits:** *In the case of biotechnology, the apple has a special protein, which increases the shelf life of the apple. Because of this method, the apple will stay fresher longer and it is less likely to have bruises (soft brown spots).*
- 2) **Producer benefits:** *There is currently an insect that transmits a disease in apples. This disease causes the apple tree to produce less, or in extreme cases, die. As a result, apple production could decrease, and the average cost of apples would start increasing. In the case of biotechnology, the apple has a special protein, which makes it resistant to this insect. This will allow apple farmers to stay in business, and keep apple prices from increasing over time.*
- 3) **Environmental benefits:** *In the case of biotechnology, the apple has a special protein, which makes it resistant to certain insects. This allows the farmer to use less pesticides when producing the apple. Reducing the use of pesticides is good for the environment. A lot of research shows that the usage of pesticides damages the environment and threatens the survival of many creatures in wild.*

Valid sample (correctly answered all the validation questions in the survey) : We have 176 observations from Belgium, 197 from France, 177 from Germany, 188 from Spain, 331 from Japan, and 377 from the United States.

Table 2. Sample size

| Group/Country | Location | | | | | |
|-------------------|------------|------------|------------|------------|------------|------------|
| | Belgium | France | Germany | Spain | Japan | USA |
| Consumer benefits | 41 | 59 | 41 | 46 | 67 | 96 |
| Producer benefits | 35 | 49 | 43 | 43 | 79 | 91 |
| Environ. benefits | 48 | 42 | 44 | 49 | 84 | 94 |
| No explanation | 52 | 47 | 49 | 50 | 101 | 96 |
| Total | 176 | 197 | 177 | 188 | 331 | 377 |

Results

Table 3. Summary statistics of some selected variables

| Variable | Definition | Location | | | | | |
|-------------|---|---------------|---------------|---------------|---------------|---------------|---------------|
| | | Belgium | France | Germany | Spain | Japan | USA |
| Age | age<=24 yrs old | 28.4% | 25.4% | 30.0% | 26.1% | 21.8% | 27.9% |
| | age between 25 and 54 | 66.5% | 68.0% | 68.9% | 72.9% | 76.7% | 60.2% |
| | age over 55 | 5.1% | 6.6% | 1.1% | 1.0% | 1.5% | 11.9% |
| Education | University undergraduate degree or higher | 68.2% | 64.5% | 33.9% | 75.0% | 64.1% | 54.6% |
| | Other wise | 31.8% | 35.5% | 66.1% | 25.0% | 35.9% | 45.4% |
| Income | Household income was greater than \$50,000/year | 48.3% | 39.6% | 63.3% | 34.0% | 95.8% | 29.7% |
| | Otherwise | 51.7% | 60.4% | 36.7% | 66.0% | 4.2% | 70.3% |
| Employ. | Full time job | 66.5% | 68.0% | 76.3% | 71.3% | 64.7% | 53.6% |
| | Otherwise | 33.5% | 32.0% | 23.7% | 28.7% | 35.3% | 46.4% |
| Family size | Number of family members | 2.744 (1.189) | 2.975 (1.423) | 2.774 (1.316) | 3.112 (1.115) | 3.276 (1.298) | 2.745 (1.385) |
| Children | Number of children under age 18 | 0.733 (0.969) | 0.924 (1.138) | 0.756 (1.004) | 0.840 (0.869) | 0.827 (0.957) | 0.688 (1.107) |
| Obser. | Number of observations | 176 | 197 | 177 | 188 | 331 | 377 |

Some interesting facts:

1) **Subjective knowledge:** consumers in Germany gave themselves relatively high scores on subjective knowledge of facts and issues concerning genetic modification .

Table 4. 1=not at all knowledgeable; 9=extremely knowledgeable

| | Location | | | | | |
|------------|----------|---------|---------|---------|---------|---------|
| | Belgium | France | Germany | Spain | Japan | USA |
| Mean score | 3.852 | 4.045 | 5.215 | 4.606 | 4.668 | 4.140 |
| Std. Dev. | (1.980) | (2.026) | (2.158) | (2.012) | (1.751) | (2.185) |

2) **Importance of country-of-origin labels (COOL):** respondents from all of these six countries thought COOL is an important information.

Table 5. 1= not at all important; 5=extremely important

| | Location | | | | | |
|------------|----------|---------|---------|---------|---------|---------|
| | Belgium | France | Germany | Spain | Japan | USA |
| Mean score | 3.727 | 3.893 | 3.665 | 3.636 | 3.903 | 3.610 |
| Std. Dev. | (0.959) | (0.963) | (1.114) | (0.937) | (0.854) | (1.020) |

3) **Satisfaction with the safety of fresh fruits from different countries:** consumers were more satisfied with the safety of their own country's fresh fruits

Table 6. 1=very dissatisfied; 5=very satisfied

| | Location | | | | | |
|------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | Belgium | France | Germany | Spain | Japan | USA |
| Domestic country | 4.204 (0.728) | 4.178 (0.829) | 3.910 (0.881) | 4.401 (0.895) | 4.021 (0.907) | 4.090 (0.827) |
| New Zealand | 3.657 (0.786) | 3.429 (0.939) | 3.411 (0.866) | 3.457 (0.819) | 3.549 (0.764) | 3.344 (0.765) |
| China | 2.602 (0.926) | 2.327 (1.021) | 2.659 (0.924) | 2.690 (0.892) | 1.612 (0.826) | 2.681 (0.946) |

4) **I don't trust the claim:** consumers did not trust the benefits claims when the products are imported. **Table 7.** 1=don't trust at all; 5=trust strongly

| | Location | | | | | |
|-------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | Belgium | France | Germany | Spain | Japan | USA |
| Produced in China | 1.568 (0.822) | 1.484 (0.859) | 1.719 (1.023) | 2.082 (1.140) | 1.405 (0.641) | 1.840 (1.123) |
| Produced in New Zealand | 2.768 (1.318) | 2.574 (1.348) | 2.742 (1.447) | 3.126 (1.110) | 3.094 (0.882) | 3.050 (1.310) |

Table 8. WTP for domestically produced GMO apples

| | WTP | | | | ΔWTP | | |
|-------------|----------------------------------|------------------------|------------------------|------------------------|----------------------|----------------------|---------------------|
| | Consumer benefits | Producer benefits | Environmental benefits | No explanation | Diff_1 ^a | Diff_2 ^b | Diff_3 ^c |
| Belgium (€) | 3.529*** (0.677) ^e | 2.583*** (0.444) | 2.839*** (0.328) | 1.469*** (0.180) | 2.060*** (0.701) | 1.114*** (0.479) | 1.369*** (0.374) |
| France (€) | 1.249*** (0.142) | 1.899*** (0.194) | 1.667*** (0.160) | 2.021*** (0.172) | -0.773*** (0.223) | -0.122 (0.259) | -0.354 (0.235) |
| Germany (€) | -0.688 (0.656) | 1.540*** (0.195) | 1.637*** (0.179) | 0.178 (0.363) | -0.866 (0.750) | 1.362*** (0.412) | 1.459*** (0.405) |
| Spain (€) | 2.755*** (0.331) | 2.076*** (0.155) | 2.379*** (0.157) | 2.154*** (0.185) | 0.601 (0.379) | -0.078 (0.241) | 0.225 (0.243) |
| Japan (¥) | 520.500*** (33.118) | 527.800*** (28.196) | 476.750*** (31.665) | 444.400*** (21.266) | 76.100* (39.358) | 83.400** (35.317) | 32.350 (38.143) |
| US (\$) | 1.862*** (0.105) | 2.503*** (0.120) | 2.758*** (0.146) | 1.585*** (0.104) | 0.277* (0.148) | 0.919*** (0.159) | 1.174*** (0.179) |

^aDiff_1 is the difference between Group 1 (consumer benefits) and 4 (no explanation).

^bDiff_2 is the difference between Group 2 (producer benefits) and 4.

^cDiff_3 is the difference between Group 3 (environmental benefits) and 4.

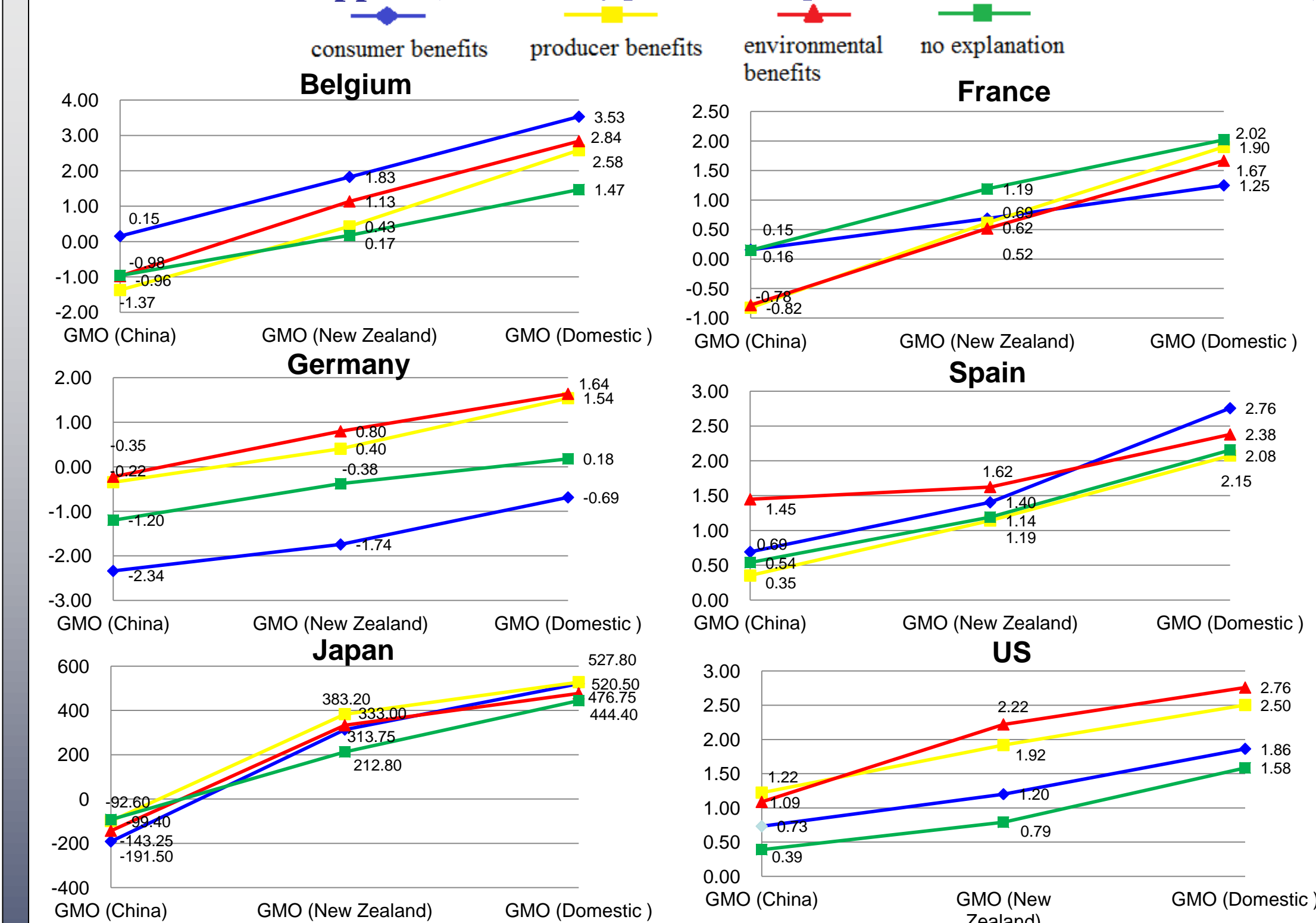
* p<0.1; ** p<0.05; *** p<0.01.

^eNumbers in parentheses are standard deviations.

Information of biotechnology effect

Table 8 shows that all types of information treatment significantly increase WTP for GMO in Belgium and US; for consumers in Germany and Japan, two benefit claims of biotechnology have positive influences; in Spain and France consumers are generally unaffected by the information and in one case where French consumers' WTP for GMO apples is even significantly lower than the group without information treatment. Among the four European countries, the WTP for GMO apples in Belgium and Spain is higher than that in France and Germany.

WTP for GMO apples (Domestically produced, imported from New Zealand, and China)



Country of Origin Effects

The upward slopes in the graphs show that consumers prefer domestically produced GMO apples the most, then the GMO apples imported from New Zealand, and the GMO apples imported from China the least. This comes from not only their preference for domestically production, but also from the fact that most of them don't trust the benefits claims of biotechnology by foreign countries (Table 7).