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**Cultures, Attitudes, and Beliefs: Implications for Safer Seafood WTP in the USA, China, and Korea**

**DongWhoi Moon, Department of Agricultural Economics, Purdue University,**

**H. Holly Wang, Department of Agricultural Economics, Purdue University, wanghong@purdue.edu**

**Na Hao, Department of Economics, Beijing Technology and Business University,**

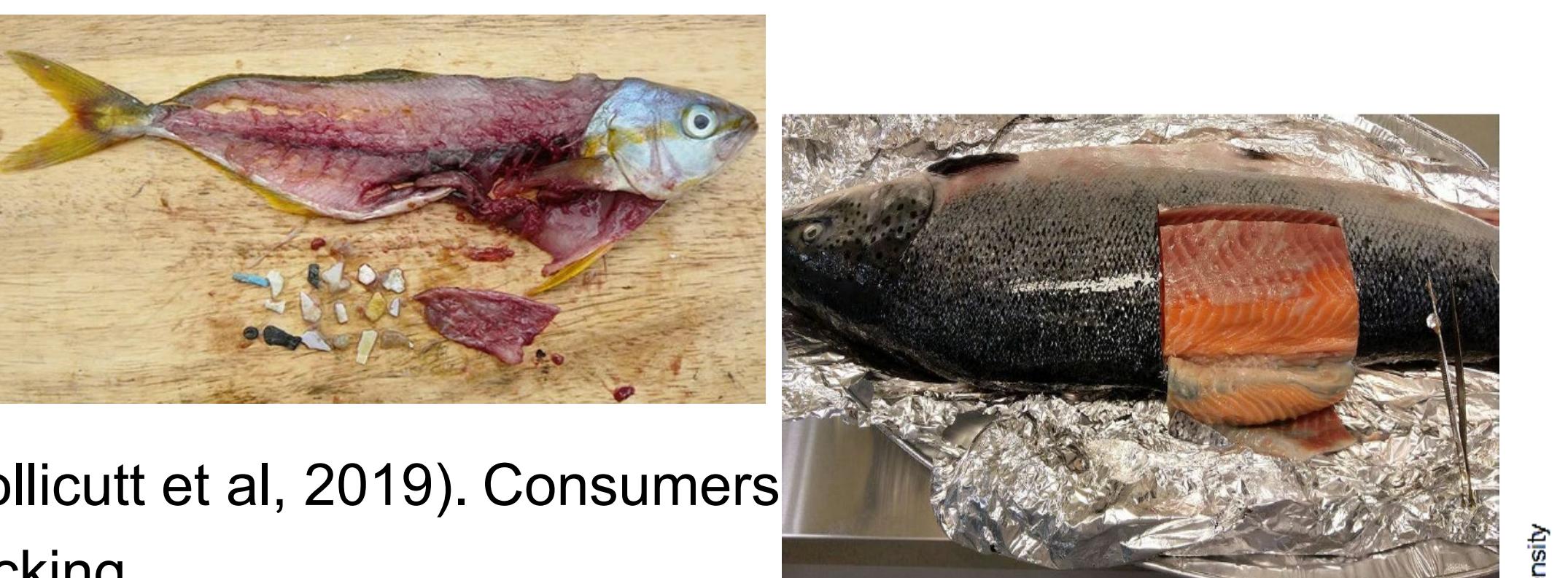
**Jayson Lusk, Department of Agricultural Economics, Purdue University,**

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## Introduction

- Microplastic particles are polluting the sea and entering popular marine species, such as salmon (Collicutt et al, 2019). Consumers worldwide will have a reaction to these novel pollutants in their food, yet research so far has been lacking.
- Cultural and attitudinal factors are two of the primary factors in determining 'green', or environmentally friendly consumption (Stern, 2000). Many behavioral studies have examined what elements differentiate Western culture from others and found that the signifying hallmark of Western culture is individualism while the Asian countries are highly associated with collectivism (Sivadas et al., 2008).
- Studies have compared the U.S. and Asian consumers (Han, 2017; Kim, 2011). However, the previous literature on environmental behavior and culture suffers from several shortcomings. The measurement of environmental behavior is not refined by economic thoughts, and the literature, while in essence being stated preference studies, has not accounted for social desirability bias in conjunction with cultural value measures and other attitudinal or belief factors.
- Employing well applied stated preference methods, this study delivers a universal measurement of environmental behavior represented by consumer demand values, willingness-to-pay (WTP), while preserving and honing the attitudinal and belief factors found in previous studies. It also modifies the previous Value Believe Norm (VBN) theory of environmental behavior to include social desirability bias and its relationships with the cultural values and environmental beliefs, while empirically estimating their relationships.
- Salmon was chosen because it is a popular food accessible in markets in all three of the countries, and because research about microplastics in its tissue have begun in recent years.



## Objectives

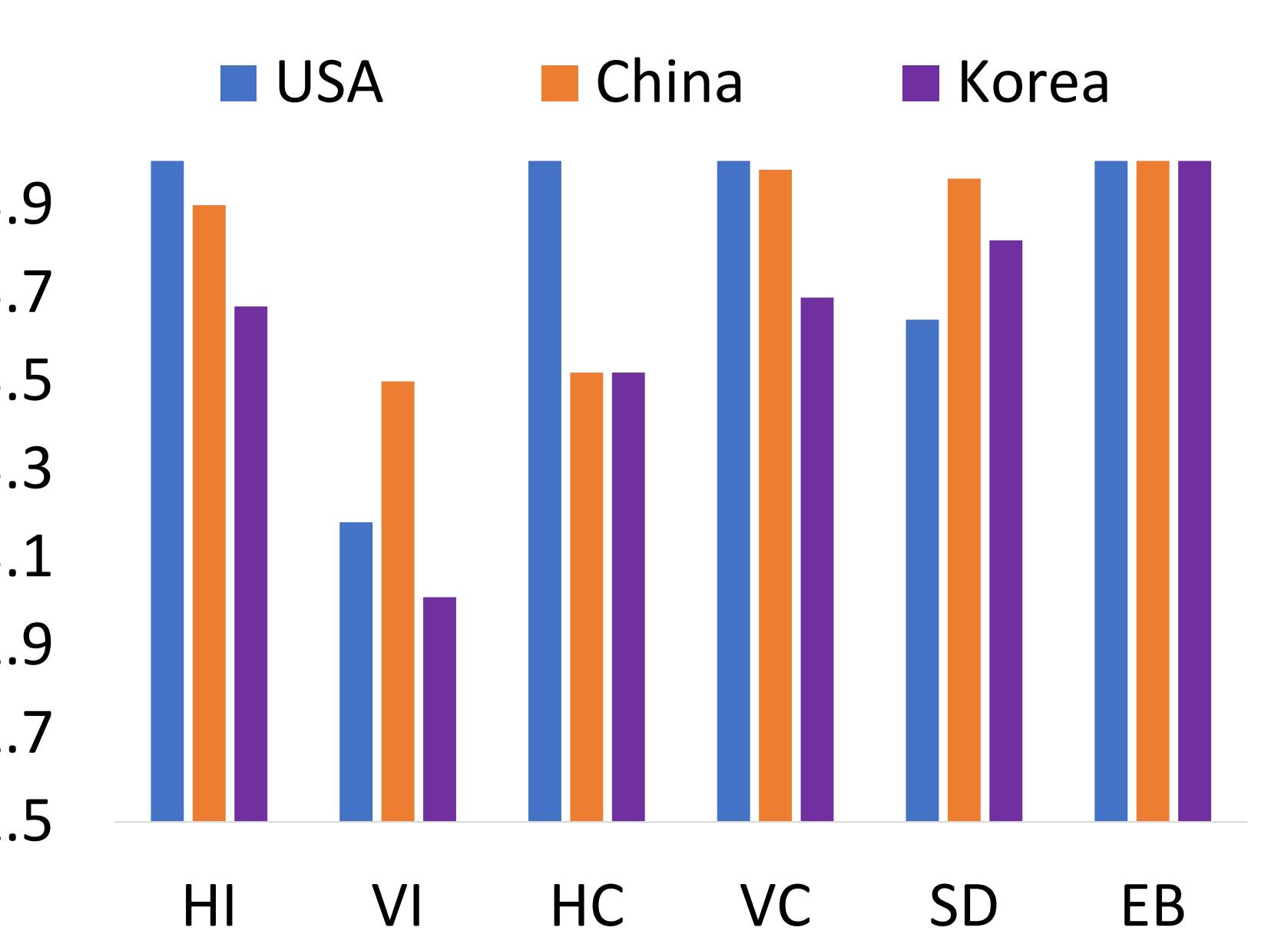
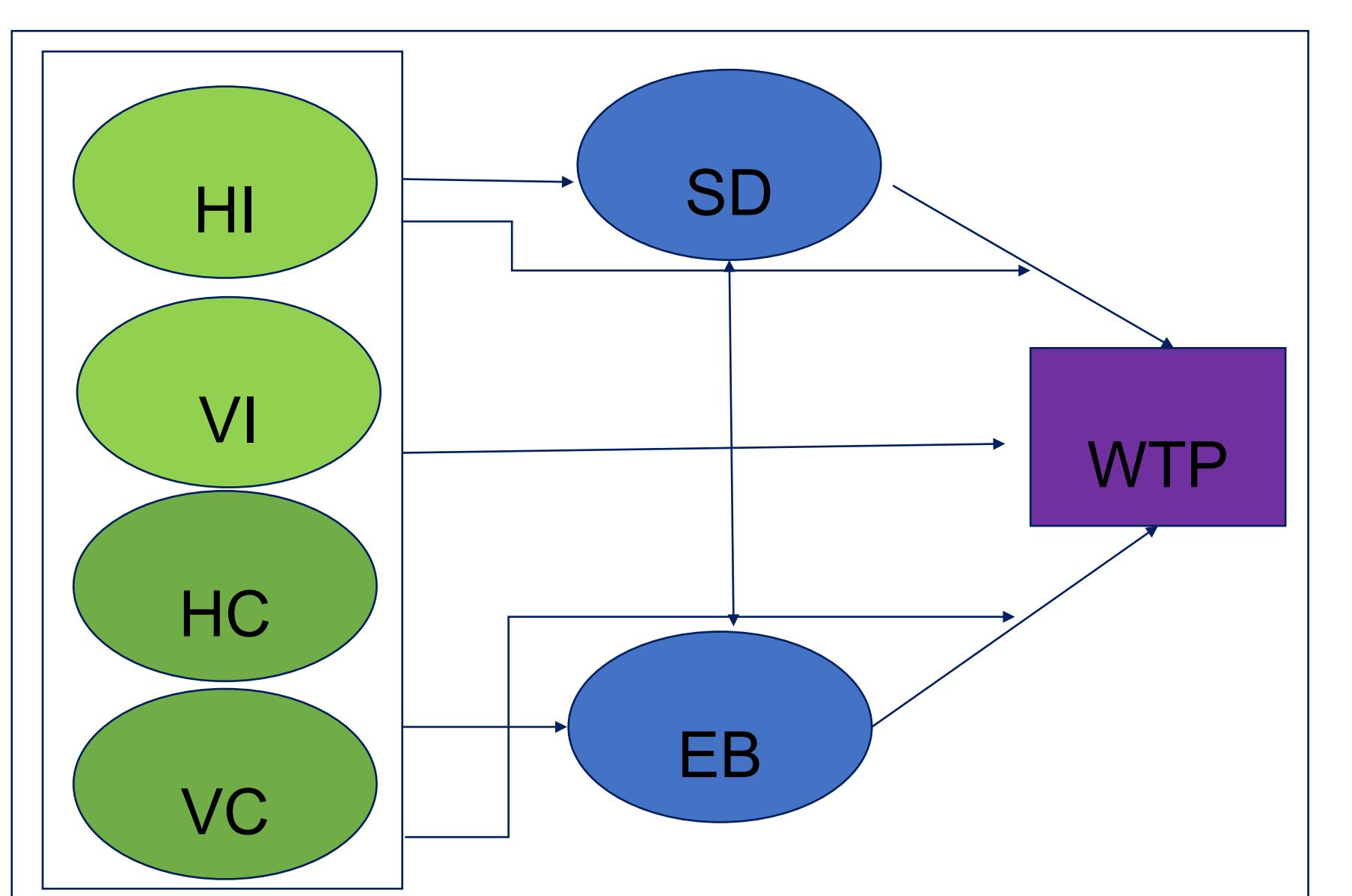
- Utilizing economic measures of environmental behavior, find out the effect of cultural factors, social desirability bias, and environmental belief on two different measures of economic environmental behavior.
- Examine the relationship between various cultural value measures, social desirability bias, and environmental belief.
- Examining how the findings in objectives 1 and 2 differ by each country.



## Survey

- Data collected online between 05/24/2021 to 08/02/2021 in three countries, USA, China and Korea, by a world leading survey company.
- Two cities in each country, New York, Chicago, Beijing, Shanghai, Seoul and Busan.
- Sample sizes are 530, 586, and 566 for the USA, China, and Korea, respectively.
- The survey also screened for respondents that had willingness to purchase salmon for consumption in the future.
- The own WTP questions and the inferred WTP elicitation questions were also randomly ordered, to prevent ordering bias.
- Multiple quality checks.

Distribution of Sample Characteristics		
USA	China	Korea
Have no religion	85.15%	54.95%
Have children	78.50%	31.10%
Female	54.61%	50.35%
Social Status		
Low	14.51%	28.27%
Medium	66.38%	61.31%
High	19.11%	10.42%



## Measurements and Theory

- Original VBN Theory modified to include social desirability (SD) bias and culture effects on relationships between WTP and others.
- Culture, a latent attitudinal concept, is represented by four measures: horizontal individualism (HI), vertical individualism (VI), horizontal collectivism (HC), and vertical collectivism (VC) (Triandis & Gelfand, 1998).
  - The horizontal mindset views others as similar to oneself, while the vertical mindset views oneself as different from others.
  - Individualism tends to focus and think oneself first, while collectivism treats oneself as a part of a group and values the group more over self.
- Social desirability is a latent attitudinal factor measuring one's desirability to be looked upon favorably by others in the society (Stober, 2001).
- Environmental belief is a latent belief factor that measures how much a person cares about the environment in general (Mostafa, 2007).
- Economic measures of environmental behavior are represented by 2 WTP measure, one's own WTP and the inferred WTP, ie, one thinks the average person's WTP (Lusk & Norwood, 2009).

### Willingness-to-Pay (WTP)

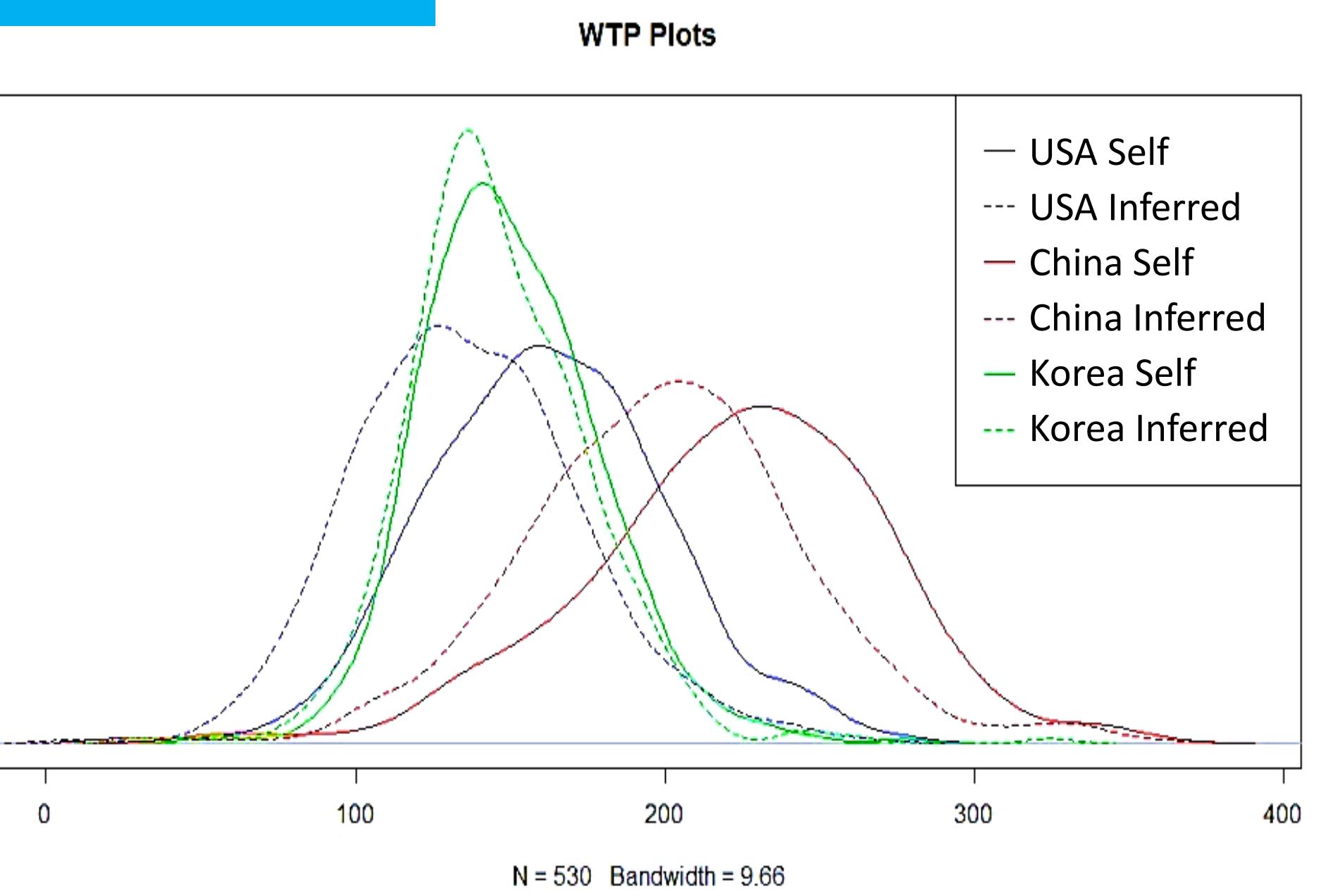
- We use double bounded dichotomous choice method to elicit both own and inferred WTPs.
  - Own WTP: The respondents were asked how much they were willing to pay in percentages for salmon with much less microplastic content above the usual price for salmon fillet.
  - Inferred WTP: The respondents were asked how much they think the average person in their community would be willing to pay in percentages for salmon with much less microplastic content above the usual price of salmon fillet.

$$WTP_i (x_i, u_i) = x_i \beta + u_i, \text{ where } x_i = \text{explanatory variables}, u_i = \text{error term}, \beta = \text{the parameters.}$$

- The empirical measurements for the following latent factors are averages of choices among 5-point Likert scale agreements to statements from totally disagree to totally agree, values shown in the bar chart.
- Environmental Belief Measure (EB):** example 'Purchasing environmentally friendly products is a great idea', used in Mostafa (2007).
- Social Desirability Bias Measure (SD):** example 'I will take advantage of others', used in Stober (2001).
- Cultural Value Measures (HI, VI, HC, VC):** examples 'It is important that I do my job better than others' (VI), 'It is my duty to take care of my family, even when I have to sacrifice what I want' (VC), 'I'd rather depend on myself than others' (HI), and 'To me, pleasure is spending time with others' (HC) used in Triandis & Gelfand (1998)
- SD bias and EB plus are the unexplained residuals of the regression of each variable on the HI, VI, HC, and VC, shown below.

$$SD_i = C_i \gamma + SD \text{ bias}_i, \quad EB_i = C_i \delta + EB \text{ plus}_i, \quad \text{where } C_i \text{ is a vector of the four culture variables}$$

## Results



Mean WTP: All are very positive

Own > Inferred in all countries, least in Korea.

For own: China > USA > Korea.

For inferred: China > Korea > USA.

WTP spread: China > USA > Korea.

- For own WTP, only HC has most positive influences, except a weak HI for China.
- EB plus only positive and significant for China. SD bias was only weakly significant and positive in Korea.
- Self reported social status: low status reduces WTP in China, high status increases WTP in the USA and Korea.
- For inferred WTP, only HC is significant and positive in all countries except for a weak VI for China.
- SD bias increases inferred WTP in the USA and Korea.
- Those who are more VI and show strong SD bias tend to have lower inferred WTPs in the USA and Korea.
- Females have significantly higher inferred WTP in the USA, but lower in China, indifferent in Korea. In China, females who have heard about microplastics previously have higher inferred WTPs.
- Self reported social status is insignificant, except for the USA, where those who self identify as high status have significantly higher inferred WTP.

### Environmental Belief

- The three countries are at similar EB levels
- Horizontal cultural tendency, regardless of individualistic or collectivistic, significantly inflate the degree of EB.
- Vertical Collectivism tend to significantly deflate EB except in the case of China, where it inflates.

### Social Desirability

- Chinese consumers have the highest SD, and the USA lowest
- High VI cultural tendency significantly deflates the SD, while high HC cultural tendency significantly inflates it.
- HI are positive and significant predictors for China and Korea. VC are positive and significant for USA and China.

### SD, EB, and HI, VI, HC, VC Multiple Regression Analysis

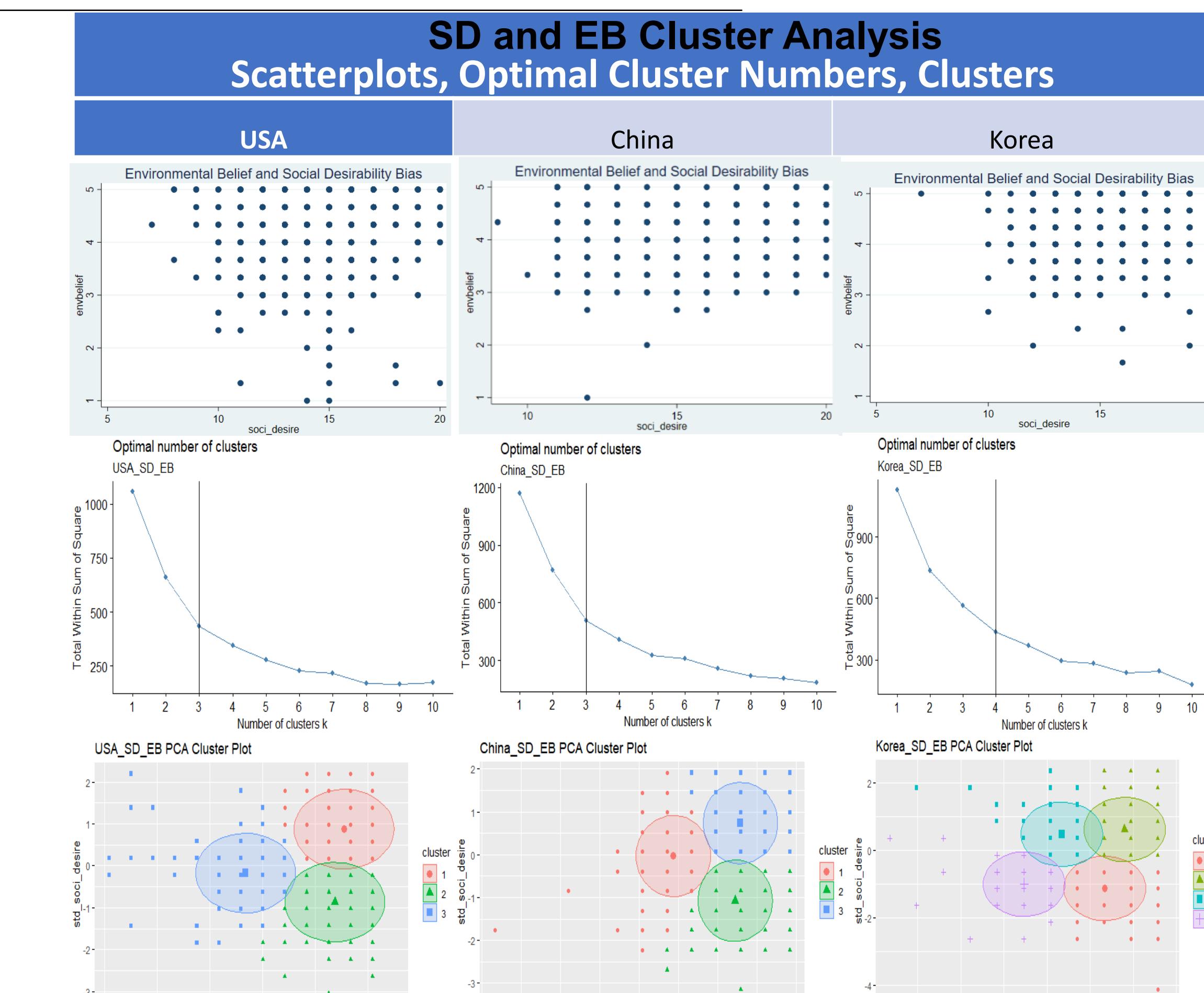
	Environmental Belief			Social Desirability		
	USA	China	Korea	USA	China	Korea
HI	0.181*** (0.051)	0.115** (0.048)	0.206*** (0.043)	0.210 (0.143)	0.624*** (0.168)	0.520*** (0.159)
VI	-0.055 (0.048)	0.050 (0.041)	-0.025 (0.036)	-0.696*** (0.120)	-0.366*** (0.137)	-0.555*** (0.129)
HC	0.364*** (0.056)	0.031 (0.041)	0.241*** (0.043)	0.974*** (0.153)	0.751*** (0.139)	0.689*** (0.175)
VC	-0.078*** (0.050)	0.142*** (0.043)	-0.061* (0.032)	0.525*** (0.142)	0.493*** (0.144)	0.195 (0.127)
Adj-R2	11.19%	8.05%	11.84%	16.85%	13.28%	10.12%

## Conclusions and Implications

- Consumers show positive WTPs for cleaner salmon in all countries. A good sign for industry to supply and good for the environment.
- Own WTPs are always higher than inferred ones, showing a hypothetical bias of overstated WTPs. Caution is needed for industry.
- Horizontal collectivism is the most significant and positive cultural value affecting both own and inferred WTPs in all countries. Government and industry shall try to identify and target the high HC group to promote environmentally friendly products. Also in the long run, the HC culture can be promoted in society that is linked to public benefit.
- For Korea, those with higher social desirability bias show significantly higher own WTPs. Therefore, actors in the salmon market in Korea should take precaution to note that the actual WTP for microplastic clean salmon might not be as high, if and when microplastic clean foods hit the market.
- There exists cluster(s) of individuals who have high environmental belief values but low social desirability bias, and vice versa (in Korea). Not all individuals are prone to the same degree of social desirability bias, and in the case of Korea, for a segment of individuals, environmentally friendly belief is not regarded as socially desirable.

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### Clustering Analysis

- K-means clustering analysis for the relationship between SD and EB.
- For all three countries, there exist one group of individuals that have both relatively low SD and EB, and another group that has relatively high SD and EB on the opposite.
- For all countries, a third group has high EB but low SD.
- For Korea, a fourth group of individuals that adds nuance, with low EB but high SD.