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# Expert opinion and public support of genetically modified food policy: Does deficit model work in China?

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#### Abstract

To what extent do expert opinions affect public opinion in policy making? While most existing studies were conducted in democracies, experts' influence under authoritarian settings is still understudied. This paper examines how expert opinion and vocational affiliation influence public attitudes toward genetically modified (GM) food in China. Through a survey experiment with over 1600 respondents, we find that experts' endorsement can increase policy support for GM food but that their opposition exerts no influence. Different vocational affiliations do not generate significantly different effects, although endorsement from foreign experts has larger effects than endorsement from domestic counterparts, who have closer connections with the Chinese government. We finally discuss the policy implications of expert involvement in policy making and promoting GM food in China based on the above findings.

#### K E Y W O R D S

authoritarian regime, China, expert opinion, genetically modified food, policy support

# INTRODUCTION

Our research question in the present study is in what extent expert opinions influence public attitudes toward genetically modified (GM) food policy in the case of China. GM food is one of the best illustrations of the complexity of scientific communication and the divergent risk perception between experts and laypeople. Promoting GM food is challenging not only because policy makers need to choose a "right" framing in policy image defined as "a mixture of empirical information and emotive appeals" (Baumgartner, 2013) to increase public acceptance but also because they need to choose the "right" person who has the proper credentials. Accordingly, experts are an ideal candidate to fulfill the above task if, in comparison with government officials or food companies as by definition, they are located in both industries and science, possess technical skills, and should be impartial to political interests (Grundmann, 2017).<sup>1</sup> Although numerous previous studies have examined attitudes toward GM food and what factors determine public acceptance (Costa-Font et al., 2008), the safety of GM technology is essentially a science problem and one of the most controversial issues between those supporters and opposers (e.g., Cook et al., 2006; Davison & Ammann, 2017). It is however interesting that seldom researches directly examined the influence of experts on public opinion. The strength of experts' persuasive capacity regarding GM food policies remains undetermined. Moreover, most existing studies were conducted in democracies, and the extent to which expert opinion matters under authoritarian settings is unclear. It is also worth mentioning that in China, although scholars had already explored various issues on GM food similar to their peers in the Western context (see the summary from Cui & Shoemaker, 2018), experimental design does not apply, which more or less undermined their significance in casual inference.

To fill in the gap mentioned above, we answer our research questions through an online survey experiment. Applying experimental design is not new in the study of expert opinion on policy support (e.g., Johnston & Ballard, 2016; Lachapelle et al., 2014). What distinguishes our research design is that we focus both on expert opinion and on experts' vocational affiliation; the latter is usually ignorant in previous studies. We suggest that in authoritarian settings, experts' affiliation may be as important as their point of view, as it signals the degree of expert autonomy, which further influences how public perceived experts' credibility. As we will illustrate in more detail in the section below, the reason is that Chinese experts are usually institutionally affiliated with government, and their difference only appears in the extent. In this vein, when a government-affiliated expert endorses the official stance of the government, the public have a hard time identifying whether such endorsement is based on scientific facts or simply a product of political pressure from the government (Huang et al., 2018). Consequently, the public deems these government-affiliated expert opinions less credible than those from experts who are more distant from the government.<sup>2</sup>

We find that endorsement from experts can increase public support for GM food, while opposition is insignificant. Our experimental results also suggest that endorsement from foreign experts who are less affiliated with the Chinese government has a higher persuasive effect on public opinion; however, such a treatment effect cannot be significantly different from that of experts from other backgrounds (state or nonstate). The heterogeneous analysis further demonstrated that education levels do not change the effects of expert endorsement. Regarding political trust, the persuasive effects are mainly effective for those who have high trust in the government. The effects on the low-trust respondents are not significant.

According to Jin et al. (2022), in the public space, laypeople are the main opponents of GM food in China. It is interesting that, however, in comparison with consumers in European countries, Chinese consumers were found to be more accepting of GM food because they had a higher desire to address food nutrition and pesticide residue issues instead of concern about the risk of using GM food (Jin et al., 2022). If this is the case, the policy implication of our findings is that the deficit model in science communication the Chinese government currently applies in promoting GM food is effective. Vocational affiliation, which has been found to be a determining factor in influencing public opinion in other issues, seems to not significantly change experts' persuasive effect. Over time, public opinion on GM food may gradually shift to the government position with expert involvement in endorsement, as demonstrated in previous studies (e.g., Shen et al., 2022).

# EXPERT OPINION, STRATEGY IN SCIENTIFIC COMMUNICATION, AND POLICY SUPPORT FOR GM FOOD

Food safety appeared to be a common concern in supporting GM food (Leggie Jr. & Durant, 2010; Tosun & Schaub, 2017, also see the summary from Costa-Font et al., 2008). Psychological research on risk perception has long noted that experts and laypeople do not share the same understanding of "risk" because they grasp different information (Slovic, 1987). In the case of GM food, House et al. (2004) suggested that information comes from two types of knowledge: "objective" and "subjective." The former is credible scientific knowledge about GM food, while the latter is what people think they know about GM food. Although these two types of knowledge are correlated, the empirical findings have not attained consensus. Some studies have found that more objective knowledge leads to more acceptance (Moerbeek & Casimir, 2005), while others have found that subjective knowledge, not objective knowledge, exerts a significant influence on willingness to accept GM food. As Costa-Font et al. (2008) summarized, for "undecided" consumers, who are "the segment that exhibits a high desire for learning more about GM technology in order to assess more clearly their attitudes toward GM food," reliable and accurate information remains crucial to their level of acceptance. The reliability of information depends on the reliability of its source (Siegrist et al., 2000). Laypeople may lack the capability or willingness to invest time in interpreting technical, scientific reports. Thus, trust in the information from experts provides a logical shortcut to reduce the complexity of risk management decisions (Siegrist, 2000). If stakeholders believe that experts represent their interests, they may be less likely to perceive GM food as highly risky and become more willing to accept it. Finally, a proper media communication strategy may help relieve anxiety regarding the risk of GM food. Policy makers should collaborate with trustworthy organizations or experts to provide credible and reliable information for the promotion of GM food (Vilella-Vila et al., 2005).

In short, according to the literature on scientific communication, if the government intends to build public confidence in the safety of GM food, it has two essential methods. The first method is known as the deficit model, which assumes a linear relationship between scientific knowledge and the perception of scientific problems (Durant, 1999). Experts are less concerned about the concomitant risks of advanced technology simply because they have more knowledge than nonexperts. If experts and laypeople have a narrower knowledge/information gap regarding GM food, they should share a similar level of policy support. In contrast, the second method, known as the democratic model, acknowledges that risk perception is a process of social construction that is influenced by various factors, such as education level, political ideology, and the decision-making process, rather than only scientific knowledge (Durant, 1999; Wan et al., 2017). The heterogeneity and confrontation of GM food perception originate from demographic variation.

These two models result in two different strategies in scientific communication. The democratic model requires an open policy-making process with public participation because laypeople do not automatically assent to expert opinion but commit to the choice they make in regard to policy making (Montpetit, 2008). However, the usual scenario seen in authoritarian regimes is that the government dominates the policy agenda (Bueno de Mesquita et al., 2003); it is the deficit model implied in practice—the Chinese government embraces a specific policy image but encounters difficulties in persuading Chinese society to support it, as we will illustrate in more detail in the next section. The solution to this dilemma, as some recent studies have noted, is that the Chinese government started to use expert opinion as a strategy to increase policy legitimacy and further exchange it for policy support (Shen et al., 2022; Zhu, 2013). The deficit model regarding scientific communication in GM food in China may be considered a kind of strategic communication that is "a specific type of a political strategy that is directed at the public

sphere to increase the public acceptance of a policy through a suitable justification or framing" conducted by experts (Wenzelburger & Konig, 2017). Wang (2015), for example, advocated the following in *Nature:* "The new responsibility placed on Chinese researchers to communicate with the public is a significant and positive step forward. It could help to counter the widespread and irrational fear in China that GM food is unsafe to eat."

The remaining question is how can we assess the acceptance of experts' attempts at persuasion? Expert opinion involves two types of information that people may use in making judgments. The first is experts vs. nonexperts factor in scientific knowledge, which has been widely examined in previous studies. The second type of information, "who the expert is," has been less studied, but relevant studies suggest that experts' ideological backgrounds may affect public trust in their opinions. For example, Critchley (2008) found that in stem cell studies, the public trusts privately funded experts less than university scientists. Attwell et al. (2017) found that Australian parents reject vaccines and the advice of scientists because they are convinced that scientific advice serves the interests of pharmaceutical companies. Vraga et al. (2018) suggested that the public may make inferences about communicating scientists' political orientations and credibility when they engage in risk communication about controversial policies. Cofnas et al. (2018), for example, found that the conservative public in the United States has declining trust in scientists because scientists tend to take a liberal-activist stance, especially social scientists. The common dichotomy such as public vs. private and liberal vs. conservative in Western countries nevertheless cannot directly apply in the case of China, as a recent study by Wu (2022) pointed out that the "left-right" dichotomy failed to describe the correlation between ideology position and social preferences.

Previous studies have suggested that people tend to judge information credibility based on providers' vocational affiliation, which can be used as an indicator of connection with government in an environment with prevailing censorship and propaganda. For example, Huang's (2015) study of rumors on social media about government failures found that the effect of rebuttals is significantly stronger if they are made by sources that are independent of the government rather than official announcements. A recent study also found that online opinion leaders (OPLs) can significantly decrease city migration policy support, regardless of the ideological position they take, if they criticize government policy. However, when OPLs endorse policies, public support for the policy does not increase because the public is convinced that "an endorsement is another piece of propaganda, and their attitudes turn against the policy, in defiance of the OPL, whom they believe to be a government mouthpiece" (He et al., 2018). But OPLs do not have the credentials of experts, and the studies mentioned above also do not examine the science-politics nexus in China. Zhu and Xue (2007) argue that it is invalid to apply the definition of a think tank in the Western context, which emphasizes independence from government as "there are no such organizations in China due to China's one party dominated system"; alternatively, "think tanks should be an 'external brain', and in some distinct and relevant sense, independent of the government." From this vein, relative independence is determined by vocational affiliation. A staff member is considered to work in a semiofficial think tank if it is directly affiliated with the government, but if he or she works in a civilian think tank affiliated with civilian nonprofit legal persons, enterprises, or university-run research institutes, we can consider him or her to be relatively distant from the government. The same science-politics nexus can be extended to experts according to Shao and Ieong (2022), and their social survey provided preliminary evidence that vocational affiliation matters to public perception of the likelihood that experts would give an opinion independent of the government. However, what would be the result of expert opinion on controversial issues such as GM food? This is what we are interested in.

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# HYPOTHESES

Based on the discussion above, we have the following hypotheses.

First, GM food, as a controversial policy issue, has received widespread attention in the public space. It is normal that people have both supportive and opposite opinions, while at the same time, they may not have enough scientific knowledge to make their own judgment, referring to expert opinion who has a better understanding of the benefit and risk in GM food and is thus a rational choice. Accordingly, we propose two hypotheses.

Hypothesis 1a. People are more likely to accept GM food when experts endorse it.Hypothesis 1b. People are less likely to accept GM food when experts oppose it.

We now turn into how vocational background works in the perception of experts' credibility. As the aforementioned experts' independence is relative in China, we called those who are government employee state experts, they are the closest with decision-makers and likely uphold government positions. Those who are working in university or nongovernmental sectors called nonstate experts are relatively distant from government and enjoy more autonomy. Foreign experts who are institutionally independent of the Chinese government should be fully autonomous and speak the truth. In the case of GM food, we already know that the central government is inclined to promote GM food (Ruan et al., 2019). Assuming that two experts expressed support for GM food, one from the agricultural bureau and the other from a national research institute, although technically, both are affiliated with the Chinese government, the former was considered less trustworthy because a government employee is more likely to speak in favor of the government's stance rather than the truth. Then, we expected:

**Hypothesis 2.** In general, state experts exert less influence on the public than nonstate or foreign experts.

Finally, expert credibility may jointly depend on one's opinion and background. Source cues affect opinion if they provide unexpected information about an endorsement that is contrary to the source's beliefs (Nicholson, 2011). Even when it expresses consensus, expert influence is heterogeneous because of their different vocational affiliations. In our case, given the central government's policy position, it is reasonable to expect that government-hired experts will stand with the government. However, if they express disagreement, which is unexpected and costly (they may receive sanctions from their employers), people may tend to believe that experts' opposition is more credible under such a scenario. In the same vein, endorsement becomes more credible when it comes from an expert at a foreign research institute who is independent from the government and is frequently depicted as hostile due to their differing opinion.<sup>3</sup> Endorsement from foreign experts is thus unexpected and considered more credible. We then have the last two hypotheses when the government leans on promoting GM food technology:

**Hypothesis 3a.** Endorsement from foreign experts is more influential than that from state or nonstate experts.

**Hypothesis 3b.** Opposition from state or nonstate experts is more influential than that from foreign experts.

# PUBLIC OPINION AND THE DEBATE ON GM FOOD IN CHINA

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Before moving to the research design, a brief overview of the debate on GM food in China would be helpful for the interpretations of our findings. First of all, there is no universal framework in GM food regulation as it is a complex interaction between science, political culture, and public administration that varied between countries (Guehlstorf & Hallstrom, 2005; Wohlers, 2010). Punt and Wesseler (2016) for example pointed out that "The EU is an adherent of the social rationality approach, whereas the USA is an adherent of scientific rationality. The former approach is more precautious about new technologies, considers known, hypothetical as well as speculative risks in its assessments of technology, and allows for a wide participation of stakeholders in risk decision-making. The latter is more focused on technological progress, considers known and hypothetical risks, and has a narrower base in risk decision-making, which is limited to experts and the law." In the case of China, the most distinguished feature in GM food policy is the government dominated the policy-making process. From the perspective of the Chinese government, as Cui and Shoemaker (2018) mentioned, "China comprises 20% of the world's population, 25% of the world's grain output, 7% of the world's arable land, and 35% of the world's use of agricultural chemicals. Consequently, China faces risks to its food security and pollution of the environment. The government has invested heavily in the research and development of technologies to improve quality and increase the output of its foodstuffs, especially grains." Promotion of GM food is one option to attain food security. In practice, China's GM food policy is somewhat stand in between the EU and US, which in one hand encouraging the development of GM technology has been repeatedly emphasized in government documents. For example, the State Council published the Safety Regulation on Agricultural GM Organisms in 2001, which suggested that promoting GM food is part of the government agenda,<sup>4</sup> and later, according to the No. 1 central document in 2015 and the 13th Five-Year Plan for Science and Technology Innovation in 2016, China should strengthen its research on genetically modified organisms (GMOs), improve its risk management of GM food, and popularize scientific education regarding the related technology,<sup>5</sup> while on the other hand, only two GM crops (cotton and papaya) are currently admitted in China reflected the CCP is cautious in the promotion.<sup>6</sup> Following the commercialization of GMOs accelerated since 2010, Ruan et al. (2019) found that reports on official media such as People's Daily also adjusted its frames: "GMOs are no longer just scientific issues, but have entered the public domain. The policy change has affected the use of frames in the People's Daily's coverage of GMO issues. Since then, the overall proportion of the factual frame used has declined slightly, and the use of regulation and human interest frames has increased." They considered such adjustments on frame using a response of the Chinese government to risk management and food safety scandals in GM food that occurred in the 2000s.

Nevertheless, like many other cases outside China, official media failed to address the widespread suspicion in Chinese society of the safety of GM food. Lu and Chen (2016) described the Chinese public's risk perceptions of GM food have gone through three different phases from "ignorant of the risk," "tolerant of the risk" to "mindful of the risk" between 1990s and 2015. One prominent example is the documentary made in 2013 by Cui Yongyuan, a former China Central Television (CCTV) host and an outspoken opinion leader. After interviewing different stakeholders, such as university professors, clinicians, government officials, farmers, presidents of farmers' associations, and consumers, the documentary concluded that there is no consensus on the safety of GM food. As a result, the documentary asserted that the Chinese government should not promote GM food before clinical trials prove that it is safe for human health. Cui's documentary has exerted significant influence on Chinese society. Inputting "Cui Yongyuan" and "GM food documentary" as keywords in Baidu (the most used search engine in China) returns over 1,000,000 related results.<sup>7</sup> The documentary has been viewed over 127,000 times on YouTube,<sup>8</sup> even though it is formally banned in China. Although the documentary has suffered from criticisms such as its imbalanced coverage of different viewpoints and selection of evidence, it reflects the public's worries about GM food.

A more recent social survey conducted by Cui and Shoemaker (2018) in 2016 also showed that Chinese society has become increasingly opposed to GM food in recent decades. The proportions of respondents (N= 2063) who supported, opposed, or were neutral toward GM food were 11.9%, 41.4%, and 46.7%, respectively. The most common reason for opposition (78.5%) was that "GM food may have unknown risks to human beings, such as some genetic defects, which may affect human beings for many generations. It will take a long time to validate the safety of GM food using scientific experiments." They also found that Chinese society lacks trust in scientists. Only 23.2% of respondents chose to believe the opinion of biologists, whereas 45.5% chose to not trust it, and 31.3% had no information on such scientific opinion.

In summary, at least two reasons suggested that the case of China should receive more attention. First, it provides the opportunity to examine model in scientific communication under an authoritarian setting. Second, it further provides the chance to examine the influence of expert opinion under widespread propaganda.

# **RESEARCH DESIGN**

# Design of survey experiment

We set up the survey experiment on the Qualtrics platform. Respondents were recruited by an online survey company in China. The respondents voluntarily took the survey and were rewarded with a small amount of (electronically distributed) cash if they finished the survey. The survey was distributed from June 11 to July 27, 2019. A total of 3555 respondents began our survey, and 1694 completed and submitted it (47.7% completion rate). We implemented further quality control by selecting those who spent at least 4 min on our survey and stayed on the treatment page for at least 15s.<sup>9</sup> In total, we obtained 1640 qualified responses for analysis (a 96.8% qualification rate). Although the sample is by no means representative, respondents have various demographic backgrounds. Their age varied from 18 to 56 years of age or older. Approximately 74.6% have at least a college degree. A total of 54.1% come from eastern provinces in China, while the rest are from other regions. A total of 21.9% of respondents were from the public sector, and 55.7% had a monthly income equal to or above 6000 RMB.<sup>10</sup> Compared to the Chinese general population, the sample skewed toward young, highly educated, and high-income participants (see Appendix Table S7). We deem this sample useful since it is more diverse than that of university students. In addition, highly educated people are more likely to voice their support or opposition of GM food issues compared to the uneducated population (Melo & Stockemer, 2014; Verba & Nie, 1987). Young people are also more likely to engage in political participation to fight for policies they support (Shao & Liu, 2019). We thus believe that the results of our survey reflect the ideas of the population who are most likely to voice opposition to GM food policy. Finally, our experimental design ensures internal validity by randomizing the independent variables. Online survey experiments are also increasingly accepted by social scientists who study China (Chen et al., 2016; Truex, 2014).

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In the experiment, respondents first read a brief introduction to GM food. In this introduction, we told the respondent that promoting GM food has been included in the food policy development scheme of the Chinese government. Then, to isolate the effects of the opinions from experts and their vocational affiliation, all respondents were exposed to identical endorsements and critical opinions. The purpose of this design is to imitate the realistic setting in which the public is exposed to both supportive and unsupportive opinions of GM food. The only difference between the groups involved who stated these opinions. In this way, we isolate the effects of experts' vocational affiliation from their opinions.

In total, we created seven experimental groups. The control group only read two opinions, with no cues about whether experts endorsed or opposed GM food. For the remaining six groups, we created two experimental treatments with a 2\*3 design. The first treatment was the expert either *endorses* or *opposes* the promotion of GM food (two items). The second treatment was experts' vocational affiliation: whether they are from *the government, a national research institute* or a *foreign institution* (three items). The purpose was to determine the experts' affiliation with the government; for example, government experts have the closest connection with the government, while foreign experts have the most distant relationship with the government.

The treatment was constructed in the following format.<sup>11</sup>

# Supportive vignette<sup>12</sup>

[The supportive opinion: An Official from the Ministry of Agriculture/Academician from the Chinese Science Academy/Agricultural Expert from the United Nations] says, *GM technology* and traditional agricultural technology are identical in essence. Since human beings began to farm, our ancestors never stopped refining heritage improvement. Therefore, (GM food) is edible with no worries. It can guarantee food security.

# Opposing vignette<sup>13</sup>

[The opposing opinion: An official study from the Ministry of Agriculture/Academician from the Chinese Science Academy/Agricultural Expert from the United Nations] says that the hazards of GM food to human health cannot be completely ruled out. Any science technology will be accompanied by risks. At the current stage, (GM food) should not be promoted widely.

Table 1 summarizes the treatments of the seven groups in detail. In the control group, respondents read a positive opinion and then a negative opinion of GM food. In the treatment groups, respondents read the opinion with no expert first and then an expert opinion. After respondents read the treatments, we asked them to answer five questions about their support for GM food. They needed to answer to what extent they agreed with the following statement on a 1- to 10point scale:

- 1. I support the policy to promote GM food. [Support]
- 2. GM food is harmful to human health. [Harmful]
- 3. GM food can guarantee that people have enough food. [Feed]
- 4. Traditional agricultural grafting is more reliable than GM technology. [Reliable]
- 5. I will buy GM food. [Buy]

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Group	Expert opinion of GM food	Expert background	N
1. Control	None	N/A	546
2. Pos.#Foreign	Positive (Endorse)	Foreign institution	198
3. Pos.#Nonstate	Positive	Research institute	169
4. Pos.#State	Positive	Government	180
5. Neg.#Foreign	Negative (Oppose)	Foreign institution	175
6. Neg.#Nonstate	Negative	Research institute	182
7. Neg.#State	Negative	Government	190

#### TABLE 1 Experimental groups and treatments.

TABLE 2 Descriptive statistics of dependent variables.

Questions for dependent variable	Mean	Standard deviation	Min	Max
Support	5.47	2.72	1	10
Harmful	6.04	2.55	1	10
Feed	6.22	2.57	1	10
Reliable	4.78	2.62	1	10
Buy	5.13	2.76	1	10

We used these five questions to construct our dependent variable: support for GM food.<sup>14</sup> The means and standard deviations for the five questions regarding GM food support are shown in Table 2. The more participants agreed with Statements 1, 3, and 5, the higher their support for GM food was. The more they agreed with Statements 2 and 4, the lower their support for GM food was. This finding shows that respondents, in general, showed moderate support since the mean scores are approximately 5 and 6 of 10.

To construct a convenient dependent variable, we recoded Questions 2 and 4 ([Harmful] and [Reliable]) reversely to positively associate them with GM food support (Cronbach's  $\alpha$  = .81). Then, we conducted exploratory factor analysis with the principal factor method over all variables in Table 2 and extracted only one latent factor (see Appendix Tables S5 and S6). We then transformed this factor into a new variable, that is, GM food support, and standardized it. This variable is the dependent variable in our experiment. To check for randomization, we also included a series of control variables, including gender, age, college attendance, region of residence (eastern, middle or western China), foreign media exposure, whether or not they are a public employee, hukou (residential registration status), party membership, income, risk preference, central/local political trust, social trust, and social media usage. The balance check (Appendix Table S8) shows that most of the control variables are balanced across the experimental groups. However, a few control variables show significant differences. Thus, we used linear regression to estimate the results of the experimental treatments to control the unbalanced variables. The complete result table with all variables is available in the Appendix (Table S4).

# RESULTS

The regression results are presented in Table 3. We run five regressions with different forms of control variables. We did not add any control variables in Model 1. In Model 2, we add all the

	(1)	(2)	(3)	(4)	FF POLICY R
	No control	Binary control	Attitude control	Original control	Original ordinal
Pos.#Foreign	0.241***	0.245***	0.250***	0.246***	0.241***
	(0.0848)	(0.0856)	(0.0840)	(0.0856)	(0.0856)
Pos.#Nonstate	0.181**	0.198**	0.171**	0.197**	0.204**
	(0.0828)	(0.0826)	(0.0820)	(0.0823)	(0.0834)
Pos.#State	0.165*	0.175**	0.181**	0.170**	0.170**
	(0.0875)	(0.0864)	(0.0849)	(0.0861)	(0.0864)
Neg.#Foreign	0.0660	0.0778	0.0936	0.0693	0.0609
	(0.0861)	(0.0862)	(0.0854)	(0.0863)	(0.0870)
Neg.#Nonstate	-0.0491	-0.0414	-0.0486	-0.0451	-0.0414
	(0.0869)	(0.0871)	(0.0873)	(0.0875)	(0.0876)
Neg.#State	-0.118	-0.0983	-0.0956	-0.0999	-0.0961
	(0.0809)	(0.0792)	(0.0795)	(0.0794)	(0.0796)
Constant	-0.0538	-0.243	-0.698***	-0.184	-0.368
	(0.0435)	(0.149)	(0.215)	(0.185)	(0.237)
Control	No	Yes	Yes	Yes	Yes
Observations	1640	1634	1634	1634	1634
Adjusted $R^2$	0.00921	0.0270	0.0437	0.0276	0.0299
<i>Note</i> : OLS estimator used. robust standard errors (hc2)	standard errors (hc2) in pare	otheses; dependent variable is the	gene food support (standardized). M	in parentheses; dependent variable is the gene food support (standardized). Model 1 has no control; Model 2 has binary demographic	inary demographic

variables; Model 3 has trust attitudes and risk preference as control; Model 4 has original demographic control; Model 5 treats original demographic controls as ordinal variables; and complete Note: OLS estimator used, robust standard errors (hc2) in parentheses; dependent variable is the gene food support (standardized). Model 1 has no control; Model 2 has binary demographic list is available in the Appendix.

p < .10; \*p < .05; \*\*p < .010.

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demographic variables, that is, control variables introduced in the last section but exclude the attitudinal control variables, that is, their risk preference, political trust, and social trust. In Model 3, we include the attitudinal control variables. In Model 4 and Model 5, we replicate Model 2 but with different coding of control variables (original controls rather than recoded as binary in Model 4 and original controls treated as ordinal variables rather than as continuous in Model 5).

The results remain consistent for all models. When experts endorse GM food [Pos.], respondents' approval of GM food increases significantly compared to the control group. Taking Model 2 as an example, the endorsement of foreign experts increases GM food support by 0.245 standard deviation, while that of nonstate experts increases it by 0.198 standard deviation and that of state experts by 0.175. The effects of foreign experts are the highest but are not significantly different from those of state/nonstate experts. Conversely, when experts oppose GM food, we cannot find sufficient evidence that respondents' attitudes on GM food change with expert opinion. Foreign experts' opposition increases support for GM food by 0.078 standard deviation, whereas that of nonstate experts decreases public support by 0.041 and that of state experts decreases it by 0.098. None of these results pass the statistical significance test. Compared to experts' endorsement, their opposition is ineffective in changing respondents' minds. The other models have similar robust findings, although the estimated effects vary slightly.

Table 4 breaks down the factor variable into five dependent variables in Table 2 and replicates the model specification of Model 2 in Table 3. The results remain largely consistent in terms of effect size and significance. The effects of expert endorsement are positive and robust on the

	(6)	(7)	(8)	(9)	(10)
	Support_C	Harm_C	Feed_C	Reliable_C	Buy_C
Pos.#Foreign	0.213***	0.174**	0.124	0.174**	0.221***
	(0.0818)	(0.0826)	(0.0863)	(0.0878)	(0.0840)
Pos.#Nonstate	0.168**	0.111	0.106	0.0859	0.212**
	(0.0833)	(0.0849)	(0.0855)	(0.0831)	(0.0841)
Pos.#State	0.209**	0.0853	0.0963	0.0722	0.143*
	(0.0844)	(0.0867)	(0.0832)	(0.0859)	(0.0844)
Neg.#Foreign	0.0746	0.0379	-0.0349	0.123	0.0722
	(0.0859)	(0.0818)	(0.0906)	(0.0878)	(0.0855)
Neg.#Nonstate	0.0193	-0.0802	-0.110	-0.0647	-0.0221
	(0.0897)	(0.0869)	(0.0855)	(0.0889)	(0.0880)
Neg.#State	-0.0831	-0.132	-0.0299	-0.117	-0.0533
	(0.0830)	(0.0870)	(0.0808)	(0.0787)	(0.0818)
Constant	-0.332**	0.166	-0.453***	0.293*	-0.330**
	(0.150)	(0.151)	(0.149)	(0.152)	(0.150)
Control	Yes	Yes	Yes	Yes	Yes
Observations	1634	1634	1634	1634	1634
Adjusted $R^2$	0.0282	0.0144	0.00991	0.00784	0.0302

TABLE 4 Breaking down the factor variable.

*Note*: OLS estimator used, robust standard errors (hc2) in parentheses; dependent variable is the gene food support (standardized). Complete list is available in the Appendix.

p < .10; p < .05; p < .010.

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question of Policy Support (Model 6) and Buying GM food (Model 10). The results of other variables vary on the level of statistical significance, but the estimated effects of expert endorsement are consistently positive. In addition, foreign experts' endorsement has a consistently more significant effect than the other two types of experts.

The results show that respondents are influenced by experts' opinions on GM food policy, but only when experts express support. Our findings confirm Hypothesis 1a while rejecting Hypotheses 1b and 3b. While our findings are consistent with Hypotheses 2 and 3a, the results are only suggestive since they do not pass the conventional statistical significance test.

Two control variables are worth further discussion.<sup>15</sup> Their risk-seeking tendency is positively associated with the support of GM food. This result is consistent with past studies that found that risk perception is the major determinant of preference toward policies regarding new technologies such as GM food (Costa-Font et al., 2008). Second, the support of GM food is positively associated with trust in the local government but not the central government or social trust. This result suggests that the support of GM food mainly relies on the trust of local governments. We speculate that the respondents attributed the reliability of GM food to how the local government implements it rather than how the central government makes the policy.

We further explore the possible reasons why experts' criticism of GM food exerts no influence by conducting heterogeneous effect analysis. Previous studies have found that individuals with a higher education level are more likely to recognize the benefits of GM technologies (Onyango, 2004; Traill et al., 2004) Most of our respondents have a college-level education, which may explain why experts' criticism has no effect on their attitudes toward GM food. We estimate the heterogeneous effects of education by separately analyzing the subsample of college-educated respondents and noncollege-educated respondents. We find that different education levels do not change the nonresults on negative comments from experts. This result means that experts' criticism of GM food is ineffective in influencing both college-level and noncollege groups.

A second possibility is that respondents may suspect the trustworthiness of information that contradicts their existing beliefs or perceptions regarding GM food (Costa-Font & Mossialos, 2005; Johnston & Ballard, 2016). To avoid possible confounding bias, the experiment did not ask about respondents' preferences before they received the treatment, but the descriptive statistics in Table 2 suggest that respondents are generally inclined to support GM food to a moderate degree. This result may suggest that respondents are not persuaded by experts' criticism of GM food. Nevertheless, further research should be conducted to explore why expert criticism has no influence.

The third potential confounding factor is political trust. Previous studies have pointed out that the high political trust in China can be explained by government performance—people tend to believe the government because when their track record demonstrates that the government makes good decisions for them (Yang & Tang, 2010; Zhengxu, 2005). Since the central government favors promoting GM food and GMOs in China, we would expect respondents with higher political trust to be more likely to align with government positions and be more susceptible to endorsement from domestic experts.

We recoded trust in central government and trust in local government into binary variables, with the average score of the variables as the cutoff points. Those whose answers were lower than the average were coded as "low trust," and those whose answers were higher than the average were coded as "high trust." Then, we conducted regression analysis on the subsamples.

We found that high political trust elicits stronger effects of expert endorsement on respondents' acceptance of GM food. Low political pressure elicits weaker persuasive effects, which are statistically insignificant. However, for expert criticism, the heterogeneous effects of political trust are minimal. People with low political trust are not necessarily more susceptible to expert criticism than their counterparts with high political trust. Interestingly, after considering the heterogeneous effects of political trust, we find similar patterns on the influence of expert vocational affiliation on attitudes toward GM food—foreign experts have a stronger positive effect than their domestic counterparts, even for respondents with high political trust. Such findings suggested that the effects of expert affiliation are relative: Respondents do not translate expert affiliation directly into trustworthiness; if it is the case, foreign experts should not have the largest persuasive effect. We speculate that because foreign experts are the least likely to align with the government position in GM food, their endorsement is unexpected and, consequently, more credible (Nicholson, 2011).

### **CONCLUSIONS AND DISCUSSIONS**

Expert opinion is important in mediating the information gap between objective scientific knowledge and laypeople's perception of advanced technology (Heikkila et al., 2020; Leach & Sabatier, 2005; Pielke, 2007; Weible et al., 2010). It is also believed that expert endorsement can increase the policy legitimacy of highly contentious policy issues (such as GM food) (Heikkila et al., 2020; Kahan, 2016; Leach & Sabatier, 2005; Pielke, 2007; Sarewitz, 2004; Weible et al., 2010). In this study, we apply an experimental design to explore to what extent expert opinion and vocational affiliation influence public attitudes toward GM food in China. By controlling the content of expert opinion, we find that respondents are susceptible to experts' positive comments (endorsement) about GM food and are likely to increase their support for GM food as a result. Endorsement from experts with less state affiliation has higher persuasive effects, although the differences between different levels of affiliation are not statistically significant. The negative comments (criticism), conversely, have no effects. Further heterogeneous analysis shows that even among those who have high trust in the government, they still trust foreign experts more than domestic experts. We speculate that respondents do not rely solely on the trustworthiness of expert affiliation. Rather, respondents consider both expert stances and expert affiliation when assessing the credibility of expert opinion.

While we admit that our sample is not representative and that the experimental design only ensures the internal validity of our findings, they should be examined in further studies in different policy realms. Nevertheless, we believe that these findings offer policy implications for promoting GM food in China and empirical contributions for the study of expert involvement in authoritarian regimes in general. First, as expert involvement in China's policy making is now common (Gewirtz, 2017; Shen et al., 2022; Zhu, 2011, 2013; Zhu & Xue, 2007), we provide evidence that the Chinese government can justify its policy preference in complex policy issues in which people lack knowledge such as GM food through expert endorsement. It is worth mentioning that we have no intention to argue that public participation in policy making is meaningless, as we did not conduct a related analysis. Further studies are needed to test the "deficit model" and "democratic model" illustrated in the science communication literature (Durant, 1999), which is better in gaining policy support in the case of China. Second, unlike in the case of monarchies in the Arab Gulf, where Jones (2019) found that expert involvement undermined rather than increased policy support for education and infrastructure, we found that expert endorsement significantly increased public acceptance of GM food. Our findings suggest that expert opinion has divergent influences on policy support even within authoritarian regimes and that such divergences may be due to differences in policy issues, political culture, or policy-making style. Further studies should continuously explore all the possibilities, as we still know very little about expert influence in policy making in autocracies. Third, we found that expert endorsement only matters in respondents with high political trust.



These findings align with previous studies on trust in information sources in nuclear power development in China and suggest that government performance is an important moderator in expert opinion influence on policy support (He et al., 2013). While the Chinese government is often cautious about the so-called "foreign force" in manipulating public opinion,<sup>16</sup> we did not find significant differences in the effects of expert vocational affiliation on policy support. Their criticism also did not undermine public support for GM food policies. In other words, at least for the GM food issue, expert involvement in public discussion is helpful to increase public support and the legitimacy of policy making. Further studies can examine whether our findings also apply to other policy issues with similar complexity and contradiction.

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## ENDNOTES

<sup>1</sup> Experts in China, as we will illustrate in the present study, have two features distinguished them from what Pielke (2007, p. 15) called "pure scientist" who "focuses on research with absolutely no consideration for its use or utility, and thus in its purest form has no direct connection with decision-makers. Research results in findings that are placed into a reservoir of knowledge where they will be available to all decision-makers. Those from various factions in society have access to the reservoir from which they can draw the knowledge that they need to clarify and argue their interests. In principle, from this perspective the scientist remains removed from the messiness of policy and politics." First, it is their occupations. According to Shao and Ieong (2022), the Chinese public perceived the most important indicator as being an expert is professional experience. Thus, experts in China not only included scientists but also included occupations like technocrats, think tank researchers, or staffs in nongovernmental organizations. Second, connection with the government is usually a necessary condition to involve experts in the policy process; see Teets (2018) and Zhu (2009, 2013).

<sup>2</sup>The literature finds that Chinese citizens have extraordinarily high trust on the central government. However, it does not mean that they have the same level of trust on local governments and unconditionally trust the credibility of state-owned agencies, organizations, and personnel; see Yang and Tang (2010) and Wang (2006). Also see Huang et al. (2018) for citizens' distrust on regime-support source of opinion leaders.

<sup>3</sup> For example, Chinese authorities have tried to restrict the use of Western teaching materials in universities. See https://www.nytimes.com/2015/02/10/world/asia/china-tells-schools-to-suppress-western-ideas-with-one-big-exception.html/. The ideological campaign is also cautious about the infiltration of Western forces. See https://www.wilsoncenter.org/event/do-western-values-threaten-china-the-motives-and-methods-xi-jinpings-ideol ogy-campaign.

<sup>4</sup>See https://www.gov.cn/gongbao/content/2001/content\_60893.htm.

<sup>5</sup> Each year, the No. 1 central document is published by the State Council in China to address agricultural policies. See http://www.moa.gov.cn/ztzl/jj2019zyyhwj/yhwjhg/201603/t20160304\_5039590.htm. For the *13th Five Year Plan for Science and Technology*, see https://www.gov.cn/zhengce/content/2016-08/08/content\_5098072.htm, accessed November 7, 2023.

<sup>6</sup>See https://www.moa.gov.cn/ztzl/zjyqwgz/kpxc/202302/t20230217\_6420890.htm.

<sup>7</sup>https://bit.ly/33AKWAW, accessed on June 28, 2022.

<sup>8</sup> https://www.youtube.com/watch?v=IbrfJ0pTEHk, accessed June 28, 2022.

<sup>9</sup>The qualification of time control follows the results of the test survey, in which we recruited undergraduate students to take the survey and instructed them to do so seriously. We used the fastest time as our filtering threshold.

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- <sup>10</sup> The descriptive statistics are available in the Appendix.
- <sup>11</sup>The original Chinese wordings are available in the Appendix.
- <sup>12</sup>The "opposing opinion" appears only in the control group and the groups treated with the "experts endorse GM food promotion" content.
- <sup>13</sup>The "supportive opinion" appears only in the control group and the groups treated with the "experts oppose GM food promotion" content.
- <sup>14</sup>See Appendix Tables S3 and S4 for the detailed results.
- <sup>15</sup> Please see detailed results in Appendix Table S7.
- <sup>16</sup> https://www.scmp.com/news/China/politics/article/3015433/be-alert-external-hostile-forces-chinese-securitychief-warns; accessed June 28, 2022.

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# SUPPORTING INFORMATION

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