

# Media Framing and Public Support for China's Social Credit System: An Experimental Study<sup>12</sup>

## Abstract

Although China's Social Credit System (SCS) is widely portrayed by Western media as repressive surveillance, recent studies show that it receives high levels of support among Chinese citizens. The information and knowledge hypothesis suggests that people support the SCS because they generally lack knowledge about the system. This study further addresses the puzzle by considering hostile media and inoculation theories. We examine the roles that media framing (Western vs. Chinese framing) and monitored behaviors (financial vs. social behaviors) play in explaining public support for the SCS. The results from a survey experiment conducted in China ( $N = 1,600$ ) demonstrate that when exposed to Western framing, Chinese citizen's support for the SCS is lower, but only when they are informed that the SCS monitors social behavior. By contrast, when they are told that the SCS focuses on financial behavior, Western framing exposure is not associated with lower levels of public support. These findings suggest that if the SCS focuses on financial domains, Chinese citizens will likely maintain a high level of support for the system despite criticisms coming from the West. However, an expansion to social domains along with exposure to Western media framing will likely result in decreased support for the system.

**Keywords:** Social Credit System, media framing, public support, financial and social behavior, information and knowledge, hostile media effect, inoculation

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Governments around the world have increasingly leveraged digital technologies to achieve their operational goals. Authoritarian regimes like China are at the forefront of designing and adopting new technologies to track citizen behaviors through novel datasets. China's emerging Social Credit System (SCS), for example, intends to assess the trustworthiness of individuals and organizations by using data gathered from multiple sources (Cheung and Chen, 2022; Creemers, 2018; Dai, 2020). Interestingly, while Western media and policymakers regularly view the SCS as a cautionary tale of surveillance creep and state repression, recent studies reveal that the SCS receives strong support among Chinese citizens (Kostka, 2019; Liu, 2021; Xu et al., 2022; Donnelly, 2021; Ahmed, 2017; Ohlberg et al., 2017). These findings raise an important puzzle: why do Chinese citizens support a state-sponsored technology when many Western observers note that it increases the range and amount of state surveillance in people's everyday life?

Existing literature points to an information and knowledge hypothesis as the main solution to the puzzle (Xu et al., 2021). According to this view, Chinese people support the SCS because they do not yet have knowledge of the behaviors being monitored and penalties imbedded in the system, or they mainly recognize the positive features of the system. In other words, the SCS may be used as a repressive surveillance tool but is officially intended to encourage societal benefits (Engelmann et al., 2021; Liang and Chen, 2021). According to this hypothesis, the negative aspects of the SCS are either unknown or deemphasized by the Chinese state and media; therefore, the repressive potential of the system will not likely surface to the top of mind when Chinese citizens report their attitudes (Xu et al., 2021; Engelmann et al., 2021). This hypothesis is further supported by research that demonstrates citizens who learn about the SCS from state media show the highest level of support (Xu et al., 2021) and that critical reports about the SCS are rare in China's main sources of news and information (Ohlberg et al., 2017). Based on the information and knowledge hypothesis, we expect

that support for the SCS will be lower when people are exposed to Western coverage, which routinely frames the system as a tool for social control and repressive surveillance.

However, we contend that this simple perspective may have ignored more nuanced roles of media framing. The hostile media theory suggests that people on one side of an issue could perceive media reports from the other side to be biased and such perceived bias can influence their attitudes towards the issue (Vallone et al., 1985). Relatedly, researchers studying inoculation effects argue that individuals can be inoculated against persuasion, which prompts them to develop resistance and counterarguments to potential challenges to their preexisting beliefs, especially when such counter-attitudinal information is provided by out-groups (Banas and Rains, 2010). In fact, the Chinese government has long promoted Chinese nationalism and inoculated its citizens from Western/liberal criticism using educational and media systems. Such inoculation typically portrays Western criticism of China as an attack or misinterpretation on the part of the West (Black, 2015; Huang and Yeh, 2019). Based on the hostile media and inoculation theories, we argue that Chinese citizens may perceive the Western media framing featuring criticisms of the SCS as hostile, biased, or ignorant and therefore disregard such criticisms; the hostile framing may even trigger increased support for the system (Liu, 2021).

As such, the two competing theories (the information/knowledge theory vs. the hostile media/inoculation theory) suggest very different effects of exposure to Western media coverage, with the information and knowledge theory suggesting a negative effect, but the hostile media/inoculation theory indicating a null or positive effect on public support for the SCS. This study considers media framing as the process by which a news outlet “defines the essential problem underlying a particular social or political issue, and outlines a set of considerations purportedly relevant to that issue” (Nelson et al., 1997: 222). Framing involves selection and salience, as the media could highlight select aspects of the issue to make them more salient (Entman, 1993). As

such, media framing can shape audiences' understanding and interpretation of certain issues (Entman, 1993; Nelson et al., 1997). We argue that Western and Chinese media framing could have different effects on public support for the SCS.

Along with media framing, we argue that the different types of monitored behaviors in the SCS should also influence public support for the system. Previous studies centering the knowledge/information hypothesis have focused on the potential for the system to regulate social and political behavior rather than financial behaviors (e.g., Xu et al., 2021). This is an important oversight because financial regulations remain the largest component of the SCS up until today (Creemers, 2018; Liang et al., 2018). Therefore, we argue that overlooking the financial regulation dimension of the SCS may lead to overly broad or even incomplete conclusions about public support for the SCS. Our paper aims to focus on not only the SCS' regulations of social behavior but also its financial regulations. This expanded focus is buttressed by recent reports that there is a large discrepancy between the Western media speculation and the reality of the SCS (Brussee, 2021; Reilly et al., 2021). Instead of "surveillance and repression of political dissidents or minorities," which the West widely concentrates on and extrapolates from, the vast majority of the system remains focused on "compliance with legally prescribed social and economic obligations and performing contractual commitments" (Brussee, 2021: 1).

The financial aspect of the SCS is similar to other credit rating systems (e.g., FICO) in Western countries as it tracks citizens' financial behaviors to designate whether people can fulfill their contractual obligations (Liu, 2019). By contrast, social behaviors involve a wide variety of activities, such as traffic violations, cheating on tests, and often differ across local SCSs (Liang and Chen, 2022), but these social elements are still in the experimentation stage in pilot cities and far from being finalized as a national policy. The national system is not yet fully established, even though significant national progress has been made in credit data sharing and monitoring. Yet, it

remains unclear whether and how the social and political behaviors used in the pilot programs may get included in the eventual national SCS (Engelmann et. al, 2021; Liu, 2019). In this study, we include a more representative list of monitored behaviors, including financial and social behaviors, and how these encompassed domains affect public support for the SCS. We argue that when Chinese citizens see the SCS as focused on financial regulations rather than social regulations, the impact of Western media framing on support for the SCS will differ.

The study uses a survey experiment conducted in China during 2021 (N = 1,600) to test the impact of media framing and monitored behaviors on public support for the SCS. The experiment has two sets of treatments: 1) Western vs. Chinese framing, and 2) financial vs. social behavior monitoring. We find that Chinese citizens' support for the SCS is lower when they are exposed to the Western framing, but only when individuals are primed with information describing the SCS as monitoring citizens' social behavior. Our study offers the first empirical study of how Chinese and Western media frames of the SCS (compared to the Chinese media framing) may influence ordinary Chinese citizens' attitudes, and how different behaviors seen as monitored by the SCS could moderate the media framing influence on public support.

### **The Complexity of China's SCS**

China's credit system was built in the early 1990s to assess the trustworthiness of individuals and firms, because China's weak implementation of laws and the fledgling market economy resulted in prevalent fraud, corruption, loan defaults, wage theft, and the skirting of laws and regulations (Creemers, 2018; Dai, 2020; Von Blomberg, 2020). The concept of "social credit" was introduced in the early 2000s and it indicates that China's credit system gradually expanded from financial creditworthiness to social domains (Chen and Cheung, 2017; Werbach, 2022). In 2014, China's State Council released the *Planning Outline for the Construction of a Social Credit System (2014–2020)*, which

approved the development of a multifaceted approach to the credit system that has become known as the SCS (Chen and Cheung, 2017). Four target fields, including judicial credibility, societal credibility, commercial credibility, and governmental credibility, are included in the SCS (Liang et al., 2018; Von Blomberg, 2020).

Prior literature has explored the SCS from various perspectives, such as its multiplicity (Liu, 2019), legal development (Chen and Cheung, 2017; Von Blomberg, 2020), public support (Kostka, 2019; Liu, 2021), use of reputation technologies and mechanisms (Dai, 2018), the blacklists and redlists (Engelmann et. al, 2021), and the privacy implications<sup>3</sup> (Chen & Cheung, 2017; Chorzempa, 2018). One focus is to understand how the SCS enhances social control. Some scholars argue that the SCS is a form of social management since it aggregates credit data and uses reward and punishment approaches to govern and steer those who break trust in financial and social domains (Creemers, 2018; Von Blomberg, 2020). Similarly, the SCS is also considered a reputation system aimed to shape social norms about trustworthiness through reputation tracking and analytics (Chen et al., 2022; Dai, 2020). The infrastructure for these control mechanisms has been purposely built by the Chinese government for various government bodies and commercial entities with a goal to eventually collect and share data (Von Blomberg, 2020).

Another focus is the multiplicity of the SCS. Currently, there is no unified SCS in China as the system consists of at least three parts: the national SCS, local pilot systems, and commercial rating platforms (Liu, 2019; Von Blomberg, 2020). First, the nationwide SCS contains data infrastructures and the blacklists and redlists to gather credit-related data from various actors including individuals, corporations, organizations, and governments to evaluate trust-breaking behaviors (Dai, 2020; Liu, 2019). Data infrastructures like Credit China play important roles in the

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<sup>3</sup> Our paper centers surveillance and privacy concerns (see for example the introduction section). For more literature on privacy concerns, see Chen & Cheung, 2017; Chorzempa, 2018; Xu et al., 2021; Xu et al., 2021.

central system. In addition, the blacklist and redlists, and the joint reward and punishment systems not only restrict social and financial behaviors for those who have credit-breaking records, but also shape social norms and narratives (Chen et al., 2022; Engelmann et al., 2021). Contrasted with the expectations that the SCS stresses social behaviors, the national SCS currently emphasizes financial and economic behaviors, and social credit scores are not currently offered at the national level (Liu, 2019; Werbach, 2022).

Second, local pilot programs implemented by municipal governments have various ways of assessing credit (Liu, 2019). The local systems often calculate a numeric score to evaluate citizens' creditworthiness (Liang and Chen, 2022), and they typically pay greater attention to social behaviors (Li and Kostka, 2022). For example, in some cities citizens may see their credit scores drop if they violate traffic regulations or jaywalk. Furthermore, these local systems also provide 'bonuses' for those who have trust-keeping behaviors. People could increase their credit scores if they receive governmental rewards or participate in social charities (Liang and Chen, 2022). Notably, these pilot systems are considered as experimentations, and they are typically not connected to the national SCS (Von Blomberg, 2020).

Third, China has built commercial credit systems on digital platforms, which will likely become an important component of the SCS (Liu, 2019; Chen & Grossklags, 2020). The most significant examples include Alipay's Zhima Credit (or Sesame Credit) and WeChat Pay Score. These commercial credit systems focus mainly on individual financial credit and combine digital data and official records for credit assessment. Moreover, these commercial credit systems provide rewards and punishments for users; those who have higher credit scores can receive various benefits whereas users with lower scores would be restricted from many activities. Chinese citizens widely use and recognize these commercial credit systems (Kostka, 2019), even though they may have more limited understanding of the official SCS (Li and Kostka, 2022).

## Media Framing, Monitored Behavior, and Public Support for the SCS

In this study, we argue that media framing likely plays an important role influencing public support for the SCS. Indeed, news outlets cover a topic in a particular way by selecting some causes and consequences while ignoring others (Entman, 1993). This could make certain aspects of the topic more noticeable and memorable to the audiences, and further affect people's interpretation and evaluation of the topic (Nelson et al., 1997). The SCS remains in the designing and piloting stages and citizens have neither the full knowledge of how the system works nor the understanding of the goals and scope of the system (Li and Kostka, 2022). Chinese citizens may be particularly reliant on media to obtain information about the SCS; therefore, how the media frame the system could affect their assessment and support for the SCS. In China, media play a key role in connecting leadership with the public, and importantly, informing citizens about important policies (Zhao, 2011; Ye et al., 2017; Xu et al., 2022). Extending this logic, news media in China should serve as a tool for the government and primarily focus on the positive aspects of the SCS, rather than the risks and problems of the system. Indeed, recent research finds that the media coverage of the SCS within China plainly emphasizes commercial benefits, public welfare, and market regulations, instead of state repression. (Shahin and Zheng, 2020; Xu et al., 2021).

By contrast, Western reports on the SCS skew overwhelmingly negative and focus on the repressive potential of the system (Song, 2018; Werbach, 2022).<sup>4</sup> For instance, Western media often view the SCS as the next step in authoritarian control, often directly linking the SCS to technology dystopian futures (Ding and Zhong, 2021). A popular *Wired Magazine* story summarizes this shared Western view, the SCS “has been compared to Black Mirror, Big Brother and every other dystopian

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<sup>4</sup> We do not claim that all Chinese framing supports the SCS, whereas all Western framing criticizes the system. Examples of Chinese social media posts critically discussing the pros and cons of the SCS can be found here: (<https://www.zhihu.com/question/37123936>; <https://www.zhihu.com/question/390003746>). For more examples please see footnote 3.



future sci-fi writers can think up. The reality is more complicated — and in some ways, worse” (Kobie, 2019). Other sources similarly describe the SCS as a key part of China’s “digital totalitarian state” that engages in surveillance and control analogous to Orwell’s “Big Brother” (Mosher, 2019). Obviously, the Western media typically frame the SCS as a means of social control through the state’s invasion of privacy and use of repressive nudges. In other words, the Western media situate the SCS as a new extension of the already robust Chinese surveillance state to maintain control of its citizens and keep the regime in power.

The Western framing is being introduced to China through at least three channels. First, Chinese media platforms have circulated Western criticisms of the SCS in their reports (Song, 2018), and citizens may share social media posts that relay Western reports on the SCS.<sup>5</sup> Second, Chinese citizens could access Western media using VPNs (Hobbs and Roberts, 2018).<sup>6</sup> Third, with the convenience brought by advancements in technology and transportation, more Chinese citizens have access to the outside-world through travelling abroad or connecting with friends who are either from or have been to the West. Though temporarily interrupted by the pandemic, international travel is expected to resume now that China loosened up its Zero-Covid policy.

Relying on prevailing theories, we offer a comparative theory test by proposing two competing hypotheses that offer different explanations about how media frames should affect public support for the SCS. Specifically, we focus on the effect of *Western media framing* in comparison to *Chinese media framing* on public support for the SCS. *Western media framing* tends to highlight authoritarian control, surveillance, repression, and privacy concerns, whereas *Chinese media*

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<sup>5</sup> A number of social media posts are found to discuss the pros and cons of the SCS in China, and below are a few examples: <https://baijiahao.baidu.com/s?id=1632026461580285069>; <https://www.zhihu.com/question/37123936>; <https://zhuanlan.zhihu.com/p/50506592>; <https://www.zhihu.com/question/390003746>; <https://www.zhihu.com/question/21607080>; <https://zhuanlan.zhihu.com/p/354302909>.

<sup>6</sup> Hobbs and Roberts (2018) find that the sudden block of Instagram in 2014 inspired millions of Chinese social media users to access censored websites by using VPN. Therefore, they conclude that acute censorship could potentially cause spikes in censorship evasion through tools such as VPN usage. However, it is worth noting that censorship could also target VPN usage and make evasion harder or more costly, which could potentially decrease VPN usage.

*framing* focuses on the societal benefits of improved trust from the SCS. On one hand, we expect that exposure to an alternative perspective from Western media would highlight the risks and problems of the system to Chinese citizens. Consequently, Chinese citizens will have lower support for the SCS compared to those who are exposed to Chinese media framing. Alternatively, Chinese citizens may perceive Western media framing as hostile and thus distrust, resist, and dismiss the criticisms resulting in public support for the SCS being unaffected by Western media framing.

### ***Information and Knowledge Theory***

Western media framing may decrease public support for the SCS by offering novel information and knowledge for Chinese citizens (Bailard, 2014). Foreign news outlets often provide a wider range of information about how other countries view the function and mission of governments and how the rest of the world understands actions undertaken by the Chinese government. These media can open the window of ideas and perspectives; past work shows that Chinese citizens consuming these alternate views tend to hold lower levels of support for the government and associated policies (Tang and Huhe, 2014; Xu et al., 2022). Thus, we expect that when Chinese citizens are exposed to Western framing about the SCS, they will tend to be less supportive of the system.

By contrast, we expect that Chinese media framing of the SCS produces higher levels of support. Chinese citizens often rely on state media to obtain information about politics and public affairs and these media outlets are the mouthpiece of the party and government (Zhao, 2011). Positive news reports when aligned with elite opinion tend to increase public support for policies, and empirical research has found that those who report learning about the SCS from state media show the highest levels of support for the system (Xu et al., 2021). Although we acknowledge cross-cultural differences in surveillance and privacy expectations (Krueger, et al. 2020), the information and knowledge theory expects that when Chinese citizens are exposed to Western framing about the SCS, they tend to be less supportive of the system. Therefore, we propose the following hypothesis:

***Hypothesis 1:*** Those exposed to Western framing, compared to Chinese framing, will have lower levels of support for the SCS.

### ***Hostile Media Theory and Inoculation Theory***

Although Western framing focuses predominately on the SCS's repressive potential, theories such as hostile media theory and inoculation theory suggest that this type of Western framing may not necessarily lower people's support. Hostile media theory argues that people on one side of an issue perceive media reports from the other side to be biased and this perceived bias can influence evaluations of politics (Vallone et al., 1985). While the early research on the hostile media effect focused on partisanship, recent literature suggest that perceptions of bias also exist when other information sources are identified (Feldman, 2018). Drawing on social identity theory and self-categorization theory, scholars have found that people often negatively evaluate or discount information provided by out-groups of diverse description (Reid, 2012).

A related explanation comes from inoculation theory, which highlights how institutions or individuals can explicitly build information frameworks to resist counter-attitudinal messages (Banas and Rains, 2010). These information frameworks inoculate people against new messages, particularly when such messages are coming from an out-group and when these messages run counter to the dominant view. The Chinese government has long used the education and media to promote Chinese nationalism and inoculate their citizens from the West (Black, 2015; Huang and Yeh, 2019). At its core, this pervasive inoculation seeks to protect the regime by amplifying and leveraging nationalism and shared culture. Western media has also gotten more antagonistic towards China in recent years; and the Chinese media and government routinely frame various forms of Western criticism as a Western misunderstanding or attack (Liu, 2021). Evidence from the independent media watchdog group FAIR suggests that “for many Chinese, such biased reports not only delegitimize the Western media; it also stirs up their patriotic passions” (Hussaini, 2020: 492).

Scholars exploring why Chinese citizens believe Chinese media over those in the West, suggest that “Western media often use reductionist caricatures of stretch analogies such as Black Mirror references” (Zou, 2021: 141). Related specifically to the SCS, some propose that Western criticisms of Chinese surveillance will be viewed as misinformed, biased, and unfair by the Chinese, who “perceive these criticisms as attacks on China” which “generated the reverse psychological effect and pushed many Chinese resident to more fully embrace the state” (Liu, 2021: 90-91). As such, negative SCS coverage may be seen by some Chinese citizens as coming from an unfair, hostile, or ignorant Western media. This framework has received empirical support, with scholars finding that exposure to Western media can enhance public support for the government and policies in China, rather than worsen it (Huang and Yeh, 2019). Therefore, we expect that Chinese citizens will discount Western criticism, or perhaps even become motivated to support the SCS. This leads to our second hypothesis:

***Hypothesis 2:*** Exposure to Western framing, in comparison to Chinese framing, will not result in lower levels of support for the SCS.

### ***The Interaction between Media Framing and Monitored Behaviors***

One of the distinctive features of the SCS is the inclusion of non-financial behaviors (Mac Síthigh and Siems, 2019). Unlike the credit systems of the West, the SCS intends to collect data on citizens’ *financial behaviors* and *social behaviors*. While financial regulations remain the largest component of the SCS, media coverage and most research tends to focus on social behavior regulations and the repressive potential of the system (Xu et al., 2021). We argue that overlooking the financial regulation dimension of the SCS may lead to overly broad conclusions about the nature of support for the SCS. In this study, we examine both types of behavior, which could moderate the effect of media framing on public support. We claim that the Western framing is more likely to be considered as ‘hostile’ when citizens are primed to consider that the focus of the SCS is financial behavior.

Because Western countries also have credit systems focusing on financial regulations, attacks against a system that primarily concentrates on financial regulations may make Chinese citizens think that the Western criticisms are biased and hostile against China. Alternatively, Western framing should be more likely to decrease support when citizens consider that the SCS monitors social behaviors.

First, the SCS is being built upon the existing credit system in China and the largest component of the SCS remains *financial behaviors*. Assessing financial trustworthiness involves monitoring regular financial behaviors such as being in arrears on bank loans or housing loans, underpayment of tax, and insurance fraud. Previous studies have revealed that the SCS collects financial and commercial data (e.g., mortgages, credit cards, delayed payments) from individuals in order to evaluate their trustworthiness, and those who have financial problems may be included in a blacklist (Liang et al., 2018; Liu, 2019). For example, the People's Bank of China deploys the Credit Reference Center to assess lending and economic activities for individuals.

By contrast, *social behaviors* vary greatly by local SCS pilot program and emphasize a wide variety of trust-breaking and anti-social behaviors including traffic violations, cheating on tests, criticizing government online, playing 'too many' video games, and failing to care for elderly family members (Liang and Chen, 2022; Li and Kostka, 2022). Presented official goals of monitoring social behavior include supporting the enforcement of laws and regulations, maintaining social order, increasing interpersonal trust, and enhancing social morality through penalizing trust-breaking behaviors (Dai, 2020; Zou, 2021). Depending on the specifics of the pilot programs, the SCS penalizes behaviors such as making counterfeited products and cheating on tests but encourages moral, ethical and socially responsible behaviors such as donations, volunteering, taking care of the elderly parents and young children (Liang and Chen, 2022; Li and Kostka, 2022).

Because financial regulation and monitoring underpins the credit systems in the West, we suggest that when the SCS is seen through the lens of financial behavior, attitudes should be less

susceptible to negative Western framing. In contrast, when social behavior is centered in discussion of the SCS, the attitudes about the program should be more susceptible to critical Western framing. The basic logic is that Western countries have similar financial credit systems, and this is generally well-known in China because the state has publicized this detail since the beginning of the rollout of their credit system. As Shahin and Zheng (2020: 34) explain, “the Chinese media framed the idea of a credit system as not exclusive to China but one already in place in capitalist economies such as the United States.” This is especially true for the financial regulations embedded in the SCS; as researchers of the SCS point out, even with the pilots, the current Chinese credit system is still largely focusing on regulations of financial behavior (Liang et al., 2018). Regulations and tracking of social behavior remain in the pilot stage and are far from being implemented nationally (Li and Kostka, 2022; Reilly et al., 2021). If the West criticizes the Chinese SCS for its privacy violations and surveillance concerns, it might very well be seen as hypocrisy (Shahin and Zheng, 2020), especially if the Chinese credit system continues to largely focus on financial regulations and the social dimensions found in the pilots are deemphasized when the national program is finalized. Based on this perspective, we develop our third hypothesis.

***Hypothesis 3:*** Exposure to Western framing, in comparison to Chinese framing, will lower public support for the SCS if social behaviors are emphasized, but the effect will be attenuated or reversed if the system is seen to focus on financial behaviors.

## **Data and Methods**

To test our hypotheses, we designed a 2×2 experiment to gauge the effects of media framing and types of monitored behavior on public support for the SCS in China. The experiment was inserted in a public opinion survey distributed in April 2021. The survey was conducted by one of the largest

polling companies in China, Horizon (零点).<sup>7</sup> Using the most recent census data and the 2019 0.1% Population Census as a benchmark, the survey sets a quota for each demographic group. The survey questionnaire was made available to Horizon's three million active adult user pool but the survey was closed as soon as the quotas of each group were met. In total, 3,527 Chinese adult citizens attempted to take the survey; excluding all invalid responses and incomplete responses due to quotas being met, a total of 1,690 full and valid responses were collected. Finally selected were the 1,600 responses that match the national profile of all adult population based on age, gender, education, urban/rural and region.<sup>8</sup>

### ***Treatments***

The experimental treatments have two dimensions—the first dimension is *Western and Chinese media framing* of the SCS, and the second dimension is four different types of behavior monitored by the SCS, which we classify as *financial behavior* and *social behavior*. Both dimensions of the treatments are embedded in a one-paragraph passage provided to respondents. Respondents are required to read the passage before answering a question about their level of support for the Chinese Social

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<sup>7</sup> The survey imitates the active sampling method that is employed by YouGov but made some adjustments in its operational procedures. Like YouGov, Horizon has actively recruited and currently maintains an online user panel of 3 million Chinese adult users, out of which 3,527 users completed or attempted to take the survey. The survey aims to collect a total of 1,600 valid responses that are representative of the Chinese adult population based on age, gender, education, region and rural/urban residence. To do this, the research team uses the most recent census data and the 2019 1‰ Population Census as a benchmark to calculate a quota for each demographic group (e.g., female respondents aged 18-29 with High school education who live in urban areas in the Northeast region). When a respondent takes the survey, they will be asked their demographic information on these five areas first. Once they finish the survey, the system will scrutinize their responses and exclude responses that took less than 7.5 minutes or when respondents' demographic information is inconsistent with the registered users' demographic information. When the responses are collected, they are filling in the quota of each demographic group. Once the quota of a certain group is filled up, later submissions that fit this demographic group will not be accepted.

<sup>8</sup> The limitation of this sampling method is that there is still a self-selection process when respondents choose to participate. However, the final sample of 1,600 still strictly reflects the national profile of the Chinese total population, which is a better sampling method than drawing a convenience sample online. Whether or not the survey sample is nationally representative does not affect the internal validity of our experimental design, but it does enhance the external validity of our findings.

Credit System. Below we describe the two dimensions and the question used to measure the dependent variable.

**Table 1: 2×4 Experimental Design**

Media Framing Type	Monitored Behavior Type	Size of Group	Experimental Groups
Chinese media framing	Financial behavior - Loan defaults	197	(1) Chinese framing and Financial behavior
Chinese media framing	Social behavior - Traffic violation	208	(2) Chinese framing and Social behavior
Chinese media framing	Social behavior - Wasting time on meaningless online activities	197	
Chinese media framing	Social behavior - Inappropriate online remarks	189	
Western media framing	Financial behavior - Loan defaults	202	(3) Western framing and Financial behavior
Western media framing	Social behavior - Traffic violation	212	(4) Western framing and Social behavior
Western media framing	Social behavior - Wasting time on meaningless online activities	193	
Western media framing	Social behavior - Inappropriate online remarks	202	

The first dimension involves Western and Chinese media framing of the SCS, with the Chinese media framing describing the main goal of the SCS as enhancing social trust and social morality and the Western media stressing concerns of privacy violation and prevalent governmental surveillance. The two types of framing and their translations are included in Appendix 1.

The second treatment dimension is the type of behavior monitored by the SCS, and this information is also embedded in the same passage shown in Appendix 1. There are four different types of monitored behavior and we combine them into two general types: financial behavior versus social behavior, as shown in Table 1 above. Because we are primarily interested in exploring the effect of Western framing (in comparison to Chinese framing), and how the behavior type (social behavior versus financial behavior) moderates this effect, we combine the eight groups into four: (1) Chinese framing and Financial behavior, (2) Chinese framing and Social behavior, (3) Western framing and Financial behavior, and (4) Western framing and Social behavior.

### ***Dependent Variable***

The dependent variable represents individuals' support for the SCS. After reading the assigned passages, all respondents are asked the same question: "on a scale from 0 (extremely oppose) to 10 (extremely support), how much do you support the social credit system?" We use respondents'



answer to this question to measure their level of support for the SCS. The mean score for our full respondent pool is 7.588, with the minimum value being 0 and the maximum value being 10, and the standard deviation being 1.713.

### ***Control Variables***

We have included several control variables, such as gender, age, education, urban or rural residence, and living abroad. Moreover, following Elkins and Sides' (2007) focus on national pride, we created a *National Identity Strength* variable to measure the degree to which respondents feel socially and emotionally attached to Chinese national and cultural identity.<sup>9</sup> In Appendix 2 we provide a detailed description of these variables along with the core independent and dependent variables.

### ***Methodology***

Because the experiments use a nationally representative sample, the results of the analysis display a high degree of external validity. Moreover, the results should display a high degree of internal validity because participants of the treatment and control groups are randomly assigned. The danger of randomized experiments, though, is that they may draw spurious conclusions about the relationships between variables if by chance the treatment groups over-represent individuals with certain characteristics that relate to the dependent variable. To protect against this possibility, we use an OLS regression model of support for the SCS, which includes dummy variables for the treatment groups (with a comparison category used as a control depending on the specific hypothesis test) as

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<sup>9</sup>The national identity strength measure is an index from six items in the survey that center national pride, which is a standard approach when measuring national identity (see Elkins and Sides 2007). Respondents were asked whether they agreed with a series of six statements related the Chinese national and cultural identity, measured along an 8-point scale ranging from 0 “completely disagree” to 7 “completely agree”. The statements were: “When someone criticizes China, I feel like (s)he is criticizing me”, “When I see Chinese flag flying, I feel very passionate and proud”, “I am very proud of the economic, scientific, and sports achievements that China has made”, “We should maintain our own Chinese culture and traditions”, “I think the Chinese nation is the best nation in the world”, and “I am proud to be a Chinese citizen”. Factor analysis revealed that all the variables have an average loading of 0.77 and the Cronbach's Alpha score for the simple additive index of these indicators is 0.9. We generate a factor score variable from this loading and recoded it to a 0 to 1 scale for ease of interpretation, with higher values indicating more intense national identity. The factor score, relative to the additive index, was used because it should best minimize measurement error, though we also re-ran the models with the basic additive score as well as an average score, and the results were substantially extremely similar.

well as controls for various characteristics that may covary with attitudes towards the SCS. The demographic, behavioral and attitudinal controls include age, education, gender, race, urban residence, experience living abroad, national identity strength, communist party membership and youth league membership.

We use dummy variables to represent experimental treatment groups and always exclude one reference category. Therefore, a statistically significant dummy variable implies the corresponding treatment group has a significant effect on attitudes towards the SCS, relative to the reference category. As this treatment is a quick, one-off reading of Western and Chinese framing, when assessing the hypotheses, we focus on whether an effect is statistically significant and its direction rather than the magnitude of the effect, which we would expect to be depressed relative to a more forceful or persistent treatment.

## **Results**

### ***Western vs. Chinese Media Framing***

To assess Hypotheses 1 and 2, we use OLS regression with a dummy variable, *Western Framing*, to capture the relative effect Western framing has on attitudes toward the SCS. In this dummy variable, *Western Frame*, all participants who received the typical Western media framing (i.e., participants in groups 5-8 in Table 1 above) are coded as 1; therefore, the reference category is Chinese media framing (i.e., groups 1-4 in Table 1), which are coded as 0.

**Table 2: Western Framing and Support for the SCS in China**

	DV: Support for SCS	
	B	SE
Western Frame	-0.17 *	0.08
Gender	0.1	0.08
Age	0	0.004
Education	0	0.05
Urban	0.02	0.11
Lived Abroad	-0.06	0.22
National Identity Strength	2.64 ***	0.25
Youth League Member	-0.38 ***	0.11
Communist Party Member	0.04	0.3
Constant	5.56	0.36
<hr/>		
R <sup>2</sup>		0.08
N		1,599

\*: P-value <0.05; \*\*: P-value<0.01; \*\*\*: P-value<0.001

**Note:** Higher values on the variables indicate: greater support for social credit system, female, age, education, urban residents, lived abroad, strength of Chinese national identity, party members, Youth League members.

As Table 2 shows, the coefficient for the *Western Frame* dummy variable is statistically significant and negative. Respondents who read a typical Western frame that centers worries about privacy violation, social control and surveillance report lower levels of support for the Social Credit System relative to those exposed to the Chinese frame. This finding conforms to the expectations of Hypothesis 1, but does not support Hypothesis 2 that suggests Chinese citizens may be inoculated against influence from Western framing. When presented with the standard Western view of the SCS, Chinese citizens tend to demonstrate lower levels of support for the SCS compared to when they receive the typical Chinese framing.

### ***Framing Effect by Type of Monitored Behavior***

To test our third hypothesis, we examine how the influence of Western media framing on support for the SCS may be moderated by the types of behavior included as part of the system. To do this, we introduce the second treatment dimension which consists of different types of monitored behavior by the SCS (shown in Table 1 above). We group these behaviors into two variables – financial behavior and social behavior – and test how the behavior type moderates the relationship between media framing and attitudes toward the SCS. Essentially, we intend to test whether Western framing (relative to Chinese framing) has a different effect when individuals are told that SCS monitors financial behavior versus social behavior.<sup>10</sup>

Figure 1 below shows the results, and a full model is included in Appendix 3. The main takeaway is that Western framing, relative to Chinese framing, has no significant impact on support for the SCS when financial behaviors are centered in the treatment vignettes. In other words, when individuals are told that the SCS monitors citizens' financial behavior, the Western framing focusing on surveillance and privacy concerns *does not* produce lower levels of support for the SCS compared to the Chinese framing.

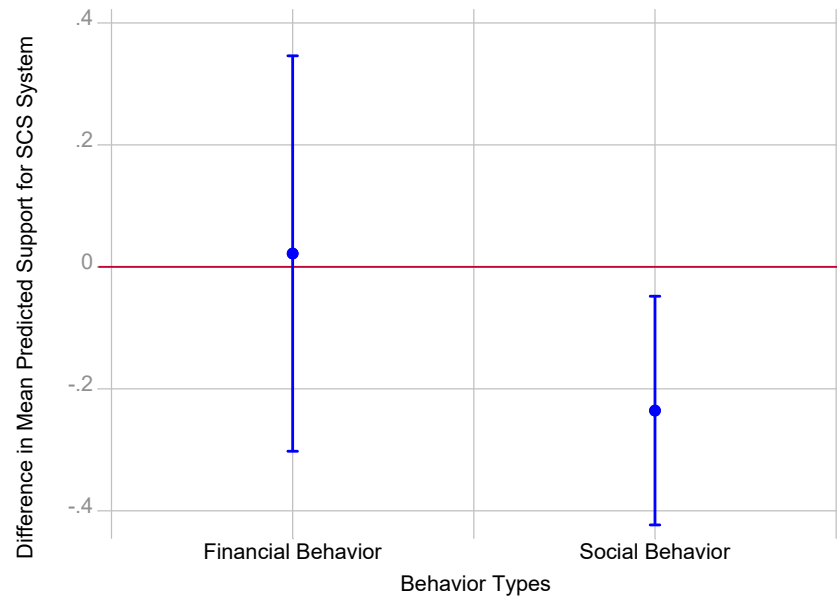
However, the treatment groups that provide information about the Social Credit System monitoring of social behaviors show a different response. For the social behavior treatment groups, exposure to Western framing (in comparison to Chinese framing) results in significantly lower support for the SCS. In other words, when Chinese citizens are told that the SCS monitors social

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<sup>10</sup> We have conducted this analysis in two ways to verify the validity of our results. First, we include *Western Frame*, *Social Behavior*, an interaction term between the two variables, and a full set of control variables in a regression model. The results are included in Appendix 3 (Table 1A). Second, we create four dummy variables: (1) Chinese framing and Financial behavior, (2) Chinese framing and Social behavior, (3) Western framing and Financial behavior, and (4) Western framing and Social behavior. We include three of them in a regression model with all the controls and leave a reference category out; by doing so, we can compare the effect of each of the three groups with the reference group. The results are included in Appendix 3 (Table 1B). When we graph the moderating effect of *Behavior Type* on the relationship between *Western Frame* and *Support for the SCS*, the graph turns out to be the same, as these two types of models are two alternative ways of capturing the same effect.

behavior, exposure to Western framing focusing on surveillance concerns results in lower relative support for the system.

Figure 1: Marginal Effects Contrast from Chinese to Western Framing Across Behavior Types



Taken together, these results lend support for Hypothesis 3.<sup>11</sup> It seems that if the Chinese SCS remains largely focused on financial regulations, but the West overwhelmingly criticizes it for its privacy violation and surveillance concerns, Chinese citizens may perceive this framing as Western hypocrisy or hyperbole and therefore discount the Western message (Shahin and Zheng 2020). Yet, if the Chinese SCS expands nationally into social domains, the Western framing will likely have a negative effect on Chinese citizens' support for the system.

<sup>11</sup> We also ran an analysis using each of the individual behaviors separately to assess whether just one of the social behaviors is driving these main results or whether the three social behaviors influenced Western framing similarly. We find that Western framing produces similar effects across the three social behaviors, with all three coefficients negative and of comparable magnitude. See Figure 1 in the Appendix 4.

## Conclusion

Our study explores some determinants of Chinese attitudes towards the Social Credit system and makes the following theoretical contributions. First, we expand the existing information and knowledge hypothesis by comparing Western media framing and Chinese media framing. As discussed, while previous research focused mainly on whether and how exposure to factual information about the SCS could affect public support for the SCS (Xu et al., 2021), less attention was paid to alternative media framing of the program's wider implications. We argue that, in addition to knowledge about how the system works, how news outlets frame the societal consequences of the SCS plays a role in explaining public approval for the SCS. Many Chinese citizens can obtain Western media coverage through bypassing the Great Firewall, and meanwhile, Chinese media and social media users also share news created by Western media. Given that Chinese media and Western media tend to highlight different aspects of the SCS and frame it differently, we propose and test two competing hypotheses. Our findings suggest that, overall, exposure to Western media framing produces lower levels of support for the SCS compared to a Chinese framing. This shows that framing the SCS as a surveillance and repression tool influenced approval of the SCS in China, suggesting that Chinese citizens' attitudes are not wholly inoculated against Western framing.

Interestingly, we also find that the influence of Western media framing on public support for the SCS is dependent upon what types of behavior the SCS intends to regulate. The results demonstrate that when Chinese citizens realize that the system focuses on social behavior regulations, Western media framing (relative to Chinese framing) has a negative effect on attitudes towards the SCS. In contrast, Western media framing seems to trigger a "hostile media effect" when Chinese citizens are primed to view the SCS as focusing on financial behavior regulations, and in this scenario, Western framing does not negatively influence support for the SCS. Because Western countries have similar financial credit systems, Chinese citizens may see Western criticisms as

hypocrisy and therefore their attitudes may not be swayed by negative Western media reports on the SCS. If our finding is generalizable outside of the experimental design, it will have important implications on the future prospects of the SCS. If (and as long as) Chinese citizens continue to see the SCS as primarily focused on financial domains, the public will likely maintain a high level of support for the system despite criticisms coming from the West; the Chinese government may not even need to downplay or deemphasize the various individual punishments embedded in the SCS for the system to maintain popular support.

Our study has several limitations. First, while the use of an experimental design fruitfully tests the causal linkage between media framing and public support, we can only observe short-term causality in an artificial setting and our study lacks ecological validity<sup>12</sup>. Thus, it is unclear whether exposure to Western media framing leads to any long-term effect. Future research could address this limitation by using panel data, case studies and other qualitative research methods. Second, in order for the survey (with the experiment embedded in it) to pass the political screening, we unfortunately could not differentiate information source and content. In other words, because having a treatment that directly criticizes the SCS would likely not survive the screening, the survey combined the source of the criticism (i.e., Western media) with the content of the criticism. However, combining the source and content leaves us unsure whether it is the source (i.e., Western media) or the content (i.e., privacy frame) that affected support for the system. Future studies could try to differentiate and assess how information sources and negative messages impact support separately.

Overall, our results suggest that media framing can play a role in explaining Chinese public attitudes towards the SCS. Chinese citizens who consume Western framing centering privacy and surveillance concerns tend to display lower relative levels of support for the Chinese SCS, but only

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<sup>12</sup> By embedding our experiment into a nationally generalizable survey, our design does have enhanced generalizability compared to experiments done with a small convenience sample.

when social behaviors are a key part of the system. As such, if social behavior regulations expand further and become a major part of the national SCS program, and if Western framing widely penetrates into common discourse within China, then our results suggest that Western framing could negatively shape attitudes about the Chinese SCS. Alternatively, if the national SCS program continues to focus mostly on financial behavior regulations, then based on our results, we would expect Western media framing to have little impact on Chinese public opinion. Of course, given our experimental design, future researchers will need to use more generalizable techniques to further test these mechanisms. Taken altogether, our work should help illuminate the reach and limits of Western media framing in shaping Chinese attitudes.



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## Appendix 1: Vignettes on Media Framing and Behavior Types

### First Dimension of Treatments-Western Media Framing vs. Chinese Media Framing

The first treatment dimension involves Western and Chinese media framing of the SCS, with the Chinese media framing describing the main goal of the SCS as enhancing social trust and social morality and the Western media stressing concerns of privacy violation and prevalent governmental surveillance. Please see below for the vignettes in both Chinese and English.

**Chinese media framing:** *China plans to establish a nationwide social credit system. Under this system, if individuals (commit a certain type of wrongdoing, see the second treatment below) their social credit score will be hurt. Individuals with low social credit scores will be restricted high-level consumption and their children's education may be impacted too. The main purpose of the social credit system is to enhance the level of honesty and trust among members of the society, to crack down fraud and counterfeiting, to improve the standard of public conduct and social ethics.* 我国拟在全国范围内建立社会信用体系。在这一体系下，个人如果(……)，则其社会信用分数会大打折扣。社会信用分数低的人会被限制高消费，甚至影响其子女上学。我们国家建立这套体系的主要目的是提高全社会的诚信意识和信用水平，打击各类诈骗和制假贩假行为、净化社会风气、提升社会公德。

**Western media framing:** *China plans to establish a nationwide social credit system. Under this system, if individuals (commit a certain type of wrongdoing, see the second treatment below) their social credit score will be hurt. Individuals with low social credit scores will be restricted high-level consumption and their children's education may be impacted too. Western media have doubts about China's SCS. Even though the system may enhance social trust, Western media argue that the large quantity of data collected violate citizens' privacy and the government can use the system as a tool for social control.* 我国拟在全国范围内建立社会信用体系。在这一体系下，个人如果(……)，则其社会信用分数会大打折扣。社会信用分数低的人会被限制高消费，甚至影响其子女上学。然而，西方媒体对中国的社会信用体系普遍存在疑义，他们认为这一体系虽然能够提高民众的诚信意识，但一来收集到的大量数据可能会侵犯到民众的个人隐私，二来公民生活的方方面面都将被监控、分析、评级，并给个人带来各种后果，恐会成为一种社会控制手段。

### Second Dimension of Treatments-Types of Monitored Behavior by the SCS:

The second treatment dimension is the type of behavior monitored by the SCS, and this information is also embedded in the same passage (as seen in the parenthesis in the above passages). There are four different types of monitored behavior: (1) loan defaults and failure to repay debts (i.e., financial behaviors) 拖

欠银行贷款逾期不还, (2) violation of traffic laws such as speeding, drunk drive, breaking a red traffic light (social behaviors) 个人如果出现酒驾、超速、闯红灯、在火车上吸烟等行为, (3) playing online video games and wasting too much time on meaningless and frivolous online activities (social behaviors) 出现上网购买太多电子游戏或浪费太多时间在轻浮或者无聊的事情上, and (4) inappropriate remarks or comments online (social behaviors) 在网上或者社交平台上发表不当言论. Combining the two treatment dimensions, there are 8 different types of passages provided to respondents, and as a result, respondents are randomly assigned into 8 different groups, with each group receiving one passage. With 1,600 respondents, we have about 200 respondents in each group. Table 1 presents a summary of the 8 treatments and the sizes of these randomly assigned groups. Because we are primarily interested in exploring the effect of Western framing (in comparison to Chinese framing), and how the behavior type (social behavior versus financial behavior) moderates this effect, we combine the eight groups into four: (1) Chinese framing and Financial behavior, (2) Chinese framing and Social behavior, (3) Western framing and Financial behavior, and (4) Western framing and Social behavior.

## Appendix 2: Survey Design and Screening Process

The experiment was designed by authors of this article, and this experiment was inserted in a survey overseen by researchers from Huazhong University of Science and Technology. The survey was funded by the National Social Science Foundation of China. Two authors of this paper are members of the research team and they are affiliated with Huazhong University of Science and Technology. The research team has obtained approval from the Institutional Review Board (IRB) of Huazhong University of Science and Technology for this study.

One of the largest polling companies in China, Horizon (零点), was hired to administer the survey. After receiving the survey questions, Horizon sent the survey questions to the Department of Industry and Information Technology for screening. The screeners never raised any concerns about the experimental design; in other words, the vignettes and the questions for this paper were conducted as originally submitted. Yet, the survey authors were concerned that if they separated the “source” and “content” of the western media framing, the design may not pass the screening. In other words, the current vignette reads like this: *Western media have doubts about China's SCS. Even though the system may enhance social trust, Western media argue that the large quantity of data collected violate citizens' privacy and the government can use the system as a tool for social control.* If we separated the “source (i.e., western media)” from the content of the criticism, the criticism may seem to come from the researchers. That might result in this whole design not being approved. To be cautious, we decided to include the source and content of the criticism both in the vignette. We discuss the implications of this decision in the paper.

## Appendix 2: Description of the key variables

**Table A1: Individual-level Variable Descriptions and Measurement**

Variable	Description	Range, Mean, Standard Deviation
<b>Support the Social Credit System</b>	Response to question: How much do you support the social credit system?	<b>Range:</b> 0-extremely oppose; 10-extremely support <b>Mean:</b> 7.59 <b>SD:</b> 1.71
<b>National Identity Strength</b>	Index of individual responses to questions regarding Chinese national and cultural pride.	<b>Range:</b> 0-low national identity strength; 1-high national identity strength <b>Mean:</b> 0.76 <b>SD:</b> 0.17
<b>Youth League Member</b>	Binary variable indicating that respondent is a member of the Youth League.	<b>Range:</b> 0-Not a Youth League Member; 1-Youth League Member <b>Mean:</b> 0.24 <b>SD:</b> 0.43
<b>Communist Party Member</b>	Binary variable indicating that respondent is a member of the Communist Party.	<b>Range:</b> 0-Not a Communist Party Member; 1-Communist Party Member <b>Mean:</b> 0.02 <b>SD:</b> 0.14
<b>Gender</b>	Gender of the respondent.	<b>Range:</b> 1-male; 2-female <b>Mean:</b> 1.49 <b>SD:</b> 0.50
<b>Age</b>	Self-reported age of the respondent at the time of the survey.	<b>Range:</b> 18 to 75 <b>Mean:</b> 43.9 <b>SD:</b> 14.5
<b>Education</b>	Self-reported highest level of education completed by the respondent.	<b>Range:</b> 1-elementary school or below; 2-middle school; 3-High School; 3-3-yr. College; 4-University degree; 5-Graduate degree <b>Mean:</b> 2.12 <b>SD:</b> 1.07
<b>Urban</b>	Indicator of whether respondent lived in a rural or urban location.	<b>Range:</b> 0-rural; 1-urban <b>Mean:</b> 0.61 <b>SD:</b> 0.49
<b>Lived Abroad</b>	Indicator of whether respondent lived abroad for 1 month or longer.	<b>Range:</b> 0-No; 1-Yes <b>Mean:</b> 0.04 <b>SD:</b> 0.19



### Appendix 3: Testing the moderating effect of Behavior Types on the relationship between Western Frame and Support for the SCS.

As mentioned in the paper, we have run two models to test our hypothesis 3. First, we include *Western Frame*, *Social Behavior*, an interaction term between the two variables, and a full set of control variables in a regression model. The results are included in Table 1A below. Second, we create four dummy variables: (1) Chinese framing and Financial behavior, (2) Chinese framing and Social behavior, (3) Western framing and Financial behavior, and (4) Western framing and Social behavior. We include three of them in a regression model with all the controls and leave a reference category out; by doing so, we can compare the effect of each of the three groups with the reference group. The results are included in Table A2 and Table A3 below.

**Table A2: Framing, Behavior and Support for Social Credit Experiment in China**

	DV: Support for SCS	
	B	SE
<b>Experimental Design Groups</b>		
Chinese Framing and Financial Behavior	-0.10	0.14
Chinese Framing and Social Behavior		
Western Framing and Financial Behavior	-0.08	0.13
Western Framing and Social Behavior	-0.24 **	0.10
Gender	0.10	0.08
Age	0.001	0.004
Education	0.001	0.05
Urban	0.02	0.11
Lived Abroad	-0.05	0.22
National Identity Strength	2.63 ***	0.25
Youth League Member	-0.37 ***	0.11
Communist Party Member	0.05	0.30
<b>Constant</b>	5.58	0.36
Adj. R <sup>2</sup>	0.08	
N	1599	

\*: P-value <0.05; \*\*: P-value<0.01; \*\*\*: P-value<0.001

**Note:** Higher values on the following variables indicate: greater support for social credit system, female, age, education, urban residents, lived abroad, strength of Chinese national identity, party members, Youth League members.

**Table A3: Frame Type, Behavior Type, and Support for the SCS in China, 2021**

	<b>Model 1</b>		<b>Model 2</b>	
Gender	.10	(.08)	.10	(.08)
Age	.00	(.00)	.00	(.00)
Education	-.00	(.05)	.00	(.05)
Urban	.02	(.11)	.02	(.11)
Lived Abroad	-.06	(.22)	-.05	(.22)
National Identity Strength	2.64***	(.25)	2.63	(.25)
Youth League Member	-.38***	(.11)	-.37	(.11)
Communist Party Member	.04	(.30)	.05	(.30)
Frame (Chinese vs. Western)				
Western Frame	-.17*	(.08)	.02	(.17)
Behavior Type (Financial vs. Social)				
Social Behavior			.10	(.14)
Frame x Behavior Type				
<i>Western Frame x Social Behavior</i>			-.26	(.19)
<b><i>Constant</i></b>	5.56***	(.36)	5.48***	(.38)
Adj. R <sup>2</sup>	.07		.07	
N	1,599		1,599	

\*: P-value <0.05; \*\*: P-value<0.01; \*\*\*: P-value<0.001

Note: Entries are OLS coefficients estimated using Stata 16, with standard errors in parentheses.

Higher values on the variables indicate: greater support for social credit system, female, age, education, urban residents, lived abroad, strength of Chinese national identity, party members, Youth League members.

The more intuitive way of interpreting the results is through graphs. When we graph the moderating effect of *Behavior Type* on the relationship between *Western Frame* and *Support for the SCS*, the graph turns out to be the same for both models, as these two types of models are two alternative ways of capturing the same moderating effect. Please see Figure 1 in the paper.

### Appendix 3: Robustness check: breaking *Behavior Type* down into four categories

We also ran an analysis using each of the individual behaviors separately to assess whether just one of the social behaviors is driving these main results or whether the three social behaviors influenced Western framing similarly. We find that Western framing produces similar effects across the three social behaviors, with all three coefficients negative and of comparable magnitude. See Figure A1 below for this result.

Figure A1

