PM ME THE TRUTH: POLITICAL BIAS, MEDIA LITERACY, AND SOCIAL NETWORK PLATFORMS

ABSTRACT. We hypothesize that the partisan bias overshadowing fact-checking can be mitigated if the corrections are provided through private messages instead of public posts; the social pressure within the interaction on public social media encourages ‘bias confirmation’ rather than ‘bias correction.’ In Study 1, we exploit a unique observational data from a popular private messenger app (LINE) in Taiwan. This real-world archive reveals that frequent interactions with fact-checking chatbot significantly increase users’ ability to discern misinformation. In Study 2, a national survey (n=1060) in Taiwan right before the 2020 Presidential election suggests that visiting fact-checking sites significantly enhances the media literacy discerning both political and non-political misinformation. In Study 3, a survey experiment (n=601) manipulating publicity and partisanship shows that people do not welcome corrections that contradict their predisposition; but the resistance can be reduced if the corrections were sent through LINE than Facebook. Its implication on battling misinformation is discussed.

Keywords: Fact-checking, misinformation, media literacy, private messengers, social network platforms
Since the 2016 U.S. election, a flurry of recent research has focused on understanding the spread and the effect of “fake news” on social media—such as Facebook, Twitter, and Instagram. Given the nature of these open platforms, fake news can easily get access to thousands of online users in a short time and is believed to have profound impacts on misleading public opinions, promoting misperception, and posting severe threats to democracy. Given the perceived threats, significant efforts are made to combat the circulation of fake news on social media \cite{Lazer2018}. Facebook, for example, has launched news guards and warning systems to crack down rumors on social networks.

However, a recent spate of news stories worldwide pointed to a different and possibly more urgent problem—the spread of misinformation on popular messaging services, such as WhatsApp, WeChat, and Line. Studies have found that rumors spread quickly via person-to-person interactions \cite{Carlson}. Private messengers can even aggravate the spread of rumors between users due to its convenience in communication and its privacy. Social messaging apps have become widely popular worldwide since they are designed in culturally specific ways to promote usage and take advantage of third-party workarounds to add extra layers of utility, which creates new avenues of potential abuse in the process. The nature of private apps makes it difficult to curb fake news because these messages are protected by encryption. Not even the administrators of these messengers can effectively trace and stem the flow of misinformation.

The swirling false information on private messengers has led to serious consequences in countries where they are highly popular. In Mexico, two people were beaten and burned to death in August 2018 after rumors spread on WhatsApp of people kidnapping children and harvesting organs. In India, a video edited to look like a kidnapping event that spread on WhatsApp inspired mobs to kill two dozen people.\footnote{https://www.nbcnews.com/tech/tech-news/how-whatsapp-became-linked-mob-violence-fake-news-why-it-n929981} In Taiwan, elections were overwhelmed by misinformation spread on the LINE app. Programmers who run a fact-checking bot on the app reported that at least 20 percent of the misinformation came from China.\footnote{https://www.stopfake.org/en/made-in-china-fake-news-overwhelms-taiwan/}
Current responses to misinformation have largely relied on fact-checking as a tool to determine the veracity of news articles shared online. However, questions regarding its effectiveness remain understudied. Is fact-checking effective in reducing misperceptions when people read false information? Among a few existing research, the findings are rather inconsistent and sometimes contradictory. Some studies have found that fact-checking help correct people’s perception of news (Fridkin, Kenney and Wintersieck, 2015; Porter, Wood and Kirby, 2018; Clayton et al., 2019), whereas others found it ineffective and sometimes even counterproductive because it can backfire when people find the correction contradicting their prior belief (Nyhan and Reifler, 2010). More importantly, we know very little about its effectiveness across different social media platforms. There is little to no literature investigating how fact-checking works in correcting news perceptions, particularly on private messengers. It remains an open question on how people behave similarly or differently when they see news alerts on open platforms versus private messengers.

We probe into these important questions by examining the role of fact-checks in changing citizens’ views of false information and the difference in effect between open and private platforms. We first argue that people will benefit the most from corrective information when they do not harbor strong political beliefs and are open to corrections. They are more willing to interact with fact-checking mechanisms, and the frequent interaction helps ‘train’ users better at discerning false news and gain media literacy. By contrast, people harboring strong political priors are prone to dismiss corrections and even discredit fact-checkers. We also contend that people welcome political corrections shared on private platforms more than the open ones. The large audience on open social media creates social pressure that encourages ‘bias confirmation’ rather than ‘bias correction,’ whereas private environments with limited audience motivate people to welcome political corrections and avoid public shaming.

We test our argument using (1) a unique observational archive (2017-2019) from a popular private messenger app (LINE), (2) a national survey, and (3) one randomized survey experiment in Taiwan. In recent years, Taiwan has been heavily inflicted by fake news attacks and is now ranked the top among all countries that are routinely influenced by disseminating
false information by foreign countries (Mechkova et al., 2020). The severity of fake news infiltration raised the attention of the Taiwanese government, which started to sponsor programs to combat fake news on social media. In addition to governmental collaboration with open platforms such as Facebook, sponsorship has also gone to civil groups that help design fact-checking chatbots on private platforms, such as LINE, to dissipate false information. Both LINE and Facebook are widely used by the Taiwanese population and are rampant with false information. The wide usage of both platforms and false information plagued on Taiwanese social media make the country a fruitful setting in which to test the expectations of our argument. The rare individual-level fact-checking data within the private messenger combined with a randomized survey experiment also aids in identifying the cognitive process of fake news awareness and fact-checking susceptibilities.

Results using chatbots archive affirm that people who frequently interact with fact-checkers increase their ability to discern fake news. Our survey result also suggests that frequent fact-checking site users in Taiwan indeed have a higher level of media literacy, enforcing the external validity of our findings. Additionally, results in the survey experiment show that people generally welcome fact-checking information. Although people tend to dislike fact-checking that contradicts their political predisposition, this bias is significantly mitigated when the fact-checking information is sent through private messengers.

Our results contribute to the existing literature on misinformation and fact-checking in several important ways. First, our findings provide an optimistic view of fact-checking’s effectiveness amongst the debate of its usefulness, showing that frequent interaction with fact-checkers helps increase the reader’s ability to discern fake news and gain media literacy. We also show that frequent interaction has a long-term impact on media literacy improvement rather than a short-term improvement in a single-shot encounter. Second, our study expands on prior literature that focused narrowly on open platforms on social media by demonstrating how fact-checking changes perceptions of information shared on private platforms. Using rare individual data from a private messenger and combining it with a randomized survey experiment, we specify conditions and mechanisms through which corrective
information is more welcomed and helps cultivate media literacy. Lastly, our findings point to the potential hurdle in fighting political misinformation when corrections or alerts are unwelcome by citizens who hold a strong predisposition. It may suggest a scope condition of fact-checking effectiveness in terms of the platforms and the reviewed content.

THE EFFECTIVENESS OF FACT-CHECKING ON SOCIAL MEDIA

Whether fact-checking can change people’s perceptions on false information remains debated. Some studies found that fact-checking increases awareness of misinformation and corrects people’s beliefs. Well-designed news alerts are found to be effective in countering false information on social media (Fridkin, Kenney and Wintersieck, 2015; Porter, Wood and Kirby, 2018; Clayton et al., 2019). However, others found that it depends. How effective fact-checking can correct misperception is related to the format of the message (Young et al., 2018; Ecker et al., 2020), the context of the message (Garrett, Nisbet and Lynch, 2013), issue salience (Mercier, 2020), the strength of the prior belief (Nyhan and Reifler, 2010), and the perception of the fact-checker (Nieminen and Rapeli, 2019).

Many studies raise the concern of pre-existing political biases and individual preferences that can reduce corrective information effectiveness. Nyhan and Reifler (2010) show that people are motivated to dismiss corrections that are incongruent with their existing partisan or ideological preferences. In some scenarios, corrections can even strengthen misperceptions among the strongly committed respondents. Similarly, Jarman (2016) shows that the respondents become more polarized after reading the fact-checking information, and Flynn, Nyhan and Reifler (2017) find that when people exhibit socially undesirable preferences (i.e., discriminating black candidates), they prefer to accept information that justifies those preferences and behavior. These findings point to less optimistic views on the effectiveness of fact-checking.

In the literature of misinformation studies, most research focuses on fact-checking effectiveness on open platforms, such as Facebook and Twitter. However, few studies discuss its effect on private platforms, such as WhatsApp, LINE, or WeChat, remain scarce. These
private messenger apps are very popular across the world, and its popularity also makes it a convenient target for misinformation attacks. Scholars have recognized the significant threat of misinformation on private messengers, which can be harder to detect and combat due to the encrypted nature. But empirical work on this topic remains lacking. Given the significance of widespread fake news on private messengers, it is imperative to study the platform effect on the effectiveness of fact-checking and see if existing findings from open social media can travel to private platforms.

**MEDIA LITERACY, POLITICAL BIASES, AND PLATFORM EFFECTS**

Whether fact-checking can help correct perceptions of misinformation depends on whether it can earn trust from people. If people believe that the correction they receive is impartial and reliable, they are more willing to accept it and continue receiving information from the fact-checker. Continuous interaction with fact-checkers helps increase people’s ability to identify false information in the future. In certain ways, accepting and digesting corrective messages from fact-checkers resemble a literacy training process. The more participation people dedicate in training, the better skills people earn by capturing key features of misinformation and tips that help them distinguish between reliable and dubious messages. These skills, once earned, can benefit not just individual trainers but also people in the network where people can share tips on how to discern false information and messages distributed on social media.

Although human is cognitive beings trying to construct a world that makes sense, we are also social animals. We are wired to categorize in-group and out-group members by any arbitrary standard (Diehl, 1990). In highly polarized politics, partisanship is seen as a salient group identity that drives opinion and attitude. This long-term psychological group attachment influences every step of information processing. A simple partisan cue can prevent people from engaging in effortful processing (Petersen et al., 2013). Rossignac-Milon and Tory Higgins (2018) suggests the *shared reality* mechanism to explain how people are biased toward the group identity. For example, using a series of experiments Higgins
and colleagues show that subjects will describe a target person to an in-group audience much more negatively when they are told that the audience dislikes the target. After the description, the experimental subjects’ memory is also found biased in the same direction as the audience in the recall task. Interestingly, such a bias disappears when the audience is an out-group member or when other monetary motivations were added. Therefore, individuals tend to construct a shared reality with other in-group members when the group identity is salient. Hence, processing the fact-checking information, especially those highly political ones, cannot be exempted. If people do not perceive corrections as reliable because they contradict their political predispositions, people tend to resist corrections and even increase their level of trust in the news being corrected. This rejection effect often occurs when people harbor strong ideological views and consider the corrective information as ‘politically incorrect’ (Nyhan and Reifler 2010). It is cognitively easier to accept corrections congruent with people’s prior beliefs than to accept corrections that contradict their view. The above argument allows us to derive the following hypotheses:

**H1:** Frequent use of fact-checkers increases people’s ability to identify false information and gain media literacy.

**H2:** People tend to reject corrections shared by fact-checkers when the corrections contradict their political predisposition.

In thinking about individual’s behavior in accepting or rejecting corrections, we also consider how it may vary across different social media platforms. Two prominent features distinguish media that allow more open access and platforms that are designed to protect privacy. First, platforms such as Facebook or Twitter provide a relatively open space for people sharing and viewing posts. Corrective intervention typically comes in the form of pop-up alerts or tags to advise caution, and these alerts are ‘automatically attached’ to the posts by the platform without any authorization from the users. People also have little knowledge of why a post is banned and how it is considered to have false information. This uncertainty can increase distrust in corrective intervention on open platforms. By contrast,
Fact-checking alerts are typically ‘shared’ by a group member into their private chatroom because private messengers’ encrypted environment forbids message filtering and proactive intervention. Corrective information shared by a close friend on private messenger apps is more acceptable than a correction sent by the platform authority with unknown sources. If the correction is related to political content, people are more willing to trust it when shared and certified by a known friend.

The second feature that differentiates open and private platforms is the pool of audience. We have good reasons to believe that people act and expect differently on different social media platforms. For example, a focus-group study conducted by the Pew Research Center shows that young people already notice the difference between public posts and private messaging [Madden et al. 2013]. They tend not to share inside jokes publicly but with their close friends privately. They would rather not upload many selfies on their online account to maintain a clean and neat profile; instead, they prefer to share selfies via emails. This example shows that people are aware that their public online behaviors and images. When people are observed, they not only adjust their behavior - they are much more likely to behave according to expectations by their peers [Crocker and Major 1989; LaFrance, Hecht and Paluck 2003]. When people are accompanied by others and were evaluated, they are much more likely to shift their performance to adhere to the standards [Karouji and Kusumi 2015].

A correction that contradicts one’s political belief may also contradict many others on the social network who share a similar political ideology. Publicly endorsing (by liking or following) an “unwelcome” view on social media can hurt one’s reputation within the social group and incur unnecessary criticism. Research also finds that social media often promotes agreeing instead of disagreeing opinions [LaFrance, Hecht and Paluck 2003]. But this social pressure is lessened on private messengers when one’s action to endorse an unpopular view or follow fact-checkers can be kept private without being examined by others. Thus, the private environment creates an incentive for users to promote correction behavior even when
the correction goes against one’s political predisposition. Therefore, we derive the following hypothesis:

**H3:** People are more willing to accept corrections contradicting their political predisposition when they are shared via private rather than open platforms.

**Research Design**

We conducted three tests to evaluate the effectiveness of fact-checking on social media. Little work has been done on private messaging apps because observing users’ behavior in such an encrypted world is difficult. It is even more difficult, if not impossible, to conduct experiments with users because the program usually forbids active push from fact-checkers to users to protect privacy. To overcome this hurdle, in our first study, we leverage a unique observational data ‘within’ messengers. The data come from a third-party fact-checking chatbot named Cofacts, the first and one of the most popular chatbots on the LINE messengers in Taiwan. According to the 2019 annual report, there are 21 million LINE users in Taiwan, where the country’s population is 23 million, showing how prevalent this messenger is. Since its high popularity, rumors are also rampant on LINE (Davis, Crowley and Corcoran 2019). To fight against the misinformation, Cofacts was established in 2016 and funded by g0v, an open-source/open-government community composed of civic hackers and engineers. The number of Cofacts registered users reached 130k in March 2020. LINE users can submit their review requests after adding Cofacts to their friend list and share reviews with their chat group. The review indicates whether false information is found in the reviewed messages with a link to detailed comments posted on their website for users to read. The data contain user IDs, the history of users’ submitted messages and whether the messages are considered having false information by Cofacts. This data provide us a unique opportunity to observe within-app users’ interaction with fact-checker.

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3 Unlike Weibo, other PM apps like LINE or WhatsApp provide users identity and forbid third party intervention in filtering messages and user blockade.


While in-app behavior is tremendously valuable in examining the effect of fact-checking usage and media literacy, some inherent issues in the data limit our ability in inference. The foremost issue is that we do not have access to the users’ biographic information protected in encryption. Hence, we cannot ‘control’ for other factors that may also affect people’s ability to identify false information. The second issue is that not all reports to the fact-checker are political contents. While we will show that our result remains robust after separating political and non-political contents, the argument that frequent interaction with fact-checkers increases people’s ability to discern misinformation regardless of content attributes can only be partially validated. Due to the above reasons, we design a second survey where we randomly select survey respondents and then examine whether frequent interaction with fact-checkers in the past will increase respondents’ ability to spot false information in our survey, especially on politically relevant content. Study 1 and 2 combined provide a complete test on our H1, which investigates whether frequent interaction with fact-checkers increases media literacy.

The above two studies are designed to examine people’s behavior after they have accepted and interacted with fact-checkers. Nevertheless, what are the conditions that dictate the likelihood of people’s acceptance of corrective information? Our hypotheses expect that politically unfavorable corrections (thus we called *unwelcome* corrections) that contradict one’s existing ideology (H2) and corrections shared on the open platforms (H3) are less likely accepted by individuals. To test these two hypotheses, we design a survey experiment where we randomly select respondents and assign treatments priming politically unwelcome fact-checking and platforms where fact-checking appears. Specifically, we test whether the subject’s response is moderated by their partisan affiliation and whether a correction sent by Facebook or LINE changes people’s reaction. The randomization of conditions (politically welcome/unwelcome corrections and open/private platforms) not only reduces unobservable biases in individuals using observational data but only helps probe how fact-checks change perception and behavior.
STUDY 1: FACT-CHECKING AND MEDIA LITERACY TRAINING IN PRIVATE MESSENGERS

The function of Cofacts is introduced below. To report dubious content to it, LINE users need to add Cofacts to their friend contacts and then forward the messages s/he received from a different chatroom to the chatbot hosted by Cofacts. If the message (sometimes in the format of figures or videos) has been reviewed by Cofacts before, then the user will receive an immediate fact-checking report on whether it is labeled as fake news and reasons for correction if it is labeled fake news. In the chatbot window, it will then ask users to provide feedback (useful or not) on the review. If the reported rumor has not yet been reviewed before, Cofacts will tell users that an answer will be posted online within four to seven days. The whole procedure of reporting and retrieving comments from the chatbot is summarized in Figure 1. Volunteers generate all fact-checking reports in regular meetings. The background of volunteers is diverse with different professions. Because of its popularity and positive image on promoting fact-checking, Cofacts is officially endorsed and cooperated by LINE company since March 2019.

![Figure 1. Procedures to report to and receive feedback from the Cofacts chatbot](image)

Data. We retrieved the data archive from the Cofacts that include all users reports from July 01, 2018, to December 25, 2018. We chose this period for two reasons. First, Cofacts updated its application with minor fixes and debugging on July 01, 2018, for the last time before Election Day, November 24, 2018. Setting July 1st 2018, as a starting point, can

keep the version of the app as constant, controlling for potential behavioral change owing to the app update. Second, December 25th 2018, is one month after the nationwide Election Day, and newly elected mayors and local congress members were inaugurated afterward. This time window around a major election allows us to examine app users’ responses to fact-checking when fake news is most rampant.

During this period, 3204 unique users submitted 4974 reports to Cofacts. The ID of the users is all encrypted, so we can only trace behaviors but not who they are. Among the users, 2342 (73.1%) submitted the report once, 527 (16.4%) submitted two reports, and 335 (10.4%) submitted three or more reports. Among the reports, 2256 (45.4%) were identified by Cofacts as rumors, while 2718 (54.6%) were not.

**Method and Operationalization.** When a report was sent to Cofacts, it implies that the user found the message suspicious. If this suspicion is proven right, it means that Cofacts confirms the user’s prior belief that this message contains misinformation. For the Cofacts users, this reply will be a ‘welcome’ fact-checking information. If the user treats Cofacts as an echo chamber for confirming the prior beliefs or group identity, they are much more likely to submit the next report so as to be confirmed again.

Cofacts protest people’s privacy and their interaction with the fact-checking is less observed by others. In this scenario, their truth-seeking motivation is less likely to be shadowed by the group identity; they are much more likely to accept the unwelcome fact-checking results.

How do users *learn* from Cofacts? If the user’s second submission is significantly much likely to be confirmed as a rumor than the first trial, it implies that the users had learned something from its first interaction with Cofacts; in this way the user is trained to obtain a higher level of media literacy - a better capacity to identify the misinformation.

Unfortunately, some limitations should be noted. LINE restricts proactive filtering or labeling news content shared on private messengers, so all the messages sent to Cofacts is self-reported by users themselves. The choice to opt-in and install the Cofacts app may imply that they are more aware of suspicious content and desire to learn how to discern fake news. Also, we do not know why Cofacts users found political message questionable. Their
suspicion could come from the news slandering the party they attach to, specific politicians they dislike/like, or an issue they pay particular attention to. Unlike the survey experiment described in Study 3, here we lack understanding of the source of suspicions and can only observe their interactions with Cofacts, which limits our confidence in inferring why they choose to believe in Cofacts’ review and why they continue/discontinue to use fact-checkers. According to a poll conducted by Line in 2019, 45% of Line users thought that it is time-consuming to check the fact even though they received suspicious messages. Hence, people would have a even lower motivation if they do not think that the message is not suspicious. Therefore, we believe that it is not unreasonable to assume that Cofact users are motivated by the messages with suspicious content.

Results of Study 1. The behavioral pattern of Cofacts users is shown in Figure 2. Among all 3204 unique users, 1362 (42.5%) of their first trial were successfully confirmed by Cofacts as a rumor, while 1842 (51.5%) were considered not as rumor. The summation is not 100% since some submissions failed to be checked by Cofacts. In their first trial, more than half of the submissions did not confirm as a rumor by Cofacts, which indicates that the Cofacts users did not have a high level of media literacy at the beginning.

How does the first confirmation/rejection influence users willingness to submit again? Among those 1362 successful rumor identifiers, 375 (27.6%) submitted the second report. Among the 1852 app users whose first report was rejected, 480 (29.1%) submitted tried again. Even though the Chi-squared test reveals indifference between the two drop rates ($p = 0.40$), the rejection replied by this private fact-checking app at least did not dissuade its users from keeping using it – even though their first trial (prior belief) was not supported.

A similar pattern also appeared in the third trial. Among the 375 respondents whose first trial was confirmed as a rumor, if their second trial was not confirmed, their dropping rate was significantly lower (43.8% to 60.0%, Chi-squared test $p < 0.005$). Among those 480 respondents whose first trail was not confirmed, if their second trial was still not confirmed, their dropping rate was also lower, albeit not significant (57.8% to 63.6%, $p = 0.24$).

Overall, Figure 2 shows that Cofacts users are much more likely to be confirmed by Cofacts when they submitted more reports, which suggests increased media literacy among Cofacts users. In the first report, 42.4% of all submissions are confirmed by Cofacts as rumors. When these users submit the second report, 65.3% of the second trials are confirmed again as rumors. Among those 51.8% users whose first report was rejected, 42.9% of their second trial succeeded. The chi-square test shows that the success rate between the two groups (the first trial confirmed and the first trial not confirmed) is significant ($p < 0.001$). The difference suggests that the Cofacts users learned from the Cofacts and are much more likely to identify more misinformation later.

![Figure 2](image)

**Figure 2.** The Behavioral Pattern of LINE Fact-Checking App Users

The result here suggests that the users were not afraid of being proved “wrong”, and they actually quite welcomed the “unwelcome” fact-checking result. They continue to use the fact-checker to increase their ability to identify false information. This result confirms our hypothesis in $H1$ that frequent interaction with fact-checkers increases user’s ability to discern misinformation and gain media literacy.

Why are successful fake news identifiers much more likely to leave the fact-checking app? One possible explanation is that they installed the fact-checking app for training themselves. If the fact-checking app confirmed their guesses, they are much more confident by their own judgment and will no longer rely on the fact-checking app in the future. Indeed, Figure 2 reveals the pattern that users are much more likely to be confirmed by Cofacts if they were confirmed in their last report. In other words, they learned from the last confirmation and gradually realized what the fake news look like in real life.
We find additional support for $H1$ by filtering out non-political messages and their reviews. Identifying political messages was done by using semi-supervised topic models. We leveraged the commonly used Latent Dirichlet allocation (LDA) topic model to extract topics in the text messages reviewed by Cofacts, and then identified topics on politics with their top 20 keywords. These keywords were then used to label each text message as politically related or not via a binary identifier. Figure A.1 in Appendix again shows that continuous interactions with the fact-checkers increase users’ ability to identify false ‘political’ information.

Admittedly, another limitation from Figure 2 is that the overall drop rate after the first submission is high (71.6%). Hence, even though those who received the unwelcome results had an lower drop rate, 70.9% still chose to stop using Cofacts anyway. Hence, it would be hard to infer the effectiveness of the fact-checking. We are not sure if these users enhanced their media literacy with only one trial of using Cofacts. Hence, in Study 2, we would like to investigate the external validity of Study 1. If Taiwanese people who have ever used the fact-checking apps or visiting the fact-checking website have, in general, a higher level of media literacy, we will be more confidence in the result of Study 1.

**Study 2: Fact-checking and Media Literacy (A survey)**

The above section shows support for the notion that people gain literacy after interacting with fact-checkers. If this pattern is true, we should expect it to be generalized to a broader population beyond the messenger app. With this idea in mind, study 2 was designed to investigate the general public’s ability to discern false information if they have frequently consulted and used fact-checkers.

The research design is straightforward. First, we create a Taiwanese fake news battery including eight verified fake and real news. Second, Taiwanese respondents ($n = 1060$) were asked about their usage of the fact-checking source and took the fake news battery right before the 2020 Presidential election. Third, the relation between fact-checking source usage and their performance in the fake news battery is examined.
Taiwan fake news battery. We follow Guess et al. (2019) their guidelines to create an eight-item fake news battery which is designed for the 2020 Taiwanese Presidential Election held on January 11, 2020. The detailed battery is reported in Table A.2 in the Appendix. Each item includes 60 to 74 Chinese characters. Item 1 and 2 are non-politics and health-related, 3 and 4 are about China, 5 and 6 are about the 2020 KMT presidential candidate Han Guo-yu, and 7 and 8 are about the 2020 DPP presidential candidate Tsai Ing-wen. All news pieces had been fact-checked by at least one of the major fact-checking sources in Taiwan before September 24, 2019.

Overall, 1060 Taiwanese respondents were recruited by Pollcracylab at National Chengchi University, Taipei, Taiwan through a random selection from its pool. PollcracyLab builds and maintains the subject frame based on the Taiwan governments household registration records. Because PollcracyLab is established under National Chengchi University, a top research university in Taiwan, it can get access to official household registration records for academic purposes. Therefore, all Taiwanese citizens have a non-zero probability of being invited for registration by PollcracyLab, a crucial foundation establishing the representativeness of any sampling procedure. Compared with other opt-in platforms such as Amazon MTurk or Survey Sampling International, PollcracyLab recruits Taiwanese subjects from diverse and more representative backgrounds. The survey was conducted from January 4 to 7, 2020 - one week before the Election Day. All subjects received NTD $50 (about USD $1.3) after completing this survey with 40 items. The whole survey design passed the IRB at the authors’ institution and was pre-registered before implementation.

The socio-demographic background of our subjects is similar to Study 3 and is presented in Table A.3 in the Appendix. Compared with the population of Taiwan, our sample is younger, fewer non-partisans, and more males. This distribution is not surprising: even though all Taiwanese people have a non-zero probability of being recruited by PollcracyLab, those who are frequent Internet users, tend to answer the online surveys, and those who are interested in politics are more likely to accept our invitation.
All subjects were asked about their media consumption across different platforms. They
were then asked “Have you ever used any Fact-checking website, such as Mygopen, Cofacts,
or Taiwan Fact-check Center?” (Yes = 1, No = 0). These three websites are the major
fact-checking source during the Election, which officially cooperates and are endorsed by
both Facebook and Line. Overall, 27.3% of Taiwanese respondents in the survey had used
fact-checking sources before the presidential election (12% more than three times, and 15.3%
one to two times). We also asked whether the respondents think that fake news is a problem
in society. Overall, 74% of respondents thought that fake news “is a serious problem”, 24%
though that fake news is a problem, and only 2% did not think that fake news is a problem.

All subjects were then asked the 8-item Taiwan Fake News Battery. They were asked to
judge whether each message is fake news or not. The ranking of the eight questions was
randomized. After the battery, subjects were asked to answer other questions beyond the
scope of this article.

Results of Study 2. Figure 3 shows the distribution of the number of correct answers made
by each subject in the Fake News Battery. We sum up the number of the correct answers to
represent the level of media literacy of the respondents. T-test shows a significant difference
in the number of correct answers between the Taiwanese respondents who experienced the
fact-checking source and who did not (5.81 to 5.65, p < 0.05).

![Figure 3. Distribution of Number of correct answer on Fake News Battery (n=1060)](https://tfc-taiwan.org.tw/articles/1231)

Propensity score matching is used to estimate the effect of fact-checking source usage on
media literacy. The exact matching method is used by the Matchit library in R 3.6.1, and

[Access: April 19, 2020]
the respondents’ age, gender, level of education, and partisanship were put into the model. The model extracts 280 respondents in the treatment group (using fact-checking source) and 623 in the control group (did not use the fact-checking source). After the matching, using fact-checking source still has a significant positive effect (5.82 to 5.66, \( p = 0.052 \)). This preliminary evidence supports \( H2 \) that using fact-checking sources can indeed enhance people’s media literacy.

Additional evidence is found when the correctness of each item in the battery is examined. Eight OLS regressions are run to explain whether the respondents answered each item correctly, which includes fact-checking source usage, worries to the fake news, age, gender, level of education, and partisanship as explanatory variables. The results are in Table 1. Results show that the fact-checking source usage can significantly (\( p < 0.05 \)) explain whether people made the correct answer in Q2, Q3, Q4, Q7, and Q8. It covers politics and non-political fake news (Q2) and across the political spectrum (Q3, Q4, Q7, and Q8).

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<th>Table 1. OLS models explaining whether people thought each item is a fact or misinformation (4 to 1).</th>
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<td>Dependent variable: Discerning the fake news (1-4)</td>
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Note: *\( p < 0.1 \); **\( p < 0.05 \); ***\( p < 0.01 \)

Taken together, Study 2 provides additional support for the effectiveness of fact-checking sources. When people frequently interact with fact-checkers, their media literacy will improve by learning from tips and suggestions provided by fact-checkers. This result is robust concerning both political and non-political contents.
STUDY 3: POLITICAL PREDISPOSITIONS AND THE PLATFORMS EFFECT

We conduct a survey experiment to manipulate the platform effect and partisan motivation. Specifically, we test whether the fact-checking information sent by Facebook or LINE will influence how people respond and whether the subject’s party affiliation affects the response. This study is designed to test $H_2$ on the partisan bias effect and $H_3$ on the platform effect. The survey experiment was conducted on April 19-21, 2019, with 601 subjects recruited. The sociodemographic background of the subjects can be found in Table A.3 in the Appendix. The whole survey design passed the IRB at the author’s institution and was also pre-registered before implementation.

Method: Experimental Design and Procedure. Regarding the manipulation of the platforms, Facebook is used as a comparison group as opposed to LINE. According to a telephone survey conducted in 2019, 98.9% of Taiwanese adults use Facebook\footnote{https://report.twnic.tw/2019/assets/download/TWNIC_TaiwanInternetReport_2019_CH.pdf} and there is no difference across generations. On Facebook, all major fact-checking source provides their fact-checking results publicly. Liu (2016) also shows that about 35% of Taiwanese people share protest-related posts publicly during the 2014 Sunflower Movement. Hence, Facebook has a higher level of publicity compared with the communication on Line in the aspect of Taiwanese respondents.

The questionnaire includes 40 items. Subjects were first asked to report their news consumption, the level of political interest, and the number of LINE messages they received daily. Survey subjects were then randomly assigned to one of the 2 (KMT or DPP scandal) X 2 (LINE or Facebook) groups. Taiwan features a two-party system where Kuomintang (KMT) and Democratic Progressive Party (DPP) dominate the major political cleavage - unification versus independence (Achen and Wang 2017; Wang 2019). In each group, they were asked to imagine that they were reading a message from “your elementary school classmates,” and the post was simulated that it was sent through a LINE chatroom or shared on Facebook. The post shows a news link describing—with a picture, a headline and a short
sentence to simulate the online environment—a previously unreported sex scandal involving several city councilors belonging to either KMT or DPP. Two sample messages are shown in Figure 4. After reading the news message, each subject was asked whether they trusted in the news (from 0 to 100).

After the message, all subjects read a message from the fact-checking app that disapproves of the previous fake information they just read. The fact-checking message was posted on the same platform as the fake news. Two examples are shown in Figure 5. This short rebuttal format follows Ecker et al. (2020) that has been found effective on fact-checking.

All subjects then answered a series of follow-up questions. They were asked how much they still believe in the original fake news (0-100), whether they will add the News Helper to their friend list on the social media, and whether they think the fact-checking information
At the end, they were debriefed that the fake news was designed by the experimenters and was compensated NTD $100 (about USD $3).

Overall, all 601 subjects completed the survey (100%). The zero dropout rate implies that the length of the questionnaire did not create a substantially cognitive burden on the subjects, so they could focus on the questions and were not distracted. Moreover, the researchers at PollcracyLab informed us that they did not receive any complaints during this survey implementation. This report enhances our confidence in the validity of the experimental design.

**Measurement.** The platform difference was manipulated by the frame of Facebook and Line. Overall, 300 (50.0%) and 301 (50.0%) are assigned to read LINE and Facebook messages, respectively. The motivation is captured through the manipulation of the partisanship in the assigned fake news and fact-checking post. We assume that our respondents tend to “unwelcome” the fact-checking result because it helps the party they dislike. For example, if a DPP supporters read a KMT scandal first and then the KMT scandal was debunked by the

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10 After this experiment, all subjects then went through other experiments that are beyond the scope of this article. This experiment was conducted first so there would be no spoil-over problem.
fact-checking message, the fact-checking message is “unwelcomed” to the DPP supporter. In contrast, if the DPP supporter read a DPP scandal first and then the DPP scandal was debunked, this fact-checking message is welcomed in the eye of DPP supporters.

However, we did not use the direct measure of partisanship for three reasons. First, unfortunately, there is no item asking respondents’ party affiliation in this survey. Second, the number of self-reported nonpartisans broke the record in 2018 in Taiwan [Wang, 2019]. Many Taiwanese people hid their party affiliation because they are motivated to pretend neutral [Lee et al., 2017]. Third, when the survey was launched in April 2019, both KMT and DPP were struggling in its presidential primaries. People are more sensitive and less willing to reveal their party affiliation as political candidates harshly attacked each other in the primaries [Klar and Krupnikov, 2016].

An alternative measure is used to measure partisanship within the political context of Taiwan: attitude toward China. In Taiwan, the Independence-Unification issue with China is the most prominent issue dominating Taiwan politics. At the end of the survey, all subjects are asked to evaluate their attitudes toward China, from 1 (dislike very much) to 7 (like very much). We consider that the respondents who answered 1 to 3 are pro-DPP (303, 50.4%), and those who answered 5 to 7 are pro-KMT (136, 22.6%). Respondents who answered 4 were dropped from the analysis (162, 27.0%). One major drawback of this measure is that this question is asked after the treatment [Klar, Leeper and Robison, 2020]. However, the China-Taiwan relationship is the dominant issue in Taiwan politics and most of Taiwanese people have a strong opinion toward it before the experiment. Moreover, the treatment in this experiment did not mention China. Hence, we believe that the respondent’s attitude toward China will not be influenced by the treatment assignment in Study 3.  

If a pro-KMT supporter reads a KMT scandal, s/he should believe in the news less. After reading the fact-checking apps rebuttal that the KMT scandal is fake news, the pro-KMT supporter should welcome this rebuttal and distrust the original content more. The same

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11An alternative measure is “which politician below can the best handle the Taiwan-China relationship?”. Respondents who chose DPP politicians could be pro-DPP, and vice versa. Overall, 80.8% of respondents are coded to be the same category in both measures. The analytical results are also similar.
logic applies to DPP supporters. We then distinguish the samples into two groups based on their party identification and the assigned message. If a KMT supporter read a fact-checking rebuttal of a KMT scandal or a DPP supporter read a rebuttal of a DPP scandal, such a rebuttal is a “welcome fact-checking”. If not, the fact-checking information will be regarded as the “unwelcome fact-checking.” In our experiment, 234 (38.9%) received the “welcome FC” treatment, while 205 (34.1%) received the “unwelcome FC” treatment.

We then capture the interaction with fact-checking by three dependent variables: 1) change of distrust to the original news, 2) the tendency to add the fact-checking account to the friend list, and 3) evaluating the unbiasedness of the fact-checking source.

We exploit the within-subject design to estimate how the treatments influence subjects’ change of perception to the fake news. We expect to see that it is harder to change people’s minds in the “unwelcome FC” group since it contradicts the respondent’s political belief.

Moreover, we should observe that the respondents who read the fact-checking message on LINE should be less polarized compared with the respondents who read the message on Facebook. The previous study shows that the fact-checking message tends to widen the gap between the partisans (Jarman, 2016) - Democrats distrust the fact-checking benefit the Republican vice versa. However, our theory suggests that such doubled standard should be less salient when people consume the fact-checking on private apps, given its feature of privacy. Before and after the treatments, we asked the respondent how much they trusted the original scandal shared by their classmate from 0 to 100. We then reversely-coded the score to a scale of mistrust to the fake news from 0 to 100. Since fact-checking is to lower the trust of the fake news, we expect to see that the fact-checking information can increase the level of mistrust toward the fake news after the treatment.

Adding the fact-checking account to the friend list indicates two important features of human-app interactions. First, it means that the subject looks forward to having more fact-checking information from the source in the future. S/he did not reject the possibility that this source can provide more valuable information even though the current post provided by this source is opposite to the subject’s political belief. Second, when the subject adds
the source to be a friend on Facebook since the friend list is publicly available by default, it may be interpreted by others that this subject endorses the source. Hence, if $H_1$ and the personal trainer model hold, we should observe the tendency that subjects in the opposite party treatment group are much more likely to “friend” the source on Line than on Facebook.

In the survey, Respondents were asked how much they would add the fact-checking account as a friend, and their answer is binary coded.

In the end, the evaluation of the unbiasedness of the fact-checking source can be the direct test of the accuracy motivation. We expect to observe that subjects in the opposite party treatment will have a higher level of unbiasedness evaluation if the fact-checking information is sent through Line than Facebook. Respondents are asked “how much do they think the fact-checking account is unbiased” and their answer is binary coded.

Before the analysis, we conducted randomization checks to see if our PollcracyLab respondents were evenly assigned to the treatment and control groups. The one-way ANOVA analysis shows that the background of respondents are not significantly different among the four treatment groups in aspect of gender ($F = 1.10, p = 0.35$), age ($F = 0.81, p = 0.48$), pro-KMT or pro-DPP ($F = 0.58, p = 0.61$), and fathers origin ($F = 0.20, p = 0.90$).

**Results of Study 3.** Manipulation check is conducted by comparing how subjects evaluated the news before and after they read the fact-checking message. Subjects in the Welcome FC group rate their distrust of the scandal of their preferred party as 64.96, compared to 50.49 in the Unwelcome group (t-test $p < 0.001$). Since the respondents distrust the scandal of their preferred party more, our fake news treatment successfully activated Taiwanese respondent’s party identifications. After reading the fact-checking message, subjects in the Welcome FC group and Unwelcome FC group rated the original fake news as 73.76 and 59.31, respectively. On average, subjects still tend to believe in the fake news linking to the party they dislike (compared to the party they liked, t-test $p < 0.001$), but their level of distrust increases in both treatment group after reading the fact-checking information ($p < 0.001$ in the Welcome FC group and $p < 0.01$ in the Unwelcome FC group). Therefore,
the two treatments successfully manipulate both the partisan motivation of respondents and the effectiveness of the fact-checking message.

**Level of Distrust to the Fake Scandal.** Table 2 illustrates the results of four Tobit regression models with lower and upper limits 0 and 100, respectively. The dependent variable is the level of distrust of the fake scandal after the subjects read the fact-checking piece. The independent variable includes the dummy of two treatments (Welcome/Unwelcome FC treatment and Facebook/Line) and their interaction (Welcome FC \( \times \) Line). Since the subjects re-evaluated their level of distrust in this within-subject design, their pre-treatment attitude would anchor their post-treatment evaluation and is added into the models as a control. Besides, model 3 and 4 exclude the subjects whose pre-treatment distrust to the fake news were already 100. Since their level of distrust cannot be higher before reading the fact-checking information, excluding them helps clarify the effectiveness of fact-checking.

**Table 2.** Change in the level of distrust to the news pre- and post-treatment

<table>
<thead>
<tr>
<th></th>
<th>Post-treatment Level of distrust to the fake scandal (0-100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full</td>
</tr>
<tr>
<td>Unwelcome FC</td>
<td>−10.258***</td>
</tr>
<tr>
<td></td>
<td>(3.322)</td>
</tr>
<tr>
<td>Line</td>
<td>−3.295</td>
</tr>
<tr>
<td></td>
<td>(3.237)</td>
</tr>
<tr>
<td>Unwelcome FC ( \times ) Line</td>
<td>8.021*</td>
</tr>
<tr>
<td></td>
<td>(4.673)</td>
</tr>
<tr>
<td>Pre-t distrust</td>
<td>0.765***</td>
</tr>
<tr>
<td></td>
<td>(0.044)</td>
</tr>
<tr>
<td>AGE, EDU, SEX</td>
<td>YES</td>
</tr>
<tr>
<td>Constant</td>
<td>30.322***</td>
</tr>
<tr>
<td></td>
<td>(3.544)</td>
</tr>
<tr>
<td>Observations</td>
<td>439</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>−1.615.363</td>
</tr>
<tr>
<td>Wald Test</td>
<td>354.944***</td>
</tr>
<tr>
<td></td>
<td>(df = 4)</td>
</tr>
</tbody>
</table>

*Note:* *p<0.1; **p<0.05; ***p<0.01

In Table 2, the dummy, Unwelcome FC, is significantly negative across all models. The result indicates that respondents distrust the scandal related to their preferred party more (or trust the scandal related to the party they dislike more), which is consistent with the partisan bias in the previous studies. However, in row 3 of Table 2, the interaction between
platform and partisanship is positively significant, and the size is almost the same as the coefficient of Unwelcome FC. The interaction term suggests that partisan bias reduces when the fact-checking message is sent through Line.

To further illustrate the interaction effect, Figure 6 shows the simulated distribution of distrust to the fake scandal across experimental groups. The error bars are the 95% confidence interval of mean value in each group. In this figure, the partisan bias is still salient when the respondents read the fact-checking through Facebook. When people read the fact-checking message through LINE, however, the difference between people’s perception of the fake scandal from different parties became narrower and indistinguishable. The result is consistent with our hypothesis that people are less biased when they consume the fact-checking message through private messaging apps.

![Figure 6. Level of Distrust to the fake scandal, stimulated by Model 4 in Table 2](image)

One may be concerned with confounding factors, even though the respondents were randomly selected. To deal with this issue, we add more control variables into the regression models, as is shown in Table A.1 in the Appendix. We add the respondent’s level of political interest (1-5), daily news consumption (1-5), line usage (1-4), and two items of political knowledge (who are the current leader of China and Japan). After adding these variables, the interaction term is still significant in $p < 0.1$ level, and the fourth model even reaches $p < 0.05$ level. Meanwhile, the estimated partial coefficients remain unchanged across the four models. This robustness check increases our confidence on the effect of the interaction.
Adding Fact-checking account as a Friend. Model (1) and (2) in Table 3 are the Logit models explaining the subject’s willingness to add the fact-checking account as the friend after reading the fact-checking information. The subject’s socio-demographic background is controlled in (2). In both models, once again, the dummy of Unwelcome FC is negatively significant. It indicates that people tend not to add the fact-checking source as a friend when it contradicts their political beliefs. However, such an unwillingness declines when the debunk came from Line. The interactive term is positively significant, and its effect size almost cancels out the negative impact coming from the Unwelcome FC.

Table 3. Adding fact-checking account as a friend and evaluating its unbiasedness

<table>
<thead>
<tr>
<th></th>
<th>Add friend</th>
<th>Unbiasedness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Unwelcome FC</td>
<td>−0.811***</td>
<td>−0.812***</td>
</tr>
<tr>
<td></td>
<td>(0.293)</td>
<td>(0.294)</td>
</tr>
<tr>
<td>Line</td>
<td>−0.475*</td>
<td>−0.485*</td>
</tr>
<tr>
<td></td>
<td>(0.273)</td>
<td>(0.275)</td>
</tr>
<tr>
<td>Unwelcome FC x Line</td>
<td>0.722*</td>
<td>0.727*</td>
</tr>
<tr>
<td></td>
<td>(0.416)</td>
<td>(0.416)</td>
</tr>
<tr>
<td>AGE, Edu, SEX</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Constant</td>
<td>−0.274</td>
<td>−1.145</td>
</tr>
<tr>
<td></td>
<td>(0.181)</td>
<td>(1.028)</td>
</tr>
<tr>
<td>Observations</td>
<td>439</td>
<td>439</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>−274.767</td>
<td>−274.345</td>
</tr>
<tr>
<td>Akaike Inf. Crit.</td>
<td>557.534</td>
<td>562.690</td>
</tr>
</tbody>
</table>

Note: *p<0.1; **p<0.05; ***p<0.01

The left column in Figure 7 visualizes the predicted percentage of subjects willing to add the fact-checking source as a friend. The prediction is calculated by the model 2 in Table 3. The error bars are 95% confidence interval of the mean value. When the respondents read the fact-checking information through Facebook, a public platform, his attitude will be politicized, so his behavior goes with his preferred party. Consequently, a big partisan effect emerges on the willingness to add the fact-checking as a friend on Facebook. However, this partisan domination disappears in the two Line groups in the left column. When the respondents read the fact-checking information on Line, his willingness to have more future interaction with this fact-checking source is independent of his partisanship. The result is
very similar to Figure 6. Hence, model (1) and (2) in Table 3 and the left column in Figure 7 provide empirical evidence to support \( H1 \).

\[
\begin{align*}
\text{Figure 7. Simulated Percentage of adding friends and evaluating unbiasedness}
\end{align*}
\]

Perceived Unbiasedness. Model (3) and (4) in Table 3 are the logit models explaining the subject’s perception that the fact-checking source offered unbiased information (unbiased = 1, biased = 0). The subject’s socio-demographics are controlled in Model (4).

Once again, in both models, the dummy of Unwelcome FC treatment is negatively significant. It indicates that the subjects tend to lower their evaluation to the unbiasedness of the fact-checking source if it helped the disliked party. However, the subject’s partisan bias is mitigated if the fact-checking information was shared through Line. The interactive term Unwelcome FC \( \times \) Line is positively significant. Hence, model (3) and (4) in Table 3 provide further empirical evidence to support \( H1 \).

The comparison of the four experimental groups is shown in the right column of Figure 7. Once again, the left two bars indicate the politicizing effect of Facebook. Besides, the percentage of subjects thinking the fact-checking source as unbiased in the Unwelcome FC \( \times \) Line group is 50.94%. In Welcome FC \( \times \) Facebook, the percentage is 35.4%. There is a significant difference between the Line and Facebook subgroup whom both received the opposite party treatment (t-test \( p=0.024 \)). Therefore, the private environment in Line makes subjects to accept the inconvenient truth and pay more attention to the accuracy motivation.
Conclusion

Our results speak to Sood and Lelkes (2018)’s caution on distinguishing congenial and accuracy preference. Sood and Lelkes argue that people may prefer an information source for two reasons: they love the content (driven by, for example, partisanship) or they love the accuracy of the content. Many studies in fake news do not distinguish them apart. We tackle this issue by the within-subject design on the trust of fake news with manipulating partisanship of the news. In our Study 3, both Table 2 and Figure A.2 in Appendix show that people may lower their trust in the fake news in general, which is consistent with the accuracy motivation; meanwhile, the coefficient of the opposite party treatment is significantly positive, suggesting that the congenial motivation (partisanship) undermines the accuracy motivation. Hopefully, results in Study 3 point out that this accuracy motivation can be restored through private messaging apps.

Our results also offer suggestions for fake news prevention. Lazer et al. (2018) argue that the two major strategies of fake news prevention lie in empowering individuals and reforming social media sites. Even though the fact-checkers are increasing globally how their fact-checking results can be sent to the ordinary people remains unexplored. Our results suggest that popularizing fact-checking results might not be the best strategy. Instead, fact-checkers and social media sites can work together to create a virtual “confession room” for individuals to enhance their accuracy motivation.

Still, our study faces several limitations. First, we only manipulate the partisanship and the platform of the fake news. However, recent works show that whether the audience will “click the link” plays an important role in the spreading and consumption of fake news (Munger, 2019). Hence, many other variables could be included in future work, such as the attractiveness of the click-bait title (Luca et al., 2020), the reputation of the fact-checking source, and the picture or emoji used in the article.

Second, even if the respondents will be better informed by the fact-checking information through private messaging apps, its impact on the vote choice and other forms of political
participation is still unexplored. We could hypothesize that the quality of decision-making can be enhanced owing to the unbiased information consumption.

Third, it is worthy of exploring whether people will "fight back" after receiving the fact-checking. Previous literature shows that people will share the fake news by their social network account (Guess, Nagler and Tucker, 2019), and the social network will influence other's political participation (Larson et al., 2019). When an individual read the fake news posted by his old friends or parents, then he found the debunk, will he send it back? Will he also post it on his social network site to publicly humiliate his friend, or will he send it back through private messaging app? How people choose and which channel is much more effective? All of these questions remain to be answered by a more comprehensive research design and data collection process.

REFERENCES


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