Paying to avoid the spotlight

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Abstract

In our increasingly digital world, the prospect of maintaining privacy in economic dealings is under significant threat. Understanding how much value people place on the privacy of their economic activities has important policy implications. This paper addresses this question through a coin-flip experiment eliciting people’s willingness to pay (WTP) to evade detection or observation. We collect data from Osaka (Japan), Wuhan (China) and Irvine (U.S.A.) to examine whether there are cross-country differences in WTP and (dis)honest behavior. Our findings show that people’s WTP to “avoid the spotlight” is positive and economically sizable across all three countries, and is the largest in Japan. Controlling for individual characteristics, we argue that the remaining cross-country differences may be due to cultural differences regarding economic privacy across these three countries.

Keywords: Privacy, Surveillance, Willingness to Pay, Lying, Social Image Concerns
1 Introduction

In our increasingly digital world, the prospect of maintaining privacy in economic dealings is under significant threat [1]. The majority of financial transactions, including those conducted using debit and credit cards, online banking, and mobile payment platforms, are now conducted electronically. These methods are all easily surveilled, with transaction records accessible through court orders in some jurisdictions or directly monitored by governments in others. Consequently, such transactions often lack any privacy protections. Indeed, the recent emergence of cryptocurrencies partly stems from a desire for financial autonomy from the uncertainties of government-issued fiat currencies and a critical need for privacy [2]. As a reaction to these stateless digital currencies, central banks from various countries, starting with China, have begun exploring the creation of Central Bank Digital Currencies (CBDCs) to maintain demand for their fiat currencies and thus preserve their ability to implement monetary policies. However, CBDC transactions, linked to electronic ledgers, will inevitably lead to further erosion of privacy [3, 4].

There is a large literature on internet privacy, involving, e.g., provision of personal information during an online purchase [5–8], to conceal various information, e.g., browsing history, contact information, location, and text on smartphone apps [9, 10]. An existing international comparison across US, Germany, and several Latin American countries shows Germans value privacy more than people in other countries [11]. While such privacy concerns are certainly important, they are not the specific focus of our study. Instead, we are interested in privacy surrounding economic transactions, i.e., the desire that economic activity is not traceable, as would be possible in transactions using cash.

We are particularly interested in individuals’ willingness to pay (WTP) to avoid being observed in reporting on economic activities. By contrast with most of the literature on the value of privacy [8–11], we use experimental methods that enable us
to elicit peoples’ WTP for privacy in an incentive-compatible manner. Our findings have important implications for understanding the acceptability or reluctance to adopt media of exchange or institutions that forego privacy rights. Specifically we ask (1) How much are individuals willing to pay for privacy in economic transactions? (2) Does behavior differ if individuals do not have a private option or cannot pay for privacy? (3) Does the value of privacy differ across countries? If so, what are the correlates of those differences?

Indeed, using the lie-detection task of [12, 13], our experimental design directly reveals whether people desire privacy, or the unobservability of their actions in order to engage in lying or other forms of immoral behavior, in an incentive compatible manner. To the best of our knowledge, ours is the first study to elicit and compare the WTP for privacy in economic transactions across countries, specifically, China, Japan and the U.S.

In our experiment, subjects flip a fair coin ten times and report the number of heads and tails (which must add up to ten). For each head that a subject reports, they receive 100 points. Thus, by reporting 10 heads, they earn the maximum of 1000 points. The earned points are converted into the local currency at the end of the experiment using a pre-specified exchange rate, that adjusts for purchasing power differences across countries, so that across countries, all of our subjects face the same monetary incentives. There is no explicit penalty for misreporting the number of heads and tails in any treatment of our study. Therefore, the profit-maximizing behavior by *homo-economicus* participants is to always report 10 heads. A meta-study of this task by [14], however, shows that most participants do not lie to such an extreme extent; rather they over-report the number of heads relative to expected numbers. What we add to this task is a willingness to pay elicitation and some further treatments.

Specifically, in our main, **CHOICE**, treatment, subjects can complete the task of flipping a coin 10 times using a freely provided virtual coin on our experimental
software platform. Alternatively, they can choose to use their own coin to complete the 10 coin flips but only if they pay a fee. Subjects are told that if they use the virtual coin, the experimenters can later check the realized outcomes of the virtual coin flip. By contrast, if they use their own coin, it is not possible for the experimenter to observe the outcome of those coin flips. Subjects are also told that, regardless of the coin they use, virtual or own, the experimenters rely only on their self-report of the outcome of the coin flip — the number of heads and tails — to determine their payment.

Prior to the coin flip task, we use the Becker–DeGroot–Marschak [BDM] mechanism [15] to elicit subjects’ willingness to pay (WTP) for the right to use their own coin to complete the coin flip task. As noted, there is no cost to using the virtual coin. Specifically, subjects submit their $WTP^i$ in 10 point increments, \(\{0, 10, 20, \ldots, 490, 500\}\). Notice that the upper bound of 500 points in the WTP elicitation is the expected gain (in points) from using one’s own coin and reporting 10 as the number of heads. Once participants submit their $WTP^i$, the computer randomly draws a price (in points) $p^i \in \{10, 20, \ldots, 490, 500\}$ for each participant. If $p^i \leq WTP^i$, the subject $i$ pays $p^i$ (out of their experimental earnings) and uses his/her own coin, otherwise, s/he uses the virtual coin for free. Subjects who do not want to use their own coin could simply state that their WTP was 0, thereby ensuring that they would use the virtual coin and this possibility was carefully explained to them.

The elicited WTP captures the privacy concerns of subjects associated with using the virtual coin instead of their own coin. To make this more formal, we adapt the framework of [14] who suggest that reporting behavior in experiments of this type is based on three determinants: (1) the material gain, (2) the self-image concern, and (3) the social-image concern. We will here refer to the social-image concern as the privacy concern.
Following this framework, the utility of reporting the number of heads, $H$, when the actual realization is $R$, $u^i(H|R)$, can be written as:

$$u^i(H|R) = \pi^i(H) - c^i(H - R) - \gamma^i(H - R)$$
if using the virtual coin,

$$u^i(H|R) = \pi^i(H) - c^i(H - R)$$
if using one’s own coin.

Here, $\pi^i(H)$ is the monetary gain, $c^i(H - R)$ is the cost associated with self-image concerns, and $\gamma^i(H - R)$ is the privacy concerns of reporting $H$ heads when the actual realized number of heads was $R$. When choosing their WTP to use their own coin instead of using the virtual coin for free, each subject $i$ would compare the expected maximized utility of using the virtual coin with that of using his/her own coin. Therefore, the submitted WTP should be equivalent to the difference between the monetary value of the two maximized expected utilities, and that is primarily driven by the cost associated with the privacy concern in using the virtual coin unless the self-image concern dominates all the other considerations.

In addition to the CHOICE treatment, we also design two control treatments, VIRTUAL and OWN, where subjects are not given a choice regarding the type of coin they can use. In the VIRTUAL treatment, subjects must use the virtual coin. In the OWN treatment, they must use their own coin. In these two treatments, therefore, there is no elicitation of WTP to use their own coin instead of the virtual coin, as there is no choice of the type of coin that will be used. Still, as in the CHOICE treatment, subjects in these two control treatments report the number of heads and tails and are paid solely on the basis of their own report.

After reporting the number of heads and tails from the 10 trials, participants had to complete a questionnaire (See Supplementary Information (SI) I for the questions) that asked them questions regarding their view of government monitoring and the justifiability of certain unethical behavior.
2 Results

We begin with the main variable of interest: subjects’ WTP to use their own coin instead of the virtual coin. We then present participants’ reporting behavior conditional on the coin they used. The descriptive statistics regarding participants’ characteristics are reported in Table S1 in the SI II. There are some notable differences in participant’s characteristics across the three locations. Namely, there are significantly fewer female participants in Osaka compared to Wuhan and Irvine, especially in the OWN and VIRTUAL treatments. Participants in Irvine are significantly more willing to take risks than those in Osaka and Wuhan. Those in Wuhan are more accepting of unethical behaviors and of the government’s right to monitor people than those in Osaka and Irvine. The Wuhan subjects also earned significantly higher points than subjects in Osaka and Irvine. We will, therefore, control for these individual characteristics later in our supplementary parametric analyses.

Figure 1 shows the cumulative distribution of subjects’ WTP to use their own coin instead of using the virtual coin for free in Osaka (red dash), Irvine (cyan dots), and Wuhan (gray long dash).
The mean (std. dev.) WTP in Osaka is 225.56 points (150.48) which is more than 40% of the expected gain (500) from misreporting. This is significantly higher than the WTP in Irvine (mean (std. dev.) 177.0 points (146.20), p=0.0538, MW) or in Wuhan (mean (std. dev.) 159.83 points (126.81), p=0.0148, MW). WTPs are not significantly different between Irvine and Wuhan (p=0.7766, MW). The results remain robust even if we control for individual characteristics (see Table S2, SI III).

### 2.1 Reporting behavior

Figure 2 shows, using bubble plots, the relationship between submitted WTP and the reported number of heads depending on the coin used (Own coin in black and Virtual coin in gray) in three locations. Reflecting the higher WTP submitted by the Osaka subjects, the number of subjects who used their own coin, instead of the virtual coin, is higher in Osaka compared to Wuhan and Irvine.

A few observations to note. In all the locations, some subjects submitted WTP=0 and reported 10 heads (homo-economicus) as seen in the upper left corner of Figure 2. Also, some subjects submitted a WTP=500 and reported 10 heads. While there are positive correlations between WTP and the reported number of heads when the own
Fig. 3 Distribution of the reported number of heads by treatment conditions: (A) when the own coin is used, (B) when the virtual coin is used, and (C) the extent of misreporting when the virtual coin is used. Red (CHOICE) and Black (OWN) in (A). Blue-dashed (CHOICE) and gray-dashed (VIRTUAL) in (B) and (C).

coin is used in all the locations, none of these is significant at the 10% level once individual characteristics are controlled for (See Table S3 in SI IV). There is a marginally significant positive relationship between the price subjects actually paid and the reported number of heads in Irvine once individual characteristics are controlled for (See Table S4 in SI IV). When the virtual coin is used, there is no significant relationship between the WTP and the reported number of heads in all the locations (See also Table S3 in SI IV).
Figure 3 compares the distribution of the reported number of heads depending on the coin used in three locations: between CHOICE and OWN (A) or CHOICE and VIRTUAL (B). It also compares the extent of misreporting when the virtual coin is used between CHOICE and VIRTUAL (C). See SI V for the analyses comparing OWN and VIRTUAL treatments.

When the subject’s own coin is used in the CHOICE treatment (shown in red in Figure 3 (A)), the reported number of heads is significantly larger than OWN treatment. This is so even after controlling for individual characteristics (see Table S7 in SI VI). This finding could be the result of two forces: selection and licensing. Regarding selection, recall that in the CHOICE treatment, those subjects who have submitted a higher WTP to use their one coin are more likely to be selected to use their own coin. This means that, their willingness to use their own coin so as to misreport is likely higher than the participants assigned to the OWN treatment. Regarding licensing, the fact that subjects have paid a price to use their own coin may have justified their reporting a higher number of heads in the CHOICE treatment as compared with the OWN treatment, where they do not pay anything to use their own coin.

When the virtual coin is used, the reported numbers of heads and the extent of misreporting are not significantly different between the CHOICE treatment and the VIRTUAL treatment, except for the Wuhan subjects. In Wuhan, the reported number of heads is marginally significantly higher, and the extent of misreporting is significantly higher in the VIRTUAL treatment as compared with the CHOICE treatment. While the difference in the reported number of heads loses its significance once individual characteristics are controlled for, the extent of misreporting continues to be significant (see Tables S7 and S8 in SI VI). This is puzzling in light of selection. In the CHOICE treatment, those subjects who have submitted low WTPs to use their own coin are more likely to be selected to use the virtual coin. Thus, these participants have low costs associated with privacy concerns. In other words, they are more willing
to use the virtual coin and misreport than the average participants in the VIRTUAL
treatment. If participants are mainly concerned about their self-image (and thus do
not misreport regardless of the type of the coin used), however, we may observe low
WTP and low misreporting. Unfortunately, it is not possible to test this hypothesis
using our data.

### 2.2 Payoffs

We have seen that subjects who used their own coin in the CHOICE treatment
reported significantly more heads than those who used the virtual coin in the same
treatment. They also reported more heads compared to those the OWN treatment.
What about their payoffs? Did subjects in the CHOICE treatment who used their
own coin earn more taking into account the fee they paid to use their own coin?

Figure 4 shows the distribution of the payoffs (net of the price paid to use one’s
own coin) in the CHOICE treatment depending on the coin used (own coin in red and
virtual coin in blue-dashed) in the three locations. The mean, the standard deviations,
as well as the *p*-value from a MW test are also reported. Except for Irvine, those
subjects who used their own coin obtained significantly higher payoffs than those who
used the virtual coin. In Wuhan, those who used their own coin earned 827.06 points
on average, while those who used virtual coin earned 669.76 points (p=0.066, MW).
In Osaka, similarly, the average payoffs are 698.28 points with their own coin and
564.71 points with the virtual coin (p=0.004, MW). In Irvine, the average payoffs for
those who used their own coin and the virtual coins were 654.74 and 602.44 points,
respectively (p=0.331, MW).

In general, participants who chose to use their own coins earn a higher average net
payoff than those who used the virtual coin. One may argue that those who purchased
the right to use their own coins were “rational” in doing so, at least in terms of material
payoff.

The net payoffs of those who used their own coin in the CHOICE treatment are not
significantly different from the payoffs earned by those in the OWN treatment. The
average payoffs (standard deviations) in the OWN treatment were 796.67 (158.62) in
Wuhan, 636.67 (140.16) in Irvine, and 640.00 (201.03) in Osaka. The p-values from
a MW test (comparing the net payoff earnings of those who used their own coin in
the CHOICE treatment) were 0.788, 0.626, and 0.236 in Wuhan, Irvine, and Osaka,
respectively.

3 Discussion

We have reported on a laboratory experiment that measures participants’ willingness
to pay to avoid the spotlight regarding their possible cheating behavior in Osaka
(Japan), Wuhan (China) and Irvine (U.S.A). It turns out that the willingness to pay
to avoid scrutiny is large, approximately 50% of the expected gain from misreporting
in Osaka, and around 30% of this expected gain in Wuhan and Irvine. The difference
between Osaka and Wuhan and Osaka and Irvine are statistically significant at the 5%
and 10% level, respectively, while the difference between the latter two, Wuhan and
Irvine, is not statistically significant. Overall, these findings underscore the substantial
value that people place in avoiding the negative social and psychological implications of
being caught in dishonest acts, highlighting a universal desire for privacy in economic activities.

Among the individual characteristics we have considered, self-reported willingness to take risk is significantly and positively related to subjects’ WTP to use their own coin. Age, gender, and subjects’ view of ethical behavior or of the government’s right to monitor people’s activities are not related to WTP. Interestingly, WTP is higher among those who believe that others are less likely to truthfully report the outcomes of their coin flips, suggesting that social or cultural norms may play a role.

In our main treatment, there is no significant correlation between the WTP to use one’s own coin and the reported number of heads regardless of the type of coin eventually used. However, participants who actually paid to use their own coin reported a significantly higher number of heads than those who used the virtual coin in Osaka and Wuhan. As a consequence, those who used their own coin by paying a price earned significantly more than those who used the virtual coin for free in these two locations.

What is the driving factor behind the different WTPs for privacy in economic transactions in the three countries? In our regression analysis, we considered several possible explanations, including people’s self-assessed honesty and their attitudes towards government monitoring. As noted, none of these factors turned out to be significant in explaining the differences that we observe across countries.

Based on the above findings, we speculate that differences across the three countries may reflect current cultural norms with regard to payment methods and, in particular, concerning the use of cash. Indeed, according to [16], Japan is an outlier in its use of cash relative to digital payments and credit cards which are more widely used in China and the U.S., respectively.

The share of cash as the method of payment for point of sale is 51% in Japan, 12% in the US, and 8% in China. The higher frequency of cash usage may be associated with a higher level of privacy-preserving preference in Japan, and thus, the significantly
higher WTP. The policy implications are that it might be more difficult to implement CBDC in Japan than in China where it has already been introduced.

While some might seek privacy to engage in dishonest or illegal activities, it is important to recognize that there can be other motivations for paying to avoid the spotlight. People may seek to avoid scrutiny because it is closely linked to their sense of personal autonomy and freedom [17]. For some, the ability to control who has access to personal information and one’s choices is fundamental to individual liberty and self-expression [18]. People may also seek privacy to better manage their social interactions and personal boundaries, contributing to their own psychological well-being [19].

In future research, it would be of interest to consider other tasks with economic consequences where people face weaker or no material incentives to dishonestly engage in the task to investigate these motives. While we suspect that there would be some reduction in the WTP for privacy in such settings, it could still be the case that individuals have a positive WTP for privacy in their economic transactions beyond the desire to avoid detection of cheating behavior.

4 Methods

Online experiments were conducted between October and December 2023 in Osaka (Japan), Irvine (USA), and Wuhan (China). The experiment was programmed using oTree [20]. A total of 360 students from local universities (120 in each country) participated. In each location, we used the Zoom software to coordinate activity. Subjects arrived via the Zoom waiting room. One by one, we privately welcomed them and checked (via video) that they had brought their own coin (except for the treatment with a virtual coin only), as we had instructed them to do. They were then given a numerical ID to be used during the experiment to maintain their anonymity. Once these tasks were completed, they were sent back to the waiting room, where they waited until the start of the experiment.
Once all the subjects had been individually welcomed they were brought back to the main room of Zoom, where the experimenter gave general instructions and sent each subject a link to the experimental platform. Clicking on the link, subjects read the instructions online at their own pace and answered the comprehension quiz. Once they had answered all the quiz questions correctly, the experiment started. For the CHOICE treatment with a WTP elicitation, there were two rounds of practice (with high and low realized prices) for the WTP elicitation. We have introduced these practice rounds, in addition to questions about WTP and payoffs in the comprehension quiz, to make sure our subjects understand well the BDM procedure which can be confusing to subjects [21]. During the experiment, subjects had their camera and microphone turned off.

The English instructions have been translated to Japanese and Chinese by our research assistants. We then ask different people to translate the instructions back to English to ensure consistency in the meaning. The English instructions can be downloaded at https://osf.io/mka75/?view_only=b4053e8c004d41f7812f31fe8827f5b2. Chinese and Japanese translations are available upon request.

The experiment lasted about 25 minutes on average, including the post-experimental questionnaire. Subjects, on average, earned 13.30 USD, 1130 JPY, and 50 RMB, including 7 USD, 500 JPY, and 20 RMB show-up fees in Irvine, Osaka, and Wuhan. While performance-based payments were equalized based on the purchasing parity at the time of the experiment (specifically, we set 100 points = 1 USD (in the US), 100 JPY (in Japan), or 4 RMB (in China)), we respected the standard show-up fees used in each location.

The experimental protocol used to collect data was approved by IRB of the Institute of Social and Economic Research (ISER), Osaka University (No. 20230201 and 20230803). The experiment is pre-registered at aspredicted.org (#147410 for the CHOICE treatment and #144318 for the control treatments).
Supplementary information. Supplementary information is provided in a separate file.

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Code and Data availability. Upon publication, the data as well as code used to analyze them will be made available on a public depository.

References


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