Assessing the interplay between repression and informational control in autocracies

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Abstract

How do authoritarian regimes maintain their hegemony over public opinion beyond state-run media and outright repression of journalists? Theory and previous research suggest that surveillance practices discourage citizens from engaging in legitimate digital communication behaviors, such as expressing opinions online. Drawing on an original survey experiment conducted in Kazakhstan in November 2023 (N=5,025), this study is able to show that citizens exposed to a text-based surveillance treatment reduce their response rate to sensitive questions by an average 3.3% while this effect is not triggered for non-sensitive questions. Moreover, the measured self-censorship can be traced back to an informed elite that has access to a more diverse international media environment. This study contributes to the literature on digital authoritarianism by showing how state surveillance practices undermine political discourse which in turn contributes to authoritarian stability.

Keywords: big data, surveillance, privacy, political repression, democracy, autocracy

1 Introduction

Over 75 countries worldwide use surveillance tools that are associated with artificial intelligence, including over 50% of advanced democracies (Feldstein 2019a). For example, Ethiopia, with its long-standing network of in-person surveillance, was a quick adopter and transitioned to digital surveillance despite initially having a low percentage of the population with access to the internet (Feldstein 2021). Many have raised the need to critically reflect on surveillance practices in contemporary societies, because of ongoing human rights violations.[1] Beyond ethical and human rights concerns, mass surveillance has been shown to have an effect on human behavior by undermining autonomy and well-being, and inducing self-censorship (Büchi et al. 2022). Surveillance practices lead to a "spiral of silence", where people are deterred from exchanging opinions (online), particularly concerning sensitive topics (Stoycheff 2016). The rise of pre-emptive and conformist behavior is in direct conflict with the essential components of deliberative democratic frameworks and represents a significant challenge to the healthy functioning of participatory societies (Penney 2022; Kappeler et al. 2023).

In an autocratic context, anticipatory and conformist behaviors are not a side-product but the main means to secure power. Many of the long ruling autocrats like Russia's Putin or Turkey's Erdoğan have increasingly resorted to using violence on protesters, repressing dissidents, and imprisoning journalists, as a means to consolidating power (Pan and Siegel 2020; Egorov and Sonin 2024). Once feared, dictators strategically signal their surveillance and repression capabilities in order to enforce self-disciplining behavior (Gohdes 2023). This self-disciplining behavior can come in many forms, but first and foremost, it results in self-censorship concerning political topics (Roberts 2018). Surveillance thus contributes to undermining collective action, to democratic backsliding, and to authoritarian stability (Carothers and Press 2022). However, some scholars have argued that autocrats refrain from directly repressing their population because of its net negative consequences (Guriev and Treisman 2019), and instead try to control the informational environment by co-opting the elite and media (Guriev and Treisman 2020). Here, manipulation control is a *substitute* mass repression, whereas others argue that repression and information control *complement* each other (Gehlbach et al. 2022; Lamberova and Sonin 2023; Gohdes 2023). This theoretical tension motivates this paper.

The main aim of this paper is thus to test these theories and investigate whether surveillance practices indeed induce self-censorship among citizens, to which magnitude, and what factors, if any, moderate this effect. To this end, a survey experiment with 5,025 participants was conducted in Kazakhstan in November 2023. Kazakhstan is a country where the government has repeatedly deployed mass surveillance technology at the internet service provider level (Raman et al. 2020), where the press is mostly state-controlled (FreedomHouse 2024), and where targeted repression against journalists and dissidents is common.[2] Kazakhstan is hence an ideal environment to test the interplay between domestic information control and surveillance (and repression) capacities.

[1] Spyware and surveillance: Threats to privacy and human rights growing, UN report warns

[2] See, for example: Amnesty International Kazakhstan Report 2023, Human Rights Watch Kazakhstan 2023 Report

Participants in the study were asked sensitive questions on domestic and geopolitical topics, after exposure to either a control, surveillance or privacy condition.[3] The main results of this study is that 3.3% of participants self-censor on average after being reminded of government surveillance capacities.[4] This effect is not symmetrical, i.e. increasing the privacy of the participants – experimentally – did not have a statistically detectable effect. Importantly, the surveillance signal affects some citizens more than others. An informed elite with access to foreign media self-censors more (6.1%) than those without the same access (0.9%). By doing so, this study adds to the literature discussing the nature of the relationship of repression and information control (Guriev and Treisman 2019, 2020; Gehlbach et al. 2022; Egorov and Sonin 2024), providing evidence for the *complementary* nature of the two. By experimentally investigating self-censorship induced by digital surveillance and estimating its magnitude, this study adds to the theoretical understanding of digitalized societies, following the call of Büchi et al. (2022). In addition, this study contributes to public opinion research by estimating self-censorship that leads to an overestimation of politically desirable attitudes in autocracies (Corstange 2012; Frye et al. 2017, 2023; Robinson and Tannenberg 2019; Tannenberg 2022). Finally, it adds to the literature on (digital) authoritarianism by showing how autocrats control the informational environment with digital tools (King et al. 2017; Roberts 2018; Guriev and Treisman 2019, 2020; Feldstein 2021; Gohdes 2023; Egorov and Sonin 2024). The following section provides an overview of the relevant literature from which the hypotheses are derived. Section 3 embeds the hypotheses in the research design and elaborates on the methodological details of the study. Section 4 presents the results, while Section 5 concludes with a discussion of the results.

2 Literature

Social scientists who study digital surveillance sometimes call it *covert repression* (Earl et al. 2022), *dataveillance* (Festic 2022; Büchi et al. 2022; Kappeler et al. 2023; Lee 2023), *fear-based censorship* (Roberts 2018, 2020), or embed it into a broader discussion of *digital authoritarianism* (Feldstein 2019b, 2021; Jones 2022; Gohdes 2023). The literature distinguishes between research on digital surveillance in different types of regimes, because there is an important difference. In theory, government surveillance in democracies is an unintended side effect, a necessary evil of anti-terror or COVID measures. Independent institutions are supposed to monitor each other and keep power in check to protect civil liberties and individual rights. In the literature on autocracies, surveillance is a crucial tool in the state's repertoire of survival strategies, to the extent that it is strategically signaled to the population (Roberts 2018; Gohdes 2023). Accordingly, research on digital surveillance in autocracies tends to understand it as a form of state repression strategically deployed by autocrats to stay in power. This research is complemented by a political economy perspective that focuses on the mutual benefits of a private-public partnership in the development of surveillance technologies in autocracies (Liu 2019; Beraja et al. 2022, 2023b,a; Huang et al. 2022).

[3] Nazarbayev University Institutional Research Ethics Committee (NU-IREC) reviewed and approved the experiment (771/25092023).

[4] 4.2% on issues concerning domestic politics and between 2.5 and 3.1% on geopolitical topics.

2.1 Repression, fear and chilling effects

The importance of surveillance in authoritarian states can also be explained by the information dilemma of the authoritarian government. As a result of censorship, media control, and the absence or manipulation of elections, the regime does not know the true sentiments of its citizens (Edmond 2013; Xu 2021; Egorov and Sonin 2024). As a result, the efficient allocation of resources to co-opt regime opponents remains impossible, as the regime is uncertain about which actors require co-optation and which actors can be better controlled through repression. Such targeted co-optation or repression is necessary, however, because large-scale mass repression is rarely used in contemporary dictatorships (Guriev and Treisman 2019; Xu 2021), partly because of the disadvantages of international backlash in a globalized economy, but also because visible repression can signal regime weakness (Guriev and Treisman 2020). Surveillance of social media helps to identify protests early and monitor local governments and officials (Qin et al. 2017).

When dissidents were identified through surveillance, targeted repression of regime dissidents discourages and deters the participation of larger segments of the population (Roberts 2018; Xu 2021; Gohdes 2023). In autocracies, political expression and discussion are possible but very limited (King et al. 2017). By *taxing information* through propaganda, distraction, and censorship, free debate on political issues is hindered (Roberts 2018). Thus, political participation takes the form of protests or revolts because of the absence of meaningful elections and the censorship of grievances. More surveillance can lead to more repression since the authorities can act on the collected information (Earl et al. 2022). In sum, there are two functions of surveillance: (1) it enables targeted repression by increasing the information available to regimes, and (2) it signals repressive capacities that induce *fear*, leading to self-censorship (Roberts 2018).

In the discourse on surveillance in democracies, a related phenomenon has been referred to as *chilling effect*. Chilling effects – the deterrence of lawful behavior out of fear that it is suspect – have been studied by several scholars (Schauer 1978; Penney 2016, 2017; Stoycheff 2016; Stoycheff et al. 2019; Büchi et al. 2022). The core of democracy can be considered to be the freedom to hold and express any political views. The discussion of political issues has increasingly moved to online spaces such as social media and text messengers, and while in online environments these expressions and debates of political opinion are vulnerable to surveillance. Theoretical studies of digital surveillance argue that *salience shocks*[5] of digital surveillance lead to inhibited digital communication behavior (Büchi et al. 2022). Recent research has suggested a common denominator in research on surveillance in autocracies and democracies: surveillance induces self-discipline (mostly self-censorship) due to the *fear* of repression (Roberts 2018; Manokha 2018; Tannenberg 2022; Stoycheff 2022; Oz and Yanik 2022). Citizens – when aware of surveillance practices – have an increased expectation of negative outcomes and will self-censor. In this vein, the first hypothesis is formulated as:

Hypothesis 1: Digital surveillance induces self-censorship in politically sensitive topics.

[5]One such shock was Edward Snowden's revelations about the NSA's ongoing surveillance of US citizens.

2.2 Mass surveillance in Kazakhstan

Kazakhstan is a resource-rich Central Asian country bordering China and Russia. After the collapse of the Soviet Union, of which Kazakhstan was a part, the country gained independence and was ruled authoritatively for nearly three decades by former Party Secretary Nursultan Nazarbayev. Nazarbayev followed the model of the modern autocrat of the late 20th century, who didn't oppress his people with brutal force, but rather told the story of a man of the people while ensuring an acceptable minimum of living conditions (Guriev and Treisman 2019). In 2019, the country's leadership changed as Nazarbayev appointed a predecessor, Kassym-Jomart Tokayev. While this transition of power was initially successful, Tokayev eventually struggled with perceptions of illegitimacy (Kudaibergenova and Laruelle 2022; Silvan 2024). Growing protests culminated in the so-called "Bloody January" of 2022 – mass protests against corruption and economic inequality on an unprecedented scale were followed by a state of emergency and fighting between the military and protesters, with thousands arrested and hundreds killed (FreedomHouse 2023a). There have been reports of torture of protesters, activists, and journalists.[6]

The government has broad powers to control the digital infrastructure, deriving its authority from laws and weak legal resistance. From controlling the content of websites through legal pressure to outright blocking of websites, to punishing journalists, there is widespread censorship (FreedomHouse 2023b). In addition, laws make anonymity online impossible, VPNs are cracked down on, and SIM cards – the access point to the internet for most of the population – must be registered with an ID. In 2019, Kazakhstan became the first country to force its population to install a custom root certificate capable of decrypting content running through the country's largest internet service provider. These surveillance capabilities have primarily targeted social media and communications services, making them seemingly a political rather than a security endeavor (Raman et al. 2020). While the root certificate was only active for about three weeks, it set a precedent and signaled the government's capabilities to the population. In addition to mass surveillance on the internet service provider level, government agencies monitor social media and communication apps targeting journalists, dissidents, and minorities (FreedomHouse 2023b). All this culminates in self-censorship on a large scale, especially when it comes to the two most important political issues – the "Bloody January" and Russia's invasion of Ukraine.

Other studies suggest that behavioral adaptations to surveillance include increased use of privacy-preserving technologies to cope with surveillance (Büchi et al. 2022; Kappeler et al. 2023). Censorship in the form of blocked websites is being bypassed with circumvention tools, leading to renewed access by citizens and increased interest in blocked content (Hobbs and Roberts 2018). In the same way, effective encryption mechanisms should *recover* digital communication behavior. Given the baseline of digital surveillance in contemporary societies, particularly in Kazakhstan (Raman et al. 2020), the potential for recovering digital communication behavior is significant. Correspondingly, the second hypothesis proposes that:

[6] Human Rights Watch: Longing for Justice in Kazakhstan

Hypothesis 2: Privacy-enhancing technology reduces self-censorship in politically sensitive topics.

A literature that studies the effects of media and propaganda in autocracies highlights the importance of controlling the informational environment in order to control the population (Enikolopov et al. 2011; Adena et al. 2015; Zhuravskaya et al. 2020; Guriev and Treisman 2022). In some of these theories, propaganda and repression are understood as *substitutes*, underscoring the importance of controlling the media and information (Guriev and Treisman 2019, 2020). These theories were formulated in order to account for the empirical observation of decreasing political violence (in autocracies) from the 1990s onward. The 2020s, however, brought an upsurge in political violence worldwide.[7] More generally, the 20th century development of democratization and decreasing levels of repression stopped, both in conjunction with the global COVID-19 pandemic in 2020 (Lührmann et al. 2020; Barceló et al. 2022) and more broadly (Grasse et al. 2021; Knutsen et al. 2024; Little and Meng 2024). At the same time, the level of information control in the form of propaganda and influence over the media has remained the same, if not increased. The expected substitution of repression and information control (Guriev and Treisman 2020) has not manifested itself empirically to a large extent. Instead, the complementarity of repression and propaganda in authoritarian rule could be observed and recent literature offers some theoretical explanations.

First, Gitmez and Sonin (2023) develop a theoretical model demonstrating that repression and propaganda can reinforce each other. When regime opponents face harsher punishments, the persuasive effect of propaganda is amplified, allowing the regime to employ it more extensively. Moreover, by eliminating those citizens who are comparatively more skeptical of the regime, repression leaves behind a more easily influenced population – a dynamic also discussed in Egorov and Sonin (2024). In their study of Russia's response to COVID-19, Lamberova and Sonin (2023) show that both information manipulation and political repression are influenced by the strength of local civil society and institutions. They also find that politically motivated arrests are associated with an increase in information manipulation, underscoring the complementary nature of these strategies. Finally, Gehlbach et al. (2022) explore the role of censorship, propaganda, and repression in autocratic rule through a theoretical model in which governments strategically combine these tools to shape citizen behavior. In the model, citizens can infer from the levels of censorship and repression whether a punishment can be expected for dissent. The government is thereby implementing a punishment strategy that induces self-censorship, which is also empirically observable (Gohdes 2023). Notably, the model predicts that it is not the uninformed mass but the informed citizen – those with direct access to alternative or foreign media – who is most prone to self-censorship. When these citizens anticipate that reporting "bad news" may trigger costly repression, they face a clear trade-off. Although there is an expressive benefit to speaking truth to power, the risk of punishment leads this small, well-informed elite to withhold or soften negative information, reinforcing the regime's control over the information environment. The "elite" is defined here as being

[7] See, for example: UN: A New Era of Conflict and Violence, ACLED Conflict Index & 2025 Watchlist

able to consume foreign media (Gehlbach et al. 2022), and elsewhere by having access to higher education (Guriev and Treisman 2019). The question of *who* self-censors is hence connected to an (perceived) informational advantage, gained by reaching beyond the domestic information environment or by education. As elaborated in section 2.1, political repression is mostly targeted to single individuals like journalists or explicit dissidents and not toward the ordinary masses. This is especially true for Kazakhstan, a country in which most repression happens against specific elite figures like journalists (FreedomHouse 2024).[8] An informed citizen is therefore less likely to reveal their preferences, because they are the one who fears targeted repression.

Accordingly, hypothesis 3 and 4 are formulated as follows:

Hypothesis 3: Citizens who consume media from outside of Kazakhstan have a higher level of self-censorship in politically sensitive topics.

Hypothesis 4: Highly educated citizens have a higher level of self-censorship in politically sensitive topics.

This study draws on this literature and investigates (1) whether digital surveillance induces self-censorship, (2) whether this effect can be reversed by a privacy-preserving technology, and (3) how different forms of repression tie into each other, that is, whether informed citizens tend to self-censor more.

3 Method and data

To test the hypotheses, an online survey experiment with 5,025 respondents was conducted in November 2023 in Kazakhstan. The survey was pre-registered[9] and carried out by NAC Analytica, a leading Kazakh sociological and public opinion research organization.[10] Participants were recruited through advertisements in social media, and a weighting-scheme was applied to make the sample nationally representative.

Before being randomly assigned to either a control group or one of the two treatment conditions, participants answered a range of demographic questions. The treatments were text-based information on the security of participants data. The treatment conditions differ with the control condition in that they either point out the possibility of the government being able to access information on online activity (surveillance condition) or ensure confidentiality by encryption (privacy condition). Section A.1 in the Appendix presents the control and treatment scenarios. The control condition consists only of a standard experimental instruction without additional information.

After having faced either treatment, participants were asked four questions in random order, three of which are politically sensitive, and one that is not sensitive and acts as a placebo. The sensitive questions concerned domestic politics (*In your opinion, is participating in protests for political change generally justified or not justified?*) and geopolitics (*In your opinion, is helping Russia avoid Western sanctions*

[8] "Media independence is severely limited in Kazakhstan. [...] Independent outlets and journalists are routinely shut down or harassed, and self-censorship is common", see: Freedom in the World Report Kazakhstan 2024.

[9] https://aspredicted.org/BVT_9Z3. See also appendix A.4 for a discussion of the pre-analysis plan and divergences from that.

[10] https://nacanalytica.com/en/

generally justified or not justified? and *In your opinion, is Russia's Special Military Operation/ invasion of Ukraine generally justified or not justified?*). The framing *Special Military Operation* and *invasion of Ukraine* was assigned at random, in order to balance invoked framing effects. Arguably, the way one describes Russia's invasion of Ukraine gives away their view on this war and thus invokes demand effects and social desirability bias. A neutral stance between the two mutually exclusive narratives of an illegitimate invasion or a 'Special Military Operation' is hard to find. Question 4 acted as a placebo, in order to control for design effects (*In your opinion, is working more than 50 hours per week generally justified or not justified?*). Answer options for the outcome variables were *Justified*, *Not justified*, and *Prefer not to answer*.

Quality controls included attention checks (two questions on respondents age had to match), speeding filters (minimum of 200 seconds), allowing only two completes per IP address, and allowing phone numbers to participate only once (payment was carried out by phone number). Out of 28,201 participants, 5,025 completed the survey, passed quality checks, were unique respondents, and were compensated 700 Tenge (approx. 1.50 USD).[11] 25 respondents left the experiments after having faced the control (7), surveillance (7) or privacy (11) condition, respectively. Most of the participants that left the survey before finishing did so in the very first pages of the survey.

Table A1 presents summary statistics for all variables. Categorical variables were transformed to scales or dummies. The sample was 48.7% male and 42.7 years old (SD=16.1), on average. Participants were asked on a 1 - 5 scale about their financial situation (M=2.85, SD=1.14), with the mean corresponding to the answer option *We have enough money for food and clothes, but buying durable goods, such as a TV or refrigerator, is difficult*. 23.2 % of participants reported having received higher education (SD=0.42),[12] their residency (where 22% (SD=0.41) reported living in either of the two large cities Astana or Almaty), and being ethnically Kazakh (M=0.72, SD=0.45). 32.6% (SD=0.47) of participants reported consuming news sources from abroad.[13] 10.9% (SD=0.31) of the participants work for some government organization and 10.9% (SD=0.31) use a virtual private network (vpn). Participants were asked about the number of children they have (M=2.26, SD=1.46). Weights for age and sex were applied in regression models to make the sample nationally representative.

4 Results

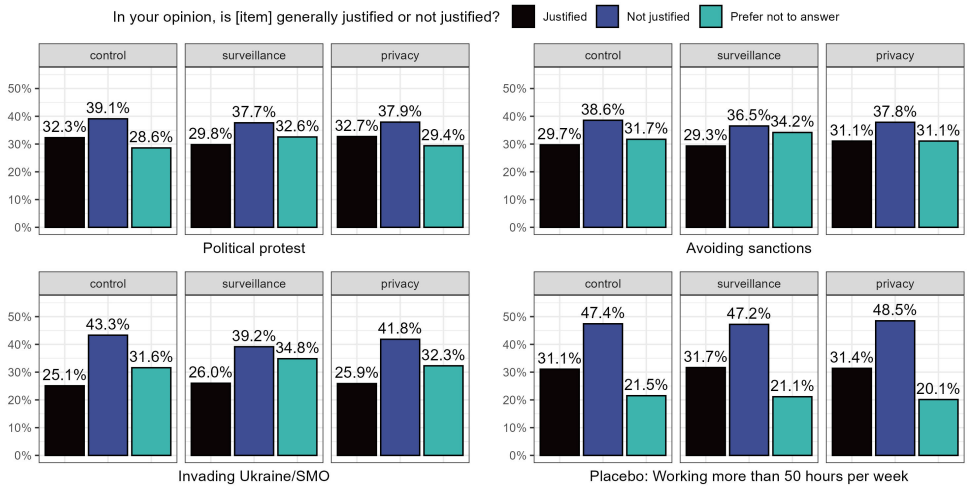
4.1 Average treatment effects

Figure 1 shows the proportion of responses in percent by treatment condition. For the first item, *participating in protests for political change* 32.3% responded *justified*, 39.1% *not justified*, and 28.6% *prefer not to answer*. In the surveillance treatment, these numbers changed by -2.51%, -1.44% and 3.95% and in the privacy treatment by 0.41%, -1.19%, and 0.78%, respectively. The second item, *helping Russia to avoid Western sanctions* has a justification rate of 29.72%, whereas 38.57% responded *not justified*, and 31.71% *prefer not to answer*. In the surveillance treatment, these numbers changed by -0.41%, -2.05% and 2.46% and in the privacy treatment by 1.36%,

[11] Figure A1 shows when and how participants left the survey.
[12] Figure A3 shows the distribution of responses.
[13] Figure A2 shows the distribution of responses.

-0.72%, and -0.63%, respectively. The third item, whether *Russia's Special Military Operation/ invasion of Ukraine* was justified, found 25.09% of supporters, whereas 43.32% responded *not justified*, and 31.59% *prefer not to answer*. In the surveillance treatment, these numbers changed by 0.92%, -4.16% and 3.24% and in the privacy treatment by 0.79%, -1.48%, and 0.7%, respectively. Generally, self-censorship was the lowest in the question revolving around avoiding sanctions, and the highest in the question corresponding to domestic politics.

Fig. 1 Responses to dependent variables



In order to assess whether these differences are meaningful statistical deviations, i.e., whether treatments have significant effects, linear regression models were estimated with the response option *prefer not to answer* as dependent variables, and treatment dummies as dependent variables. Weights for age and gender were applied to make the sample representative of the population. A treatment effect, as defined here, is the increase or decrease in the response option *prefer not to answer* to a sensitive question. Table 1 shows the average treatment effects (ATE) resulting from these models in column 1.[14] The surveillance treatment results in an increase in the *prefer not to answer* option for sensitive items by 3.3% on average being statistically significant at the 99% level. This increase provides some evidence in favor of the first hypothesis, that is, participants are more likely to self-censor when reminded of governmental surveillance capacities. The privacy condition does not yield a measurable effect (0.3%) and is not significant, hence not providing evidence in favor of the second hypothesis. Priming participants for an increase in privacy does not motivate them to increasingly share their opinions, on average. The privacy interactions (columns 3

[14] Table A2 shows the same average treatment effects but all questions separately. The placebo question did not have an effect.

and 4) – as well as the simple privacy dummy – have no measurable effect. The privacy treatment does not appear to have a detectable effect. This is consistent with the other specifications and does not support the acceptance of hypothesis 2.

Table 1 Linear regression models

	"Prefer not to answer"			
	(1)	(2)	(3)	(4)
Privacy	0.003	−0.006	−0.011	−0.013
	(0.009)	(0.009)	(0.010)	(0.010)
Surveillance	0.033***	0.027***	0.009	0.023**
	(0.009)	(0.009)	(0.010)	(0.010)
International Media		−0.120***	−0.142***	−0.120***
		(0.009)	(0.014)	(0.009)
Higher Education		−0.057***	−0.057***	−0.072***
		(0.009)	(0.009)	(0.015)
Privacy × International Media			0.013	
			(0.019)	
Surveillance × International Media			0.053***	
			(0.019)	
Privacy × Higher Education				0.029
				(0.021)
Surveillance × Higher Education				0.016
				(0.021)
Region FE	No	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes
Observations	15,075	15,075	15,075	15,075
R^2	0.002	0.187	0.187	0.189
Adjusted R^2	0.001	0.184	0.184	0.187

Notes: The dependent variable is answering *prefer not to answer* to a sensitive question. Robust standard errors in parentheses. Weighting was applied. The list of control variables includes: age group, gender, financial situation, city size, VPN usage, ethnicity, number of children, Russian language proficiency, government employment status, region, religious affiliation, and consumption of Kazakh media.
*p<0.1; **p<0.05; ***p<0.01

4.2 Conditional average treatment effects

The remaining two hypotheses concern the question of *who* self-censors. As laid out in section 2, predictions from the literature suggest that an informed elite self-censors. This is because they have a) more complete information, and b) awareness of divergence of this information from other public information. Following this logic, hypothesis 3 posits that citizens who consume media from abroad are more likely to

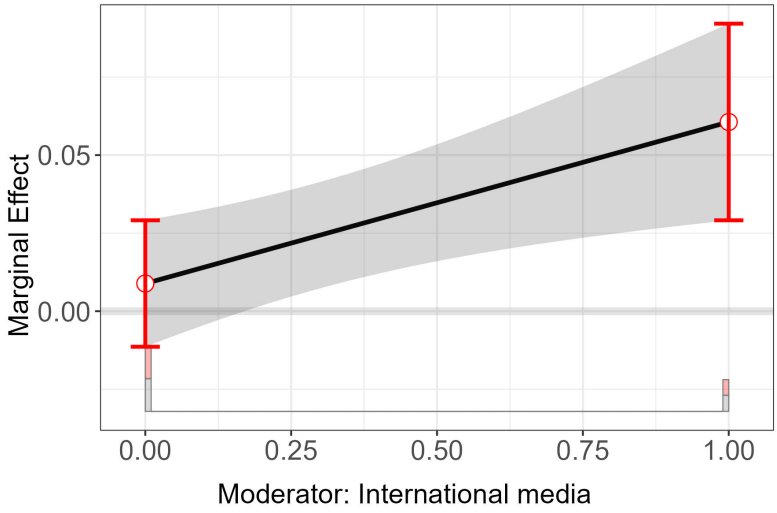
self-censor. Turning to results in table 1 can inform this hypothesis. In column 2, the overall association between international media consumption and self-censorship is negative (-12%) and statistically significant when controlling for the full set of control variables. It seems that, on average, consuming international media informs citizens in a way that allows them to answer questions more easily, which is somewhat intuitive. On the surface this seems to oppose the expected effect formulated in hypothesis 3.

Looking at the additional effect of interacting the treatment dummies with international media consumption in column 3, the model behaves differently. The interaction between the surveillance dummy and the international media consumption variable is *positive* and statistically significant. The surveillance treatment effect is increased by 5,3% for those who consume international media. Notably, the effect of the non-interacted surveillance treatment dummy turns insignificant in this specification (in column 3). This suggests that the effect of the surveillance treatment is now mainly isolated in the interaction effect coefficients. In order words, the great majority of the surveillance treatment effect might be driven by those who consume international media. In order to investigate this possibility further, the procedure for interpreting multiplicative interaction models proposed by Hainmueller et al. (2019) is applied.

Figure 2 shows the marginal effects for the interaction of the surveillance treatment dummy and the consumption of international media. The estimation follows the same procedure as in column 3 of table 1 but with recommended diagnostics. Those who not consume international media self-censor with a likelihood of 0.9%, compared to those who do with 6.1%. The possibility that the surveillance treatment effect might be driven by those who consume international media receives further support. In light of the theory this can be interpreted as an elite (access to international media) that censors because of the concrete threat of repression (surveillance treatment). This finding supports hypothesis 3.

Similarly, albeit with a different definition of elites – having access to higher education – hypothesis 4 suggests that informed citizens self-censor more. Following this logic, column 2 of table 1 and figure 3 report results corresponding to this hypothesis. First, the higher education dummy is also negative (-5.7%) and statistically significant. This suggests that citizens with higher education are more *less* likely to self-censor, on average. Although against the theoretical prediction, an alternative interpretation is that citizens are simply better informed and hence better able (and willing) to answer these sensitive questions. Turning to column 4 of table 1, both interaction effects are small and not significant. More than that, the size of the surveillance dummy decreases only slightly, suggesting no (or very small) heterogeneity for having access to higher education. Figure 3 confirms this suspicion, showing that that non-highly educated citizens self-censor with a likelihood of 2.2% and highly educated citizens with a likelihood of 3.89%, which is not a statistically significant difference between the groups. Hypothesis 4 does not find enough evidence to be supported. This study might be not powered enough to detect a small effect like this (Kane 2024). Moreover, it appears that there are heterogeneous effects regarding the association between being elite (in either definition) and self-censorship. On the one hand, access to a richer media environment and education increases the answering of political questions. On the other

Fig. 2 Interaction effect international media and the surveillance treatment dummies



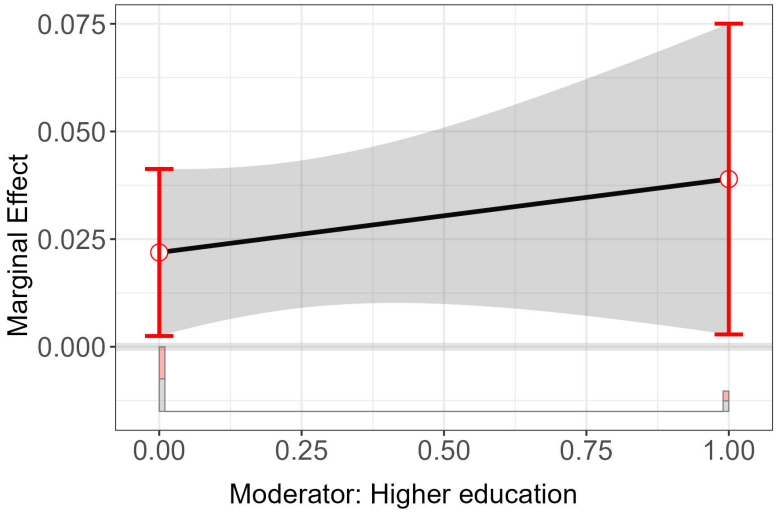
Notes: Comparisons of control and surveillance treatment groups; linear regression yielding point estimates with 95% level confidence intervals; interaction between the surveillance treatment and consuming international media. The estimation was carried out following Hainmueller et al. (2019). The estimation is independent of but corresponds to column 3 of table 1. Standard errors are robust. Weighting was applied. The list of control variables includes: age group, gender, higher education, financial situation, city size, VPN usage, ethnicity, number of children, Russian language proficiency, government employment status, region, religious affiliation, and consumption of Kazakh media.

hand, receiving a surveillance signal – here experimentally induced – reverses this effect and consistently leads to self-censorship. This confirms the theoretical intuition that an informed elite knows when to self-censor Gehlbach et al. (2022).

In summary, the main results correspond to: (1) the surveillance treatment – compared to the control group – lead to an increase in the likelihood to answer *prefer not to answer*. In the context of this study, this is evidence for political self-censorship. (2) This effect is not symmetrical: the privacy condition did not lead to a decrease in political self-censorship. Finally, (3) the effect is driven a by an informed elite that chooses to self-censor. This elite is best defined by international media consumption, and to a much more limited extent by having access to higher education.

While the measured effect of self-censorship (3.2%) is seemingly modest compared to other studies (Robinson and Tannenberg 2019), these numbers did not decrease when participants were treated with the privacy condition. In other words, while people tend to increase their self-censorship in the face of salient surveillance practices, no decrease in existing self-censorship in the face of encryption technology could be found. This study thus provides evidence for the theoretical prediction of Büchi et al. (2022), which suggests an erosion of digital communication behavior over time, with an increasing aggregate chilling effect that does not diminish. More specifically, it was shown that the potential for *immediate* recovery is very low, if not non-existent, and

Fig. 3 Interaction effect higher education and the surveillance treatment dummies



Notes: Comparisons of control and surveillance treatment groups; linear regression yielding point estimates with 95% level confidence intervals; interaction between the surveillance treatment and having a higher education degree. The estimation was carried out following Hainmueller et al. (2019). The estimation is independent of but corresponds to column 4 of table 1. Standard errors are robust. Weighting was applied. The list of control variables includes: age group, gender, financial situation, city size, VPN usage, ethnicity, number of children, Russian language proficiency, government employment status, region, religious affiliation, and consumption of Kazakh and international media.

that the only recovery possible is one in which the salience of surveillance practices declines over time.

An alternative interpretation is that, since the loss of privacy reduces communication behavior much more than the gain of privacy increases it, seemingly, citizens are loss averse concerning privacy. In other words, losses of privacy affect citizens more than gains in privacy do, as expressed in their behavioral adaptations. Assuming symmetry in the strength of the experimental treatments, this asymmetry in measured effects suggests asymmetric preferences, corresponding to what is known as loss-aversion (Schmidt and Zank 2005). This also means that – for policies that aim to enhance the political discourse – privacy-preserving technologies are no solution for increasing surveillance capabilities, first because they are costly and access is unequally distributed, and second because they are simply not as effective – because of the aforementioned loss-aversion. In addition, the privacy treatment may have had less valence than the surveillance treatment, i.e., it may have conveyed less urgency because it was semantically closer to the control group.

5 Concluding discussion

This study contributes to the literature on digital authoritarianism by showing how surveillance reduces digital communication behavior in autocracies. It is one of the very few studies that directly measures and assesses self-censorship in a randomized

Table 2 Hypotheses overview

Hypothesis	Support
1) Surveillance ↑	Yes
2) Privacy ↓	No
3) International media ↑	Yes
4) Higher education ↑	No

Notes: Summary of the hypotheses and corresponding evidence in this study. The arrows indicate the expected direction of self-censorship associated with the variable. *Surveillance* and *Privacy* correspond to treatment conditions and are causal hypotheses. *International media* and *higher education* correspond to correlates and interactions with the treatments.

and controlled experiment. This has many theoretical and practical implications: Self-censoring citizens do not express their opinions on political issues, which contributes to the chilling of political discussions and the further depoliticization of individuals, or in other words, to the stabilization of the hegemonic power of the state over public opinion. Without knowledge of peers' preferences on political issues, political opposition to incumbents has difficulty organizing, a key reason why autocrats resort to censorship (King et al. 2017). New surveillance technologies can thus directly bolster the autocrat's power before unrest forms, which in turn can be suppressed through the use of facial recognition surveillance technology (Beraja et al. 2023a).

Previous research has focused on the acceptance of new (surveillance) technologies (Kostka 2019; Kostka and Antoine 2020; Kostka et al. 2021; Kostka and Habich-Sobiegalla 2022; Xu et al. 2022; Kalmus et al. 2024; Kostka et al. 2023; Karpa and Rochlitz 2024), measurements of *opinions* towards surveillance (Davis and Silver 2004; Dietrich and Crabtree 2019; Alsan et al. 2023), or behavioral *intentions* in order to cope with surveillance (Stoycheff 2016; Stoycheff et al. 2019; Stoycheff 2022; Büchi et al. 2022; Xu 2022). The correlation between *approval* or *intentions* towards a specific technology and *behavioral adaptations* because of this exact technology might not be linear nor homogeneous. More specifically, approval or tolerance for state surveillance does not singularly translate into no self-censorship, or conversely, high self-censorship. In China, there are exceptionally high approval rates of state surveillance (Su et al. 2022), while there are also high rates of self-censorship Robinson and Tannenberg (2019). In Kazakhstan, the approval of state surveillance is much lower,[15] and self-censorship rates are also smaller, yet substantial. It appears as if approving or tolerating state surveillance might be a coping mechanism to deal with the cognitive and emotional stress of surveillance, an argument also suggested in the context of China (Ollier-Malaterre 2023). As Ollier-Malaterre (2023) documents, living with digital surveillance intertwines cultural, psycho-social, and economic factors, resulting in multifaceted behavior not free of contradictions.

In this study, the average treatment effect was driven by an informed elite. This elite hides their opinions in the face of potential repression, a strategic consideration for surviving an authoritarian context, such as Kazakhstan. Beyond the literature

[15] 31.6% of Kazakh people say the government should definitely or probably have the right to monitor all emails and any other information exchanged on the Internet, whereas this number is 60.6% in China. Source: World value survey wave 7.

on authoritarianism in which this argument is theoretically grounded (Roberts 2018; Gehlbach et al. 2022; Egorov and Sonin 2024) – self-censorship as a response to surveillance is neither theoretically nor practically limited to autocracies (see section 2). There are virtually no countries in which citizens do not have to fear some sort of repercussions for stating politically sensitive views. Perceptions of being monitored in conjunction with some sanction mechanism – be it "being canceled" or arrested by the police – can lead to self-censorship. In this vein, others have theorized chilling effects induced by surveillance more broadly as "best understood as an act that conforms to, or is in compliance with, social norms in that context" (Penney 2022, p.1520). This study has contributed by assessing the chilling effect of digital surveillance specifically in an autocratic context.

Finally, there are cognitive components behind behavioral adaptations that remain opaque to the design of this study. The present study identified average behavioral responses and further investigated which groups are more sensitive to self-censoring as a behavioral response, but by design neglected an investigation of cognitive mechanisms. There are different promising offers in the literature providing avenues for further research; the economics of privacy literature suggests the involvement of an evolutionary "sense" of privacy related to congenital processes of impression management (Acquisti et al. 2022), or, the literature on chilling effects of dataveillance, which suggests including "dataveillance imaginaries", i.e., the cognitive understanding of humans subject to (data) surveillance processes, which substantially shape behavioral responses (Kappeler et al. 2023). If anything, this study has helped to shed light on the need for qualitative studies or mixed-methods designs that complement and enhance the findings of quantitative studies of digital surveillance.

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Appendix A Supplementary Material

A.1 Treatment design

control	privacy	surveillance
In the next section, you will be asked your opinion on economic and political issues directly. Your answers will remain confidential.	In the next section, you will be asked your opinion on economic and political issues directly. Your answers will remain confidential. Our encryption mechanisms make it completely impossible to track your data.	In the next section, you will be asked your opinion on economic and political issues directly. Your answers will remain confidential. However, as you may be aware, the government of Kazakhstan may access information about your online activity directly from your Internet Service Provider.

A.2 Additional Tables

Table A1 Summary statistics

Variable	N	Mean	SD
agegroup			
... 18-24	5025	0.13	0.337
... 25-34	5025	0.216	0.411
... 35-44	5025	0.211	0.408
... 45-54	5025	0.169	0.375
... 55+	5025	0.275	0.446
male	5025	0.487	0.5
higher_ed	5025	0.232	0.422
financial_situation_scale	5025	2.85	1.14
large_city	5025	0.22	0.414
vpn_user	5025	0.109	0.312
ethnicity			
... Kazakh	5025	0.722	0.448
... Other	5025	0.033	0.179
... Russian	5025	0.245	0.43
children	5025	2.26	1.46
language_russian	5025	0.622	0.485
government_employee	5025	0.109	0.312
media_international	5025	0.326	0.469

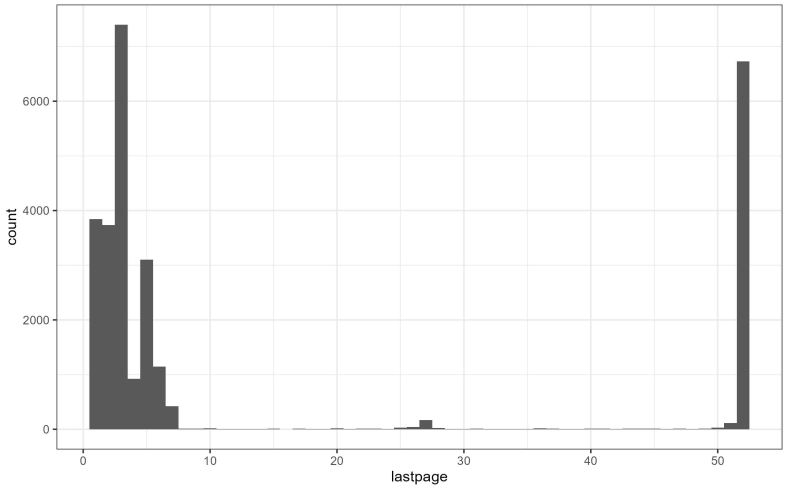
Table A2 Linear regression models for all dependent variables separately

	Dependent variable:			
	Protest	Sanction evasion	Invasion	Placebo
	(1)	(2)	(3)	(4)
Privacy	0.011	−0.010	0.007	−0.021
	(0.016)	(0.016)	(0.016)	(0.014)
Surveillance	0.042***	0.025	0.031*	−0.004
	(0.016)	(0.016)	(0.016)	(0.014)
Constant	0.285***	0.317***	0.318***	0.217***
	(0.011)	(0.011)	(0.011)	(0.010)
Observations	5,025	5,025	5,025	5,025
R^2	0.002	0.001	0.001	0.0005
Adjusted R^2	0.001	0.001	0.0004	0.0001
Residual Std. Error (df = 5022)	0.459	0.467	0.470	0.406
F Statistic (df = 2; 5022)	3.843**	2.446*	2.019	1.199

Notes: Linear regression models for all sensitive questions and the placebo question. Treatment dummies served as independent variables. Weighting for age and gender applied. The dependent variable is answering *prefer not to answer* in the four different questions described in section 3. *p<0.1; **p<0.05; ***p<0.01

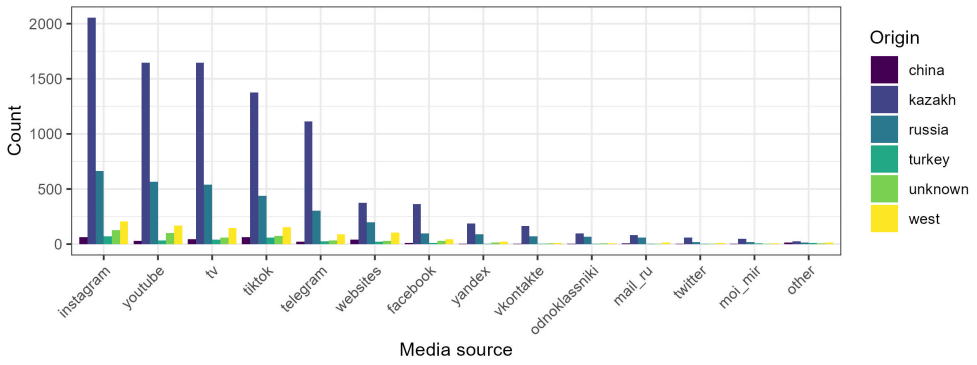
A.3 Additional Figures

Fig. A1 Last page of the survey



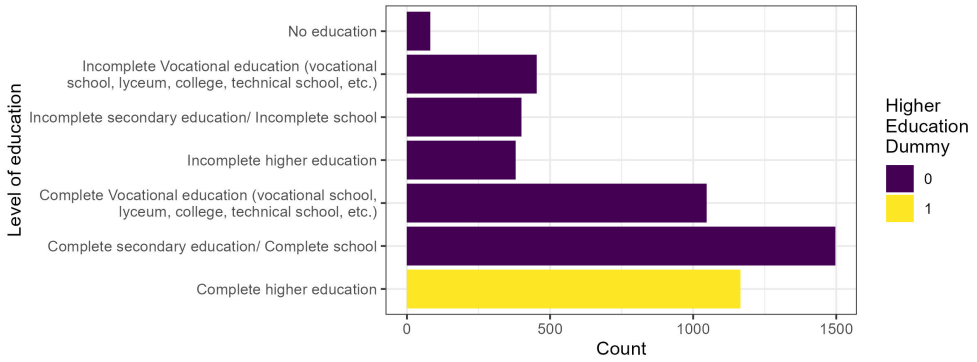
Notes: This figure shows which page of the survey was the last page a respondent saw. The very last page was the payment page, which was reached by 6,727 participants. 5,025 of these were successfully compensated, the others were not due to either failing quality checks, or entering a phone number that has already been used for payment. This indicated a duplicate entry by a single individual which is against the terms of the survey. The small bump around question 27 failed the matching age question quality check. The left tail of the distribution, i.e., those who left before page ten failed quality checks repeatedly (speeding, duplicate IP, under 18 years old) and/or indicated living outside of Kazakhstan. Many attempts to enter and complete the survey multiple times were prevented by the quality checks. The compensation of 700 Tenge posed as an incentive to complete the survey multiple times.

Fig. A2 Media consumption patterns



Notes: This figure shows which media sources respondents indicated as their "most important source of information for political and economic events". They were able to select up to four out of a list with all the options shown in randomized order. The next question asked them about the origin of each news source, which is indicated in the colors of the bars.

Fig. A3 Education levels



Notes: This figure shows which is the highest level of education respondents indicated they received. Those with a completed higher education degree have been as "elite", corresponding to hypothesis 4 and regressions in table 1.

A.4 Review process and divergence from the pre-analysis plan

The pre-registration can be found on https://aspredicted.org/BVT_9Z3. The major departures from the planned analysis – particularly with respect to not including portions of the data collected – are outlined below. The author is grateful to the excellent anonymous reviewers who provided very useful suggestions for improving the paper. Much of the deviation from the pre-registered plan is due to reviewer recommendations.

A.4.1 Revised Estimation Approach

The original plan relied on a list experiment with indirect measures analyzed via maximum likelihood and logistic/multinomial regressions. This approach has been replaced by an estimation strategy that defines self-censorship solely as "prefer not to answer" responses, with linear (OLS) regression and robust standard errors—including specifications with control variables and regional fixed effects – to ensure a more intuitive and consistent interpretation. The initial pre-registration suggested to compare direct questions with list experiment ("indirect") responses. This approach has been neglected in favor of a more concise analysis. Assessing a "baseline" of opinions toward a particular question through list experiments – while empirically successful – did not improve the theoretical contribution with respect to self-censorship because of surveillance. Assessing the effect of the treatments on the responses to the direct questions proved to be more crucial in this regard.

A.4.2 Streamlined Analysis of Conditional Effects

Originally, heterogeneous effects were examined through multiple subgroup analyses using median sample splits, resulting in a large number of tests without sufficient theoretical guidance. The literature review has since been refined to better motivate the empirical design, resulting in new, focused hypotheses regarding the heterogeneous effects of surveillance on self-censorship. Furthermore, the estimation of conditional average treatment effects now uses interaction models, providing clearer insights into moderation effects.