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To Repress or to Co-opt? Authoritarian Control in the Age of Digital Surveillance

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Abstract: *This article studies the consequences of digital surveillance in dictatorships. I first develop an informational theory of repression and co-optation. I argue that digital surveillance resolves dictators' information problem of not knowing individual citizens' true anti-regime sentiments. By identifying radical opponents, digital surveillance enables dictators to substitute targeted repression for nonexclusive co-optation to forestall coordinated uprisings. My theory implies that as digital surveillance technologies advance, we should observe a rise in targeted repression and a decline in universal redistribution. Using a difference-in-differences design that exploits temporal variation in digital surveillance systems among Chinese counties, I find that surveillance increases local governments' public security expenditure and arrests of political activists but decreases public goods provision. My theory and evidence suggest that improvements in governments' information make citizens worse off in dictatorships.*

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In early June 2013, former National Security Agency contractor Edward Snowden revealed top-secret documents concerning the U.S. government's surveillance operations. In Western democracies, the Snowden leaks fueled intense controversy among the public and caused a significant retreat in government surveillance.[1] However, in dictatorships where the governments pay less heed to public opinion, courts, and civil rights, digital surveillance has steadily increased in the past decade. Many authoritarian countries have purchased, developed, or enhanced surveillance tools in recent years (Valentino-DeVries, Vo, and Yadron 2015). More importantly, unlike U.S. surveillance that mainly focuses on international communications (Gellman and Poitras 2013), government surveillance in authoritarian regimes primarily targets domestic activity. Why are authoritarian governments so enthusiastic about domestic surveillance? How does digital surveillance influence government behavior and citizen well-being? The rapid rise in digital surveillance, as I show, has implications for our understanding of how dictatorships use repression and co-optation to address the risk of popular uprisings and to enhance regime stability.

Dictators control their populace through repression and co-optation, whereby citizens benefit from privileges doled out by the regime but also are subject to government suppression and even violence (Svolik 2012). Dictators' strategies to mitigate the risk of popular revolt and maintain regime stability must weigh the costs and benefits of both tools. Though a large body of literature

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[1]For example, the U.S. Congress passed the USA Freedom Act on June 2, 2015, which significantly curtailed the government's sweeping surveillance of phone calls and data gathering; on May 25, 2018, the European Union passed the strictest privacy law in EU history—the General Data Protect Regulation.

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emphasizes dictators' repression-co-optation trade-off (e.g., Frantz and Kendall-Taylor 2014; Wintrobe 2000), few studies have addressed how changes in the informational environment shape this trade-off.[2] The literature on information in authoritarian regimes largely focuses on the *horizontal information problem* faced by dissenting citizens who do not know each other's anti-regime sentiment, which prevents them from coordinating uprisings successfully (e.g., Edmond 2013; Kuran 1991). In such settings, communication technologies facilitate horizontal information exchanges, enabling better coordination among citizens (e.g., Edmond 2013). A few recent studies argue that dictators allow *vertical information flows* through media or multiparty elections to address social grievances and to monitor local officials (Huang, Boranbay-Akan, and Huang 2019; Lorentzen 2014; Miller 2015). However, an important question in vertical information exchange remains unexplored: Dictators do not have refined information on each citizen's anti-regime sentiment and thus cannot optimally allocate resources between repression and co-optation to deter collective action. This article argues that increasing digital surveillance shapes the repression-co-optation trade-off in substantively important ways by mitigating this *vertical information problem*, thereby allowing authoritarian governments to substitute targeted, preventive repression for more costly universal co-optation.

All dictators face threats from citizens excluded from power, especially organized opposition groups (Svolik 2012). Even if disenfranchised citizens cannot threaten regime survival, dictators still have an incentive to prevent everyday protests and maintain social order for economic growth so that they can extract more rents from the economy (Pan 2015). Radical opponents—citizens with stronger anti-regime sentiments—pose greater threats to social order than moderate ones because they have a stronger tendency to protest (Lust-Okar 2005) and they are crucial to forming a critical mass necessary for anti-regime mobilization (Oliver and Marwell 1988). In *stable dictatorships*, large-scale, indiscriminate repression is rare and usually not a preferable option to dissuade mass mobilization in the first place. Ideally, dictators could selectively repress radicals to prevent mass mobilization by addressing threats when the opposition is still organizing collective action (Ritter and Conrad 2016). However, dictators are inherently uninformed. In contrast to democratic leaders, who obtain information about citizens from free speech, critical media, and multiparty elections, dictators face the difficulty of obtaining accurate information about citizens even if they hold elections because citizens have an incentive to misrepresent their anti-regime sentiments when faced with the prospect of repression (Kuran 1991).[3] This authoritarian information problem undermines dictators' ability to identify radicals for targeted repression. As a result, dictators resort to expensive co-optation policies such as *universal* welfare provision to prevent moderates from coordinating with radicals to form an organized opposition.

The development of information and communications technology (ICT), especially surveillance technology, alleviates the vertical information problem in dictatorships. ICT facilitates citizens' digital communication, leaving substantial information in digital formats for governments to access and analyze. For example, the Iranian and Syrian regimes employ an array of digital surveillance tools to spy on citizens, especially those they deem threatening to regime survival (Gohdes 2014; Gunitsky 2015). Chinese government agencies also invest in digital tools to track and analyze online activities to contain threats before they spread (Qin, Strömberg, and Wu 2017). Moreover, recent technology advancements in high-resolution cameras, facial recognition, and big data processing empower governments to monitor citizens and identify dissidents in a timely manner (Liu and Wang 2017). When digital surveillance enables dictators to identify radical opponents, they substitute less expensive targeted repression for nonexclusive co-optation to lower regime survival cost. Thus, as digital surveillance technologies advance, we should observe increased selective repression but less nonexclusive co-optation.

This article focuses on surveillance technology rather than ICT penetration,[4] using China as a testing ground. In 1998, the Ministry of Public Security in China proposed the Golden Shield Project—a digital surveillance system (Walton 2001)—to improve the efficiency and effectiveness of the police. In 2001, the central government approved and started to fund the project, which was then implemented through several phases. The first phase of the project mainly built population databases, ID tracking systems, and Internet surveillance tools. The second phase of the project—the 3111 Initiative—focused on street surveillance camera

[2] See Blaydes (2018, Chap. 2) for a recent exception.

[3] Miller (2015), among others, argues that multiparty elections in dictatorships allow citizens to signal dissatisfaction with the regime. But this type of information is much blunter than information collected in a society with political freedom. Further, many authoritarian regimes, such as China, Saudi Arabia, and North Korea, do not have multiparty elections.

[4] This article considers increases in digital surveillance for a given level of Internet penetration. See Shapiro and Siegel (2015) for an example of how changes in ICT access alter insurgent mobilization and government surveillance together.

systems. Recent advancements on this project started to integrate facial recognition, big data, and artificial intelligence technologies into the system. Due to the central ministry's phase-in strategy in experimenting with this project, the timing of implementation varied across counties. This variation in the timing allows comparison of counties with and without completed Golden Shield systems, using difference-in-differences (DiD) designs.

Using unique archival data on Chinese county government expenditures and county-level political prisoners, I find that the implementation of the Golden Shield Project increases local governments' targeted repression, as measured by local public security expenditure and the number of political prisoners. I also find that the Golden Shield Project has a negative impact on government welfare provision, agriculture investments, and provision of other public goods. These findings are consistent with the theoretical predictions that governments substitute preventive, targeted repression for nonexclusive co-optation. The results are robust to lagged dependent variable models that address the endogeneity problem between the local implementation of the Golden Shield Project and a need for repression, as well as matching and trajectory-balancing models that address time-variant omitted variable biases.

This article directly contributes to a large body of literature on repression and co-optation in dictatorships (e.g., Davenport 2007; Gandhi and Przeworski 2006), especially work that focuses on the repression-co-optation trade-off. For example, Wintrobe (2000) presents a general theory of dictatorships that hold power through a combination of repression and loyalty, a concept similar to co-optation. Gershenson and Grossman (2001) analyze the changing mix of repression and co-optation that Soviet elites used to retain power in response to exogenous changes in domestic and international threats. Frantz and Kendall-Taylor (2014) develop a framework to show how co-optation institutions influence different types of repressive strategies in dictatorships. My work differs in two ways. First, I argue that though both repression and co-optation are important tools of authoritarian control, the information requirements to employ common forms of repression and co-optation differ—(targeted) repression requires more refined information. Second, I derive informational conditions under which dictators substitute repression for co-optation.

The theory and evidence in this article address a common phenomenon regarding information and repression in dictatorships. Sullivan (2016) examines police repression in Guatemala to show that when the government accumulates sufficient information about organizers to repress mobilization repeatedly, it can destroy challenger organizations by targeting the clandestine activities; but when repression is directed at ongoing overt challenges, it motivates backlash that escalates dissent. Dimitrov and Sassoon (2014) compare the operation of state security organs in Bulgaria and Iraq and find that, in Bulgaria, massive repression was replaced by surveillance and targeted repression because State Security was able to collect more fine-grained information on citizens. Truex (2019) also shows that the Chinese government strategically anticipates events that create focal points for protest coordination and then uses preventive repression to reduce dissent beforehand. My article contributes to this literature by highlighting the role of digital technologies in selective repression and examining the *trade-off* between targeted repression and nonexclusive co-optation when governments' information improves.

This article also contributes to a growing body of literature on ICT and authoritarian survival. Early studies posit that information technologies increase political freedom since they spread democratic values and empower ordinary citizens to mobilize (e.g., Diamond 2010). However, the Internet and ICT also provide authoritarian governments with new opportunities for political control (e.g., Lynch 2011). Authoritarian governments use the Internet and ICT to censor and repress online expressions (King, Pan, and Roberts 2013), collect information about citizen preferences (Gunitsky 2015), monitor local politicians (Qin, Strömberg, and Wu 2017), distract or guide public opinion (King, Pan, and Roberts 2017), and identify demonstrators and political opponents (Gunitsky 2015; Lynch 2011). Recent scholarship also finds that many regimes, including Russia, Turkey, Egypt, Bahrain, and Syria, employ domestic digital surveillance to monitor citizens (e.g., Gohdes 2014, 91). This article contributes to this literature by emphasizing the information advantages of digital surveillance for dictators to better target repression and decrease costly co-optation. Just as important, the theory and findings highlight that improvements in government information likely induce more repression instead of more policy concessions, as suggested in prior literature (e.g., Gunitsky 2015; Miller 2015).

An Informational Theory of Repression and Co-optation in Stable Dictatorships

Dictators rely on repression and co-optation to control citizens excluded from power (Svolik 2012). Repression subdues opposition to the ruling elite by force or violence

(e.g., Davenport 2007). It is the defining characteristic of all states and is particularly salient in dictatorships. Co-optation, on the other hand, provides benefits to a group of citizens in exchange for political support (e.g., Gandhi and Przeworski 2006). While co-optation often involves using formal institutions such as parties and legislatures to cement enduring commitments to provide benefits to co-opted groups (Gandhi and Przeworski 2006), even dictatorships without strong formal institutions appease popular discontent with policy concessions or material handouts (Kitschelt and Wilkinson 2007). To forestall dissent before coordinated protest manifests, dictators choose the optimal levels of repression and co-optation by weighing the costs and benefits of both.

The Trade-Off between Targeted Repression and Nonexclusive Co-optation

Repression and co-optation can be indiscriminate or targeted, but most of today's *stable, nonrentier dictatorships* seldom use indiscriminate repression or targeted co-optation as the main tools for everyday social control.

Large-scale, indiscriminate repression can incur international sanctions (Way and Levitsky 2006), lowers economic productivity (Nafziger and Auvinen 2002), causes mass backlash and mobilization (Sullivan 2016), and potentially leads to elite splits (O'Donnell, Schmitter, and Whitehead 1986). For a regime on the brink of collapse, large-scale, indiscriminate repression may be a drastic remedy, but it is not a long-term solution for sustaining a stable dictatorship by dissuading mass mobilization in the first place. Further, indiscriminate repression is less effective than targeted repression in deterring participation,[5] although it requires less information on citizens' types (Dimitrov and Sassoon 2014). Scholars find that targeted repression against individual opponents and weakening challenger organizations is far more frequently employed as an everyday tool of repression in dictatorships than indiscriminate repression (Ritter and Conrad 2016; Sullivan 2016; Truex 2019).

On the other hand, targeted co-optation is expensive because its cost increases with the number of individuals co-opted, whereas nonexclusive co-optation such as public goods provision is far more efficient for buying mass support (see Bueno de Mesquita and colleagues' [2003] selectorate theory building on this intuition). In most of today's stable dictatorships, citizens' anti-regime mobilization is low and regime stability is high because the regimes provide the two most basic public goods all citizens value—social stability and broad-based, long-term economic growth, which increase citizen satisfaction with the regime (Magaloni 2006). Therefore, dictators seldom use exclusive co-optation to buy mass support, especially in nonrentier states where governments face resource constraints.

Moreover, targeted co-optation of radicals is less efficient in deterring mobilization than targeted repression because the cost to buy support from radicals can be significantly higher than that to imprison them. Further evidence suggests that selective co-optation is ineffective in preventing protests because the unequal distribution of benefits among citizens intensifies contention and catalyzes collective action (Pan 2015).[6] More importantly, selective co-optation incurs a commitment problem that undermines the effectiveness of this strategy: Dictators can renege on the promised rewards once the mobilization threat is gone, and co-opted opponents may also renege by mobilizing later, ignoring the reward they received (Stokes 2005). This commitment problem intensifies if radicals have strong anti-regime sentiment and thus are likely to renege on their promises.[7] Thus, to deal with radicals, dictators prefer employing targeted repression to targeted co-optation.

This discussion underscores an important scope condition for my theory: recent stable, nonrentier dictatorships where the governments attempt to deter mass mobilization. Given that most dictatorships, most of the time, are relatively stable,[8] my theory has general implications for modern dictatorships.

As *nonexclusive co-optation* and *targeted repression* become common practices in recent stable dictatorships, dictators face a trade-off between these two strategies for everyday social control. Ideally, dictators prefer targeted repression to forestall citizen mobilization by *identifying* radical opponents and then *stopping* them through harassment, intimidation, or detention (Truex 2019). However, dictators face a vertical information problem that citizens tend to hide their true anti-regime preferences when they feel threatened by the prospect of

[5] Siegel (2011b) demonstrates that targeted repression is more likely to deter mobilization than random repression. Although social networks and the distribution of preferences influence the relative advantages of targeted repression, it is still better at preventing mobilization than random repression for all levels of repression intensity, and especially at low-intensity levels.

[6] Targeted co-optation can be as effective as or more effective than repression when it has a positive spillover effect on insurgents' social network (Siegel 2011a), but this evidence suggests the spillover effect could be negative.

[7] Nonexclusive co-optation is less prone to the commitment problems since it can still buy off honest moderates.

[8] Military juntas are less stable, but they have been increasingly rare in the past 30 years (Geddes, Wright, and Frantz 2018).

state repression (Kuran 1991). Due to this information problem, dictators cannot accurately target radicals. Nonexclusive co-optation is most useful when the regime has sufficient geographic, occupational, or racial/ethnic information about a large group of potential opponents to offer public or club goods but does not have accurate individual-level information to distinguish radical from moderate opponents. Because buying support from a moderate is cheaper than buying support from a radical, and public goods are nonexclusive regardless of the number of recipients, the regime gains support from a large number of moderates. Although this strategy does not win over radicals, whose price of support is higher than that for moderates, if protests require coordination between radicals and moderates, nonexclusive co-optation deters moderates from participating, thereby reducing the likelihood of protest mobilization.

Although moderates typically outnumber radicals, the latter remain the primary threat to social order because radicals are more likely to organize a protest, and a protest is more likely to succeed when radicals participate (Oliver and Marwell 1988). Because successful anti-regime protests require coordination between moderates and (particularly) radicals, dictators selectively repress radicals to prevent coordinated protests rather than providing universal welfare to all opponents when the regime has accurate individual-level information about citizens' types. Thus, when the probability of finding radicals is low, dictators prefer co-optation to repression. In contrast, when the likelihood of finding radicals is sufficiently high, dictators opt for selective repression over nonexclusive co-optation.

Digital Surveillance, Co-optation, and Repression

In the past two decades, the development of the Internet and the spread of social media have altered the way of communication, which provides authoritarian governments with new opportunities for surveillance. Citizens transmit information in electronic forms through an Internet infrastructure that can be controlled or interrupted by the government. Digital surveillance technologies, such as spying malware and automated mass-detection systems, are widely used in authoritarian countries (Gohdes 2014). In addition, recent advances in automated text analysis, machine learning techniques, and high-powered computing have reduced the costs of identifying critical users and censoring messages (Edmond 2013). Dictators use these tools to track and analyze online activities, to gauge public opinion, and to contain threats before they spread (Qin, Strömberg, and Wu 2017). Moreover, street surveillance cameras, combined with facial recognition and big data technologies, help dictators identify individual radical opponents and monitor early protests (Liu and Wang 2017). Thus, when information through digital surveillance increases dictators' *probability* of detecting radical opponents, dictators will substitute targeted repression for co-optation to preempt anti-regime mobilization. This logic informs the following expectations:

Repression Hypothesis:

Government digital surveillance increases targeted, preventive repression in authoritarian regimes.

Co-optation Hypothesis:

Government digital surveillance decreases nonexclusive co-optation in authoritarian regimes.[9]

Discussion

My theory focuses on the role of information in shaping authoritarian repression and co-optation. It applies to a majority of today's stable dictatorships. Even in societies where regime ideology or cultural legacies motivate high-intensity indiscriminate repression (e.g., genocide) against certain religious or ethnic groups, states still rely on surveillance and targeted repression to achieve social control (Blaydes 2018; Dimitrov and Sassoon 2014; Gohdes 2014).

Preventive repression as a result of increased government surveillance might further deter citizens from revealing true preferences, exacerbating the authoritarian information problem in the long run. However, if governments employ less visible, low-intensity repression, citizens will be less likely to hide their regime preferences. Thus, authoritarian governments have an incentive to make repression less visible to prevent backlash and to create uncertainty about their repression targets so as not to exacerbate the information problems in the future.[10]

Although my theory does not endogenize the adoption of digital surveillance, it is helpful to think about why

[9] I examine repression and co-optation separately because they are different outcomes of surveillance. Yet, since repression and co-optation are correlated due to the trade-off discussed above, I also use a seemingly unrelated regression (SUR) approach to fit models of repression and co-optation together to allow for correlated errors.

[10] Although dictators may sometimes make preemptive repression visible to deter potential protesters, there is no need to publicize all cases since acknowledging that many people are protesting against the regime signals regime vulnerability (Gueorguiev 2017). Instead, dictators can make a few representative cases of repression visible for deterrence purpose while hiding their surveillance practice from the public.

digital surveillance arises in the first place. First, dictators may develop digital surveillance to improve repression efficiency as long as its benefits outweigh costs. For example, states with high technology capacity (i.e., lower surveillance costs) may be more likely to engage in digital surveillance. Second, dictators may switch to targeted repression because they cannot afford nonexclusive co-optation or they need to direct the resources toward more productive investments. An economic downturn, an interstate war, a growing threat of social uprising, or emerging sectionalism may force dictators to develop digital surveillance for targeted repression. Further, dictators may adopt digital surveillance to control hard-to-penetrate populations such as religious or ethnic groups. Nevertheless, even if digital surveillance is endogenous to repression, the prediction that digital surveillance increases targeted repression and decreases nonexclusive co-optation still holds. My empirical strategy addresses endogeneity concerns to identify the causal effect of digital surveillance on repression and co-optation.

Data and Empirical Strategies

I use a full sample of about 3,000 Chinese counties (and districts) to examine how digital surveillance influences government repression and co-optation. These counties, as analogs to states in the international system, along with the Chinese government's phase-in digital surveillance programs, allow me to adopt a difference-in-differences (DiD) design to identify the effects of digital surveillance on repression and co-optation. Moreover, the large number of counties allows matching and trajectory–balancing methods to handle potential time-varying confounders that could weaken the DiD estimation.

Fiscal Arrangements in Chinese Counties

China is an authoritarian country with a multilevel government incorporating about 3,000 counties/districts (for simplicity, hereafter, I use *county* to indicate both) nested in prefectures/cities (about 335) and provinces/municipalities (31) under the central government. On average, a county has about 500,000 residents.

I focus on county governments because they are directly responsible for social welfare provision and repression at the local level. Similar to leaders in authoritarian countries, county leaders in China worry about popular uprisings because their career advancements are tied to local stability (Edin 2003). County leaders, therefore, employ co-optation and repression (e.g., providing social welfare and arresting dissidents) to prevent protests. Due to fiscal decentralization, county governments keep a share of the tax income and allocate their budgets without direct central control (Jia, Guo, and Zhang 2014). Scholars have long attributed China's economic growth to local governments' fiscal autonomy; see, for instance, Montinola, Qian, and Weingast's (1995) "federalism, China style" and Oi's (1995) "entrepreneurial local government." Further, China's 1994 tax reform—the famous "Separating Tax System"—further expanded county governments' expenditure obligations, including support for agricultural production, financing compulsory education, provision of public health services, and management of social security programs (Jia, Guo, and Zhang 2014). In other words, each county has a largely constrained budget (from tax and revenue) to allocate across different categories. If local officials save money from some redistribution obligations, they can spend more on other activities that benefit their political careers, such as large-scale development projects that signal economic and political achievements (Guo 2009). Thus, Chinese county leaders' career incentives, fiscal responsibilities, and budget constraints are similar to those of state leaders in the international system.

Measures and Data

I use county-level public security expenditure and the number of political prisoners as two complementary measures for targeted repression. For investment in nonexclusive co-optation, I use local welfare and public goods expenditure as well as local public goods provision. The data are collected from multiple archives kept in Beijing, Hong Kong, and other cities in China.

Public Security Expenditure Measure. Local public security expenditure is the total annual spending of local police forces, procuratorates, and courts. This expenditure, therefore, includes spending on the local government organizations that implement targeted repression: detentions, monitoring, harassments, beatings, and torture of local activists and dissidents. It does not include the spending of high-intensity repressive bodies such as the Armed Police Force and the People's Liberation Army, which the central government and provincial governments fund. Moreover, foreign observers have long used local security spending as an indicator for domestic repression in China (e.g., Martina 2014); archival evidence suggests that the regime invests in local security spending to maintain everyday social stability.

Local public security budgets exclude expenses of the Golden Shield Project, which was mostly funded by the

central government. Though local security expenditure may also be used to fight crime, scholars find that Chinese security agents are better trained and equipped to control protests than to combat crimes (Scoggins 2018). Thus, the local public security expenditure is a reasonable proxy for targeted repression. See Appendix A.1 in the supporting information (SI) for details about this measure.

Political Prisoners Measure. While security spending measures investment in repressive capacity, which closely hews to the theoretical expectations, it does not measure actual repression. Therefore, I use the number of political prisoners as a complement to the spending measure.

The political prisoner data draw on information contained in the Congressional-Executive Commission on China's Political Prisoner Database (CECC-PPD). The CECC lists individuals who have been detained or imprisoned in China for noncriminal reasons. Human rights organizations, such as Human Rights in China, the Network of Chinese Human Rights Defenders, Human Rights Watch, and the Dui Hua Foundation, compile lists of the prisoners' names and dates of incarceration. Several recent studies employ this political prisoner data to measure preventive repression (e.g., Gueorguiev 2017; Truex 2019). Data on detentions are available starting in 1981, but poor data quality during the early years, when entries were recorded retrospectively, makes them unsuitable for analysis. In addition, I use the second-phase Golden Shield Project to examine these prisoner data. Considering that the first-phase Golden Shield Project (completed in 2005) could contaminate the effect of the second-phase project, I then exclude all entries prior to 2006. After excluding entries with missing information, 4,531 (out of 5,007) detentions remain between 2006 and 2017. Among them, 82% of arrests were related to political crimes such as association, speech, and the spread of information—precisely the types of actions that facilitate protest coordination. Unlike combating crime, which is loosely organized, controlling social unrest is well disciplined in China with specific government protocols (Scoggins 2018), makeing prisoner data a comparable measure of targeted repression across different localities.

I generate a measure of local repression by aggregating every prisoner's time and location of detention (complemented by location of residence) in each county-year unit. This yields a 12-year panel for about 2,860 county-level units between 2006 and 2017. On average, each county arrested about 1.52 activists during the time period (the maximum is 256 and the minimum is 0).[11] See SI Appendix A.2 for details about this measure.

[11]I address the concern of underreporting in SI Appendix B.6.

Discussion of Repression Measures. Both measures of targeted repression have their drawbacks: Security spending includes all expenses of local security bodies; the prisoner data have missingness. Nevertheless, using both measures together mitigates the drawbacks of each. Moreover, whereas the prisoner data may have reporting biases because some regions are more heavily repressed traditionally, the difference-in-differences design exploits *temporal* variation within counties rather than cross-sectional variation, mitigating bias from spatial missingness.

Co-optation Measures. I use local welfare expenditure—the total expense of subsistence allowances, pensions, endowments, and medical and unemployment insurance policies—as a measure of investment in co-optation. This measure is a reasonable proxy for co-optation because scholars find that welfare policies in authoritarian countries effectively co-opt groups of people who pose a high risk to regime stability (Knutsen and Rasmussen 2018). I also use the expenditures and quantities of local public goods, such as the numbers of welfare centers and beds and the numbers of students in elementary and middle schools, as measures of co-optation. Note that I include agriculture production as a proxy for government spending on agriculture because this spending is a local government obligation. These measures of local public goods therefore capture the nonexclusive nature of co-optation.

Data Sources. I construct two data sets for these measures. First, I compile an original panel of county-level annual fiscal data using multiple sources. The 1994 – 2007 county-level public security, welfare, education, and agriculture expenditures come from the Fiscal Statistical Yearbook of Chinese Cities and Counties from 1995 to 2008.[12] Data on other covariates such as population and gross domestic product (GDP) come partly from the China County Socio-Economic Statistical Yearbook. The final data set contains about 2,860 counties from 1994 to 2007, roughly 36,180 observations. Second, I matched the 2006–17 county-level political prisoner data with the socioeconomic and public goods data from the China County Socio-Economic Statistical Yearbooks.[13] Summary statistics of these two data sets are reported in SI Appendix A.3.

[12]The national fiscal yearbooks are only available by 2008 with data by 2007.

[13]The socioeconomic yearbooks contain no data for city districts—the same administrative-level units as counties. I address this missing data problem in SI Appendix B.2.

The Golden Shield Project

My main empirical strategies rely on difference-in-differences comparisons that exploit local *temporal* variation in the implementations of a surveillance system—the Golden Shield Project (GSP). In 1998, the Ministry of Public Security initiated the GSP, a domestic surveillance and filtering system that integrates online government databases with an all-encompassing surveillance network (Walton 2001). This project was constructed through several phases.

The first phase of the project, completed in 2005, mainly built population databases, ID tracking systems, and Internet surveillance tools. A local GSP platform includes a local population database that records residents' photo, ID number, address, household composition, and other basic information; further, it connects to a network of population databases nationwide. This local-level database also communicates with a database for high-priority monitoring and control (重点管控 人口) that records residents who potentially threaten social and regime stability. Based on these two population databases, the platform further integrates several surveillance programs or tools. In addition, the system has ID scanning and tracking terminals installed in hotels, Internet cafés, train stations, bus terminals, airports, and train and air ticket offices. These tracking systems allow local police to track local and migrant populations, especially the population for high-priority monitoring and control. For example, once a blacklisted petitioner books a bus, train, or flight ticket to the province capital or Beijing, the system automatically notifies the local police bureau, and then the bureau will send officers to stop the petitioner.[14]

Moreover, the local GSP platform incorporates Internet surveillance modules that monitor important websites, online forums, and social media. Based on keywords searching software, these modules automatically discover and record public sentiments, and then report signs of social instability to local police (Du 2013). There are also Internet control modules that can conduct remote attacks (e.g., denial-of-service attacks) to disrupt websites, fabricate posts in threads, and guide online discussions (Du 2013). Combining IP address tracking with population databases enables the police to identify individuals who post sensitive information and track their location.

In the late 2000s, the Ministry of Public Security started the second phase of the GSP by integrating street surveillance cameras into the system. The ministry initiated a series of projects, including the 3111 Initiative.[15] With recently developed artificial intelligence and facial recognition technologies, the surveillance camera system identifies individuals in real time (Liu and Wang 2017).

Abundant anecdotal evidence suggests that the GSP facilitates preventive repression. For example, two famous lawsuits filed by Chinese political prisoners against Cisco reveal that the GSP, equipped with Cisco networking hardware, can detect, identify, and track political dissidents, who were later imprisoned by police (Moses 2011). There are also many individuals monitored and detained for their online political writings.[16]

Empirical Specifications

Based on the local implementation of the GSP, I employ two main estimation strategies to analyze the effect of digital surveillance on local repression: a difference-in-differences (DiD) approach that compares differential changes in repression before and after the completion of this project, and a lagged dependent variable estimation that addresses endogeneity concerns that arise if past repression influences the timing of implementation of local GSPs in different cross-section units. Because different data sets cover different time ranges, I use the implementations of the first-phase GSP (2005) as an identification strategy for the expenditure data set and the second phase (3111 Initiative, three waves) for the prisoner data set.

I also use the same DiD specifications to estimate the effect of digital surveillance on government co-optation. Because measures of co-optation and repression are different budget expenditures, which are correlated with each other given local government budget constraints, I also use seemingly unrelated regression (SUR) models to fit specifications with different budget expenditures together that allows errors to be correlated across equations.

Difference-in-Differences Design. I first use a difference-in-differences approach that compares changes in outcome Y_{it} in places with and without completed Golden Shield systems:

$$Y_{it} = \alpha_1 + \rho_1 D_{it} + \tau_1 time_t + \gamma_i + \lambda_t + X'_{it}\Psi_1 + \epsilon_{it}, \quad (1)$$

where Y_{it} can be county i's repression or co-optation at year t; γ_i and λ_t are county and year fixed effect dummies;

[14]Interview with a subdistrict office director in Sichuan Province in June 2015.

[15]Other projects include the Safe Cities project, the Skynet project, and the Rural Sharp Eyes project.

[16]See China's Political Prisoner Database by the Congressional-Executive Commission on China at https://www.cecc.gov/resources/political-prisoner-database.

X'_{it} is a set of time-varying county-level controls, and ϵ_{it} is the error term. The term $time_t$ is a dummy variable indicating the period that the local GSP system has been completed. D_{it} is an indicator variable that is one if county i has a completed system at year t and zero otherwise. I am interested in estimating ρ_1, the DiD estimate.[17]

This DiD model estimates the over-time changes in control and treatment groups and then takes the difference of the two over-time differences. With exogenous controls X_{it}, the key identification assumption is $E(\epsilon_{it}|\gamma_i, \lambda_t, D_{it}) = 0$. That is, a county with a completed GSP system should have to maintain the same difference as a county without a completed system had the former not completed the system. In other words, there are underlying parallel trends on the outcomes between the two groups.

Note that I define *treatment* and *time* differently for the two data sets because they span different phases of the Golden Shield Project, as in the following:

Golden Shield First Phase. The expenditure data set covers the period from 1994 to 2007. I use the *first phase* of the GSP as an identification strategy. The GSP was initialized in 1998 and began operation in 2003. The first phase of this project, including the population databases and most of the ID tracking systems, was completed in 2005.[18] Some counties were even equipped with an Internet surveillance system by 2005. In 2006, the central Ministry of Public Security awarded about 40 prefectural-level Bureaus of Public Security for their excellent work in completing the first phase of this project, which suggests that these 40 prefectures had finished the first-phase surveillance systems by 2005, whereas the other 280 prefectures did so only after 2005. The DiD estimator for this data set exploits this temporal variation: $time_t$ is a dummy variable that is equal to 1 after 2005, and D_{it} is an indicator variable that is equal to 1 if county i is located in a prefecture that has completed GS after 2005 and 0 otherwise.

Golden Shield Second Phase—The 3111 Initiative. The political prisoner data set covers the period from 2006 to 2017. I use the second phase of the GSP—the City Alarm and Surveillance Camera Pilot Project (3111 Initiative)—as an identification strategy. Since 2006, the Ministry of Public Security and provincial governments have jointly conducted three waves of the 3111 Initiative (Ding 2010). The first wave included four cities (consisting of about 50 county-level administrations), where the systems took effect in 2008. The second wave included 22 cities (consisting of about 130 counties/districts), with the systems completed in 2010. During the last wave, another 470 counties/districts piloted "3111" projects, with completion in 2012 (Li and Hikvision Digital Technology Co. 2015). A total of 660 pilot counties/districts were selected with a relatively even distribution within 31 provinces to *demonstrate* the surveillance camera systems to all other counties in China. Thus, local security concerns were not a major reason for selecting these counties, which mitigates the endogeneity problem. I also find that past political arrests are not correlated with pilot county selection. The phase-in nature of the 3111 Initiative permits a staggered DiD design with multiple time periods and multiple groups—a stronger identification strategy than a single treatment period DiD. For the political prisoner data set, D_{it} is an indicator variable that is equal to 1 if county i is a 3111 pilot county after the time of completion and 0 otherwise.[19]

Lagged Outcome Variable Design. The causal identification of the DiD method assumes *time-invariant confounders* that can be captured by the fixed effects. However, it is possible that repression and surveillance are endogenous. For example, local pressure for repression may directly affect the implementations of local GS systems or the self-selections of the 3111 pilot counties. It is also possible that counties that spend more money on repression tend to spend more on surveillance. To address this endogeneity problem, I use a lagged outcome model to account for pressure for repression or other omitted variables that lead to repression (Angrist and Pischke 2008):

$$Y_{it} = \alpha_2 + \rho_2 D_{it} + \pi_2 Y_{it-1} + \lambda_t + X'_{it}\Psi_2 + \epsilon_{it}, \quad t = 1, \ldots T, \qquad (2)$$

where Y_{it-1} refers to the 1-year lagged outcome variable (i.e., repression). For different data sets, the variable D_{it} indicates different counties in different time periods, as mentioned above.

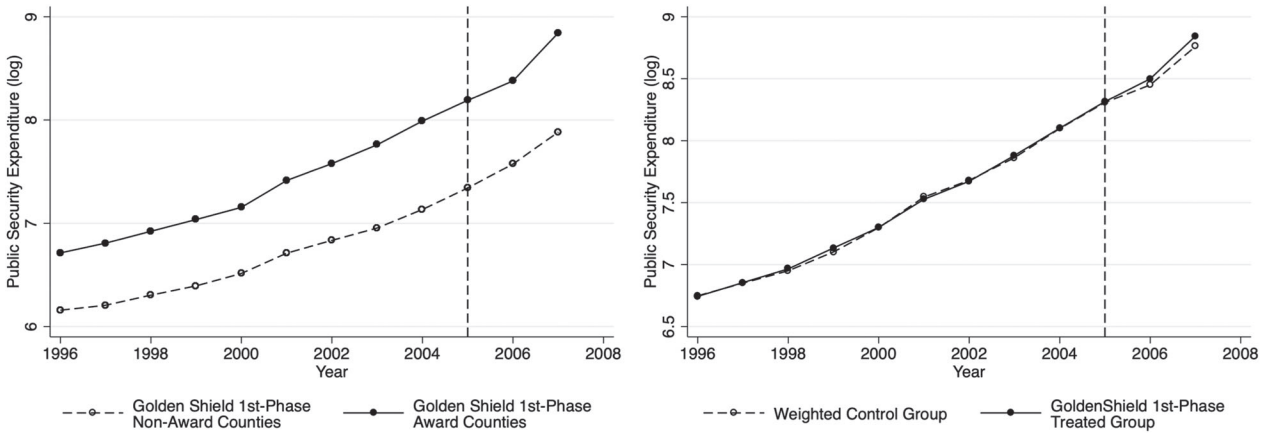
DiD, Lags, and Trajectory Balancing. While both DiD and lagged outcome models are solutions of causal inference, each requires relatively strong assumptions for identification that are often hard to justify. Fortunately, Angrist and Pischke (2008) point out an interesting bounding property of these two approaches. They prove that if the DiD model is correct but the analyst

[17] I use the cluster-bootstrap variance matrix developed by Bertrand, Duflo, and Mullainathan (2004) to adjust for serially correlated standard errors.

[18] See http://www.china.com.cn/chinese/zhuanti/283732.htm.

[19] See SI Appendix A.4 for details about the 3111 Initiative as well as how those pilot counties were selected.

FIGURE 1 Trends in Security Expenditure, First-Phase Golden Shield Project



Unweighted Trends

Trends with Trajectory-Balancing Weighted Control Group

uses a lagged outcome model, this will generate a correlation between the treatment and the lagged outcome that will bias the treatment effect downward. Conversely, if the lagged outcome model generates the data but the analyst estimates a DiD model, the estimated treatment effect will be too large since the unestimated lag parameter will be additive with the treatment effect through the error term. Therefore, we can view the estimates from a DiD model and a lagged outcome model as the upper bound and the lower bound for the causal effect of interest.

Another way to address the endogeneity problem is a recently developed trajectory–balancing approach, which uses kernel balancing to weight control observations to match the treated observations according to the pretreatment trends (i.e., high-order "trajectory") of outcomes and covariates (Hazlett and Xu 2018). This approach handles time-varying confounders by assuming some time-fixed linear combination of the time-varying confounders. Because pretreatment outcomes contain information on those confounders, balancing control observations with the treated on pretreatment outcomes differences out the time-varying confounders.

Results

In this section, I first present the results of surveillance on repression using those two repression measures. I then show that repression substitutes for co-optation after surveillance implementation.

Golden Shield and Local Public Security Expenditure

My argument posits that digital surveillance increases preventive repression. Figure 1 provides initial evidence from security spending data. The plot in the left panel shows that since 2006, the year that the GSP's first phase was completed, counties in prefectures with completed surveillance systems have increased local public security expenditure more so than counties without completed surveillance systems, especially in 2007. The trends between the two groups are relatively parallel. To mitigate time-varying omitted variable biases, I further use the trajectory-balancing approach to weight the control group. As shown in the right panel, the weighted control group—counties without completed surveillance systems—have almost the same pretreatment trend as that of the treated group, and the treated group has had a larger increase in security expenditure since 2006.

Table 1 presents the estimated results using the unweighted data. Column 1 reports the DiD estimate (*GS Completed County*), controlling for local total fiscal expenditure, population, and urbanization. Because the first-phase GS systems are completed at the prefecture level, I cluster standard errors by prefectures. The estimated effect is positive, large, and statistically significant, indicating that county governments in prefectures with completed GS systems spent 11.6% more on public security than counties in prefectures with uncompleted GS systems after 2005.

Column 2 reports the results of the lagged dependent variable (DV) model using the unweighted data; the

Table 1 First-Phase Golden Shield Project and Public Security Expenditure

	(1) Fixed Eff. Security	(2) Lagged DV Security	(3) Fixed Eff. Security	(4) Lagged DV Security	(5) Fixed Eff. Security	(6) Lagged DV Security
Golden Shield × Time	0.116***	0.036**	0.100***	0.030**	0.128***	0.034**
	(0.029)	(0.014)	(0.030)	(0.012)	(0.037)	(0.014)
Time: Post-2005	0.784***		0.039***		0.552***	
	(0.083)		(0.013)		(0.102)	
Lagged DV		0.754***		0.773***		0.755***
		(0.012)		(0.017)		(0.014)
Expenditure (Log)	0.638***	0.263***	0.570***	0.237***	0.531***	0.223***
	(0.036)	(0.013)	(0.049)	(0.015)	(0.032)	(0.015)
Population (Log)	0.043	−0.010*	0.045	−0.015***	0.045	−0.002
	(0.029)	(0.005)	(0.040)	(0.006)	(0.030)	(0.006)
Urbanization Ratio	−0.006	0.046***	−0.002	0.041***	−0.001	0.062***
	(0.013)	(0.010)	(0.016)	(0.010)	(0.013)	(0.012)
GDP (Log)			0.002	0.011***		
			(0.006)	(0.004)		
Admin. Exp. (Log)					0.149***	0.047**
					(0.053)	(0.022)
County Fixed Effects	Yes	No	Yes	No	Yes	No
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.121	−0.590***	1.363***	−0.741***	0.000	−0.771***
	(0.310)	(0.075)	(0.488)	(0.079)	(0.407)	(0.103)
Observations	34,757	31,632	25,340	24,827	27,329	24,489
R-squared	0.889	0.953	0.826	0.948	0.858	0.948
N of Counties	2,745		2,731		2,742	

Note: The dependent variable, Security, is log-transformed. Robust standard errors are clustered by prefectures. The numbers are of observations are different between fixed effects models and lagged DV models because the lags automatically drop observations in the first year. SI Table B.4 shows that the results remain similar and robust when matching the sample of the fixed effects models with that of the lagged DV models.
***p < .01, **p < .05, *p < .1.

estimate suggests the lower bound for the causal effect. The coefficient for *GS Completed County* remains positive and statistically significant: County governments in surveillance prefectures have spent roughly 3.6% more on public security since 2005. Columns 3–6 show that the results are stable when including additional controls such as GDP and administrative expenditure.[20] In addition, the result from weighted data using the trajectory-balancing approach indicates a 6.9% increase in security expenditure after surveillance.[21] Together, these results suggest that the GSP has a large, positive effect on local repression. Given that China's internal security spending was larger than the army's budget in 2011, a 4–12% increase in security spending is substantial. I also conduct a DiD falsification test based on the weighted data and find no pretrend difference (SI Appendix B.5).

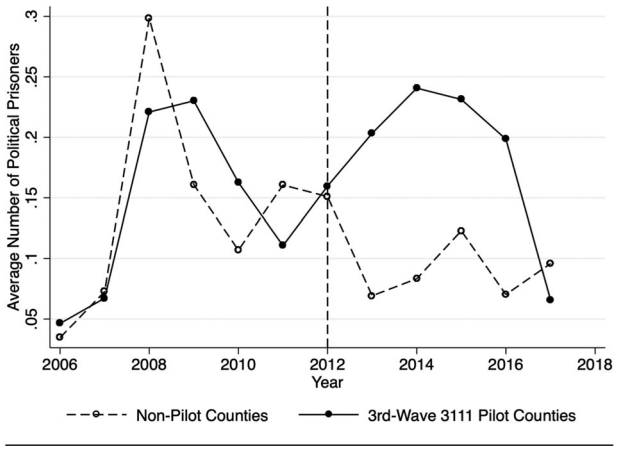
3111 Initiative and Political Prisoners

Figure 2 plots the number of political prisoners between the last wave of the "3111" counties and the never-treated counties before and after 2012. Pilot counties with completed surveillance camera systems have a sharper increase in the number of prisoners than nonpilot counties. Figure 2 also shows that the presurveillance trends between these two groups of counties are almost identical, which gives us more confidence to interpret DiD results as causal because it suggests common

[20]The main models (columns 1 and 2) do not include these two controls because the GDP variable misses all counties/cities in 1994, 1995, 1996, and 2007, and the administrative expenditure variable misses all counties/cities in 2004 and 2005.

[21]SI Appendix B.4 presents detailed results from the trajectory–balancing approach.

FIGURE 2 Trends in Political Prisoners, Third-Wave 3111 Initiative



underlying trends between these two groups in the absence of the 3111 Initiative.

Column 1 in Table 2 reports the DiD estimates from Equation (1), with standard errors clustered on counties because the 3111 Initiative uses counties as pilot project units.[22] The result indicates that pilot counties with advanced surveillance camera systems arrest 0.1 more political activists than nonpilot counties. Given that the average number of prisoners per county-year is 0.13, political prisoners almost double in surveillance pilot counties relative to nonpilot counties. Column 2 reports the lagged DV model estimate from Equation (2). The result is also substantial and statistically significant. A DiD falsification test finds no pretrend difference between these two groups (SI Appendix B.5).[23]

The Tibet and Xinjiang autonomous regions rely more heavily on repression than other provinces due to ethnic tensions and secession. In addition, petitioners and protesters are more likely to gather in Beijing, China's political center, and therefore preventive repression is more intensive there. It is possible that the positive results are driven by outlier counties in Beijing, Tibet, and Xinjiang. The prisoner data also show that governments in these three regions arrest disproportionally more activists than governments in other areas. To address this concern, I replicate the analyses using a subsample that excludes counties from those three provinces. As shown in columns 3 and 4, the results remain large and statistically significant.

Note that the average numbers of political prisoners in 3111 pilot and nonpilot counties converge in 2017, possibly suggesting that local governments may have arrested most dissidents so that extensive imprisonment is no longer necessary. It is also possible that citizens have learned to hide from government surveillance. Unfortunately, the data do not allow me to test these possibilities. Nevertheless, the evidence suggests that digital surveillance is effective for at least 4 years.

Surveillance and the Repression-Co-optation Trade-Off

Scholars argue that Internet and social media surveillance enable authoritarian governments to collect accurate information on mass opinion and to tailor policies accordingly (Gunitsky 2015). Although the Chinese government may use the information to adjust policy, this practice does not preclude the government from employing surveillance to identify political opponents. If, however, surveillance is primarily a tool to inform policy, we could expect surveillance to increase welfare spending in areas of potential unrest. In contrast, my theory suggests that surveillance for identifying individual opponents should result in more repression and less redistribution because the former is a more cost-efficient way to maintain social stability.

To test this trade-off, I examine how surveillance influences redistribution and security expenditures together using seemingly unrelated regression models with a DiD setup. I use levels of expenditure rather than log scales to compare spending in different categories.[24] Table 3 shows large, negative, and statistically significant effects of surveillance on welfare and agriculture spending. Further, I examine how the 3111 Initiative influences local public goods provision. Table 4 shows that most of the effects are negative, and the effects on the number of beds in hospitals and agriculture products are large, negative, and statistically significant (2.4–12 percentage decreases). Overall, these results suggest that surveillance decreases nonexclusive co-optation. Note that the negative effects do not mean an absolute reduction in public goods and welfare provision. Instead, these DiD estimates indicate that welfare spending and public goods have smaller increases in surveillance counties than in nonsurveillance counties.

[22] The results are robust to clustering on prefectures.

[23] The models do not include socioeconomic controls because city districts'(more than one-third of county-level units) controls are missing. Nevertheless, the results are robust with controls based on a subsample excluding city districts (SI Appendix B.2). In addition, I use fixed effects negative binomial models, negative binomial models, and zero inflated negative binomial models to address the discrete and nonnegative values of the prisoner variable. The results remain robust to all model specifications. See SI Appendix B.2 for details.

[24] See SI Table B.5 for estimation in log scales.

TABLE 2 The 3111 Initiative (Second-Phase GSP) and Political Prisoners

	All Provinces		Tibet, Xinjiang, and Beijing Excluded	
	(1) Fixed Eff. Prisoners	(2) Lagged DV Prisoners	(3) Fixed Eff. Prisoners	(4) Lagged DV Prisoners
3111 County	0.095***	0.084***	0.109***	0.042***
	(0.028)	(0.022)	(0.025)	(0.014)
Lagged Prisoners		0.157***		0.142***
		(0.011)		(0.010)
County Fixed Effects	Yes	No	Yes	No
Year Fixed Effects	Yes	Yes	Yes	Yes
Constant	0.038***	0.065***	0.035***	0.065***
	(0.007)	(0.010)	(0.007)	(0.011)
Observations	34,328	31,460	32,033	29,359
R-squared	0.002	0.025	0.002	0.021
N of Counties	2,868		2,674	

Note: Robust standard errors are clustered by counties. The results remain similar and robust when matching the sample of fixed effects models with that of lagged DV models.
***p < .01, **p < .05, *p < .1.

Alternative Mechanisms

One concern is that digital surveillance lowers the thresholds of what dictators perceive to be radical opponents to include individuals' browsing preferences. This means increased repression might result from "redefining" radicals instead of detecting radicals. However, information on the prisoners arrested for their online activities in the CECC-PPD database suggests that most of them used the Internet as a platform for anti-regime mobilization, indicating they are likely radical regime opponents. I further exclude all Internet-related arrests (about 10.6%)

TABLE 3 First-Phase GSP, Public Security, and Redistribution Expenditures

	(1) Security	(2) Welfare	(3) Education	(4) Agriculture
Golden Shield × Time	2,880.395***	−3,074.662***	−432.507	−993.202**
	(679.486)	(1,170.605)	(1,190.548)	(430.684)
Time: Post-2005	−1,195.498***	1,265.825**	1,815.880***	1,356.417***
	(301.880)	(520.074)	(528.934)	(191.343)
Total Expenditure (10,000 CNY)	0.073***	0.038***	0.131***	0.029***
	(0.000)	(0.000)	(0.000)	(0.000)
Population (10,000 Person)	−1.377***	3.608***	32.768***	0.817***
	(0.223)	(0.383)	(0.390)	(0.141)
Urbanization Ratio (0-1)	345.805	992.496**	−3,131.139***	−1,088.907***
	(279.129)	(480.878)	(489.071)	(176.923)
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Constant	−379.243*	115.844	3,415.862***	1,344.601***
	(214.221)	(369.055)	(375.343)	(135.781)
Observations	19,755	19,755	19,755	19,755
R-squared	0.923	0.567	0.950	0.839

Note: The unit of all dependent variables is 10,000 CNY. Seemingly unrelated regressions are employed with two-way fixed effects. Robust standard errors are clustered by prefectures.
***p<.01, **p<.05, *p<.1

Table 4 The 3111 Initiative (Second-Phase GSP) and Public Goods Provision

	Welfare			Education		Agriculture		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Welfare Centers	Welfare Beds	Hospital Beds	Primary School Students	Middle School Students	Grain Prodct	Cotton Prodct	Oil Crop Prodct
3111 County	0.006	−0.004	−0.024**	0.006	0.001	−0.047***	−0.121*	−0.108***
	(0.024)	(0.033)	(0.012)	(0.009)	(0.012)	(0.011)	(0.072)	(0.026)
Land Area (Log)	−0.063	0.004	0.024	0.059**	0.032	0.075	0.276	0.063
	(0.081)	(0.064)	(0.023)	(0.027)	(0.031)	(0.051)	(0.183)	(0.091)
Population (Log)	0.140*	0.312**	0.309***	0.447***	0.503***	0.124**	0.349*	0.599***
	(0.076)	(0.125)	(0.072)	(0.081)	(0.089)	(0.053)	(0.211)	(0.150)
1st Industry (Log)	0.041	0.117**	−0.013	−0.090***	−0.013	0.319***	0.266**	0.253***
	(0.042)	(0.054)	(0.020)	(0.021)	(0.022)	(0.052)	(0.113)	(0.069)
2nd Industry (Log)	0.065**	0.072**	0.036***	−0.041***	0.014	0.015	0.226***	0.128***
	(0.027)	(0.032)	(0.010)	(0.009)	(0.015)	(0.010)	(0.069)	(0.029)
Fiscal Bgt. (Log)	0.036	0.114***	0.055***	0.026***	0.089***	−0.006	0.059	0.134***
	(0.027)	(0.038)	(0.014)	(0.010)	(0.015)	(0.012)	(0.091)	(0.033)
County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.649	1.129	4.284***	9.376***	6.923***	7.113***	−3.407*	−0.047
	(0.912)	(1.064)	(0.378)	(0.400)	(0.426)	(0.632)	(1.937)	(0.998)
Observations	19,474	19,447	20,065	20,107	20,099	18,361	8,542	19,275
R-squared	0.018	0.351	0.613	0.234	0.258	0.118	0.104	0.045
N of Counties	2,081	2,081	2,086	2,086	2,086	2,066	1,093	2,041

Note: The dependent variables are log-transformed. Two-way fixed effects models are used. Robust standard errors are clustered by counties. $^{***}p < .01$, $^{**}p < .05$, $^{*}p < .1$.

from the sample. The results remain large and statistically significant at the .01 level (see SI Appendix B.6 for details).

If surveillance allows the government to more efficiently govern by improving redistribution accuracy and monitoring local officials, then increased surveillance should mean a fixed amount of government spending on local public goods will yield more gains in citizen welfare and more gains in social stability. Thus, while surveillance may allow the government to substitute repression for (costly) local public goods provision, a decline in spending on public goods provision could simply be the result of more efficient governance brought about by increased surveillance. However, we can rule out this mechanism for several reasons. First, my empirical strategy is based on the Golden Shield Project that is designed for police departments to monitor citizens. It is unlikely that this surveillance system improves government efficiency in delivering public goods. Second, the 3111 Initiative (the second phase of the GSP) is designed to install street camera systems in cities. It is unlikely that city camera systems improve redistribution accuracy in rural areas and thus influence agricultural production (Table 4, columns 6, 7, and 8).

A reduction in welfare spending after surveillance might also result from local government budget constraints: They spend more money on repression, with less left for redistribution. However, if this were the case, we would observe an accounting balance between increases in repression spending and decreases in co-optation. As shown in Table 3, the reduced co-optation spending is about 60% larger than the increased security spending, suggesting that the trade-off between repression and co-optation is unlikely to stem from local governments' accounting balance. A final concern is that increased surveillance might better inform a government strategy of individual-level targeted benefits, which might influence welfare expenditure. Though I cannot rule out this possibility, the increased political arrests with surveillance suggest that governments use more targeted repression.

Conclusion

Today, roughly half of the world's population lives under some form of nondemocratic government. Although social scientists, policy makers, and human rights advocates celebrated the dawn of the Internet era in the hopes that better communication technology would become a powerful tool to ensure and encourage freedom and democracy (Diamond 2010), we have not observed widespread authoritarian collapse in the two decades since the advent of this era. In this article, I argue that digital surveillance empowers dictators by resolving their information problem in identifying radical opponents and enabling them to substitute preventive repression for co-optation to prevent social unrest. The evidence from analyzing the effects of the Golden Shield Project on Chinese subnational governments' repression and co-optation is consistent with this theory.

The findings of this article are based on the practices of surveillance and repression conducted by the police in a non-electoral dictatorship, but the theory developed here is generalizable to other types of surveillance and repression as well as to electoral autocracies. For example, in 2004, the Hugo Chávez regime in Venezuela was able to identify several million voters who had attempted to remove him from office. The regime then used a user-friendly software program known as Maisanta to distribute the list throughout the government bureaucracy for punishment. Scholars find that voters who were identified as Chávez opponents experienced a 5% drop in earnings and a 1.3 percentage point drop in employment rates after the voter list was released (Hsieh et al. 2011). This case suggests that dictators have many ways to surveil and repress opponents, and surveillance can be effective when it is used to collect individual-level information on citizens' political preferences during elections.

The theory and findings in this article have several implications for explaining authoritarian survival in the digital age. First, digital surveillance helps dictators repress radical opponents to forestall large-scale, social protests that might threaten their survival. Second, contemporary dictatorships seldom employ large-scale, in-person surveillance (e.g., Stasi in East Germany) to control society due to its detrimental effects on social trust and economic growth (Blaydes 2018) as well as the costs and risks of creating and managing a large bureaucracy composed of human agents who may threaten the dictator's survival. Digital surveillance relies less on human agents and can more easily be disguised. The reduced social and political costs facilitate using surveillance to control society in dictatorships.[25] Moreover, surveillance enables dictators to use preventive repression to address threats before overt mass protests mobilize, which reduces the necessity to engage in reactive, often more violent, state-led repression (see Greitens [2016] for a similar argument). As a consequence, surveillance likely reduces dictators' reliance on military or paramilitary forces for retaining power and therefore lowers the risk of military takeover. Future research in these directions is worth exploration.

References

Angrist, Joshua D., and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton, NJ: Princeton University Press.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. 2004. "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics* 119(1): 249–75.

Blaydes, Lisa. 2018. *State of Repression: Iraq under Saddam Hussein*. Princeton, NJ: Princeton University Press.

Bueno de Mesquita, Bruce, Alastair Smith, Randolph M. Siverson, and James D. Morrow. 2003. *The Logic of Political Survival*. Cambridge, MA: MIT Press.

Davenport, Christian. 2007. "State Repression and Political Order." *Annual Review of Political Science* 10: 1–23.

Diamond, Larry J. F. 2010. "Liberation Technology." *Journal of Democracy* 21(3): 69–83.

Dimitrov, Martin K., and Joseph Sassoon. 2014. "State Security, Information, and Repression: A Comparison of Communist Bulgaria and Ba'thist Iraq." *Journal of Cold War Studies* 16(2): 3–31.

Ding, Zhaowei. 2010. "The Progress of National-wide 'Safe City' Projects in 2010." [in Chinese] *China Public Security* 2010(01): 74–78. http://www.cnki.com.cn/Article/CJFDTOTAL-GGAZ201001015.htm

Du, Xinwei. 2013. "Design and Implementation of Taiyuan Comprehensive Information Platform for a Bureau of Police" [in Chinese]. Master's thesis. University of Electronic Science and Technology of China, http://cdmd.cnki.com.cn/Article/CDMD-10614-1013330231.htm.

Edin, Maria. 2003. "State Capacity and Local Agent Control in China: CCP Cadre Management from a Township Perspective." *The China Quarterly* 173(1): 35–52.

Edmond, Chris. 2013. "Information Manipulation, Coordination, and Regime Change." *Review of Economic Studies* 80(4): 1422–58.

Frantz, Erica, and Andrea Kendall-Taylor. 2014. "A Dictator's Toolkit: Understanding How Cooptation Affects Repression in Autocracies." *Journal of Peace Research* 51(3): 332–46.

[25] Digital surveillance is quicker and more comprehensive than human agent-based surveillance and thus may be more accurate if human agents are subjective or even malicious against "innocent" people.

Gandhi, Jennifer, and Adam Przeworski. 2006. "Cooperation, Cooptation, and Rebellion under Dictatorships." *Economics & Politics* 18(1): 1–26.

Geddes, Barbara, Joseph Wright, and Erica Frantz. 2018. *How Dictatorships Work: Power, Personalization, and Collapse*. Cambridge: Cambridge University Press.

Gellman, Barton, and Laura Poitras. 2013. "U.S., British Intelligence Mining Data from Nine U.S. Internet Companies in Broad Secret Program." *Washington Post*, July 3. https://www.washingtonpost.com/investigations/us-intelligence-mining-data-from-nine-us-internet-companies-in-broad-secret-program/2013/06/06/3a0c0da8-cebf-11e2-8845-d970ccb04497_story.html.

Gershenson, Dmitriy, and Herschel I. Grossman. 2001. "Cooption and Repression in the Soviet Union." *Economics & Politics* 13(1): 31–47.

Gohdes, Anita R. 2014. "Repression in the Digital Age: Communication Technology and the Politics of State Violence." PhD dissertation. Universität Mannheim. https://ub-madoc.bib.uni-mannheim.de/37902/.

Greitens, Sheena C. 2016. *Dictators and Their Secret Police: Coercive Institutions and State Violence*. Cambridge: Cambridge University Press.

Gueorguiev, Dimitar D. 2017. "In Public or in Private: Repressing Dissidents in China." Working Paper. https://ssrn.com/abstract=3038812.

Gunitsky, Seva. 2015. "Corrupting the Cyber-Commons: Social Media as a Tool of Autocratic Stability." *Perspectives on Politics* 13(1): 42–54.

Guo, Gang. 2009. "China's Local Political Budget Cycles." *American Journal of Political Science* 53(3): 621–32.

Hazlett, Chad, and Yiqing Xu. 2018. "Trajectory Balancing: A General Reweighting Approach to Causal Inference with Time-Series Cross-Sectional Data." Working Paper. UCLA and UCSD. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3214231

Hsieh, Chang-Tai, Edward Miguel, Daniel Ortega, and Francisco Rodriguez. 2011. "The Price of Political Opposition: Evidence from Venezuela's Maisanta." *American Economic Journal: Applied Economics* 3(2): 196–214.

Huang, Haifeng, Serra Boranbay-Akan, and Ling Huang. 2019. "Media, Protest Diffusion, and Authoritarian Resilience." *Political Science Research and Methods* 7(1): 23–42.

Jia, Junxue, Qingwang Guo, and Jing Zhang. 2014. "Fiscal Decentralization and Local Expenditure Policy in China." *China Economic Review* 28(C): 107–22.

King, Gary, Jennifer Pan, and Margaret E. Roberts. 2013. "How Censorship in China Allows Government Criticism but Silences Collective Expression." *American Political Science Review* 107(2): 326–43.

King, Gary, Jennifer Pan, and Margaret E. Roberts. 2017. "How the Chinese Government Fabricates Social Media Posts for Strategic Distraction, Not Engaged Argument." *American Political Science Review* 111(3): 484–501.

Kitschelt, Herbert, and Steven I. Wilkinson. 2007. *Patrons, Clients and Policies: Patterns of Democratic Accountability and Political Competition*. Cambridge: Cambridge University Press.

Knutsen, Carl Henrik, and Magnusn Rasmussen. 2018. "The Autocratic Welfare State: Old Age Pensions, Credible Commitments, and Regime Survival." *Comparative Political Studies* 51(5): 659–95.

Kuran, Timur. 1991. "Now out of Never: The Element of Surprise in the East European Revolution of 1989." *World Politics* 44(1): 7–48.

Li, Yanxiang, and Ltd. Hikvision Digital Technology Co. 2015. "The History and Prospects of Safe City" [in Chinese]. *China Public Security* 9. http://www.cnki.com.cn/Article/CJFDTOTAL-GGAZ201509013.htm.

Liu, Joyce, and Xiqing Wang. 2017. "In Your Face: China's All-Seeing State." BBC News, December 10. https://www.bbc.com/news/av/world-asia-china-42248056/in-your-face-china-s-all-seeing-state.

Lorentzen, Peter L. 2014. "China's Strategic Censorship." *American Journal of Political Science* 58(2): 402–14.

Lust-Okar, Ellen. 2005. *Structuring Conflict in the Arab World: Incumbents, Opponents, and Institutions*. Cambridge: Cambridge University Press.

Lynch, Marc. 2011. "After Egypt: The Limits and Promise of Online Challenges to the Authoritarian Arab State." *Perspectives on Politics* 9(2): 301–10.

Magaloni, Beatriz. 2006. *Voting for Autocracy: Hegemonic Party Survival and Its Demise in Mexico*. New York: Cambridge University Press.

Martina, Michael. 2014. "China Withholds Full Domestic-Security Spending Figure." Reuters, March 4. https://www.reuters.com/article/us-china-parliament-security/china-withholds-full-domestic-security-spending-figure-idUSBREA240B720140305

Miller, Michael K. 2015. "Elections, Information, and Policy Responsiveness in Autocratic Regimes." *Comparative Political Studies* 48(6): 691–727.

Montinola, Gabriella, Yingyi Qian, and Barry R. Weingast. 1995. "Federalism, Chinese Style: The Political Basis for Economic Success in China." *World Politics* 48(1): 50–81.

Moses, Asher. 2011. "Fighting China's Golden Shield: Cisco Sued Over Jailing and Torture of Dissidents." *Sydney Morning Herald*, August 16. https://www.smh.com.au/technology/fighting-chinas-golden-shield-cisco-sued-over-jailing-and-torture-of–dissidents-20110816-1ivkv.html

Nafziger, E. Wayne, and Juha Auvinen. 2002. "Economic Development, Inequality, War, and State Violence." *World Development* 30(2): 153–63.

O'Donnell, Guillermo, Philippe C. Schmitter, and Laurence Whitehead. 1986. *Transitions from Authoritarian Rule: Comparative Perspectives*. Vol. 3. Baltimore: Johns Hopkins University Press.

Oi, Jean C. 1995. "The Role of the Local State in China's Transitional Economy." *The China Quarterly* 144(Dec 1995): 1132–49.

Oliver, Pamela E., and Gerald Marwell. 1988. "The Paradox of Group Size in Collective Action: A Theory of the Critical Mass. II." *American Sociological Review* 53(1): 1–8.

Pan, Jennifer. 2015. "Buying Inertia: Preempting Social Disorder with Selective Welfare Provision in Urban China. PhD dissertation. Harvard University. https://dash.harvard.edu/handle/1/17467174.

Qin, Bei, David Strömberg, and Yanhui Wu. 2017. "Why Does China Allow Freer Social Media? Protests versus Surveillance and Propaganda." *Journal of Economic Perspectives* 31(1): 117–40.

Ritter, Emily Hencken, and Courtenay R. Conrad. 2016. "Preventing and Responding to Dissent: The Observational Challenges of Explaining Strategic Repression." *American Political Science Review* 110(1): 85–99.

Scoggins, Suzanne E. 2018. "Policing Modern China." *China Law and Society Review* 3(2): 79–117.

Shapiro, Jacob N., and David A. Siegel. 2015. "Coordination and Security: How Mobile Communications Affect Insurgency." *Journal of Peace Research* 52(3): 312–22.

Siegel, David A. 2011a. "Non-disruptive Tactics of Suppression Are Superior in Countering Terrorism, Insurgency, and Financial Panics." *PloS One* 6(4): e18545.

Siegel, David A. 2011b. "When Does Repression Work? Collective Action in Social Networks." *Journal of Politics* 73(4): 993–1010.

Stokes, Susan C. 2005. "Perverse Accountability: A Formal Model of Machine Politics with Evidence from Argentina." *American Political Science Review* 99(3): 315–25.

Sullivan, Christopher M. 2016. "Political Repression and the Destruction of Dissident Organizations: Evidence from the Archives of the Guatemalan National Police." *World Politics* 68(4): 645–76.

Svolik, Milan W. 2012. *The Politics of Authoritarian Rule*. Cambridge: Cambridge University Press.

Truex, Rory. 2019. "Focal Points, Dissident Calendars, and Preemptive Repression." *Journal of Conflict Resolution* 63(4): 1032–52.

Valentino-DeVries, Jennifer, Lam Thuy Vo, and Danny Yadron. 2015. "Cataloging the World's Cyberforces." *Wall Street Journal*, December 28. https://www.wsj.com/articles/cataloging-the-worlds-cyberforces-1444610710

Walton, Greg. 2001. *China's Golden Shield: Corporations and the Development of Surveillance Technology in the People's Republic of China*. Montréal: Rights & Democracy.

Way, Lucan A., and Steven Levitsky. 2006. "The Dynamics of Autocratic Coercion after the Cold War." *Communist and Post-Communist Studies* 39(3): 387–410.

Wintrobe, Ronald. 2000. *The Political Economy of Dictatorship*. Cambridge: Cambridge University Press.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix A: Data and Summary Statistics
A.1: Public Security Expenditure Measure
A.2: Political Prisoner Measure
A.3: Summary Statistics
A.4: Golden Shield Award Prefectures and 3111 Initiative Pilot Counties
Appendix B: Additional Empirical Analyses
B.1: Public Security Expenditure Data
B.2: Political Prisoner Data
B.3: Currently Detained Prisoners with Arrest Information Searched Online
B.4: Trajectory Balancing and Matching for Security Spending Data
B.5: DiD Falsification Tests
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