What motivates non-democratic leadership: Evidence from COVID-19 reopenings in China

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This version: February 23, 2021

Abstract

We examine Chinese cities' COVID-19 reopening plans as a window into governments' economic and social priorities. We measure reopenings based on official government news announcements, and show that these are predicted by citizen discontent, as captured by Baidu searches for terms such as "unemployment" and "protest" in the prior week. The effects are particularly strong early in the epidemic, indicating a priority on initiating economic recovery as early as possible. These results indicate that even a non-democratic government may respond to citizen concerns, possibly to minimize dissent.

JEL classification: D73; P26

Keywords: Bureaucratic incentives, unrest, non-democracy, China, COVID-19

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1 Introduction

One conjectured merit of non-democratic governance is that it allows for decision-making that provides coordinated responses to societal concerns. As observed by Kudumatsu and Besley (2008) command-and-control systems may be effective in, for example, providing public infrastructure and coordinating private investments. However, as they also observe, an effective government should also "protect the vulnerable," which will often require that officials attend to citizens' concerns. (This point is echoed in a more nuanced form in classic analysis of democratic transitions by Acemoglu and Robinson (2005), which argues that elites may choose to "buy off" some groups (e.g., the middle class) to forestall democratization.)

While non-democracies are, by definition, not subject to democratic accountability and hence face no immediate imperative to respond to societal demands, populations that grow too dissatisfied with their leaders may take more extreme measures to bring about regime change, as exemplified by the recent Arab Spring uprisings (among many, many others). Thus, leaders that take the long view may wish to minimize dissent in order to maintain control (see, e.g., King et al., 2013 on the central importance of maintaining social stability for Chinese officials). This imperative for order and stability is almost surely felt also by lower-level officials, as it may be necessary to gain promotion.

We study Chinese city leaders' responses to the recent COVID-19 pandemic. Studying government policies toward the pandemic in a non-democratic setting is worthwhile in its own right, given the vigorous debate on whether democratic accountability has aided or hindered responsiveness to this epochal global health threat (e.g., Kleinfeld, 2020).[1] But we may also use these responses as a way of understanding what motivates officials in the Chinese bureaucratic hierarchy more generally. That is, how have governments weighed economic versus public health considerations in guiding their policy responses? And to the extent that they are concerned with economic outcomes, are these primarily citizen concerns, standard governmental performance metrics, or both? Our particular setting is well-suited to studying these questions: the rapidly-shifting nature of the epidemic, combined with possible citizens discontent over extended lockdowns, forced leaders in each city to manage potentially conflicting objectives on a day-to-day basis (and thus generating within-city variation that we exploit in our analysis).

We measure government reopenings based on the number of articles in the government-owned city newspaper that includes the term *reopening* in the title, during the first two months after the

[1]The Chinese political system is organized around the Chinese Communist Party, which refers to its system of governance as democratic centralism. At lower-levels of government, there may be active citizen input and indeed even multi-candidate elections, though at higher levels in practice political selection is via bureaucratic promotion. See, e.g., Fisman et al. (2020) for additional details. For simplicity we use the term "non-democratic" throughout.

Chinese New Year.[2] This measure has the advantage of reflecting government policy toward restarting the economy, rather than the combined effects of government policy and individuals' responses to health risks, such as traffic patterns (which we will also consider).As we explain in greater detail in Section 2.1, the government did not provide explicit reopening policy announcements, as was common in many states and cities within the U.S. Rather, reopening "guidances" came gradually and sometimes obliquely via stories in official newspapers that described what was expected to unfold in subsequent days or weeks.

We begin by showing that cities with higher COVID case counts experienced a greater decline in economic activity, as captured by traffic in 2020 versus the same day in 2019 (relative to the Chinese Spring Festival).[3] Specifically, in a panel setting, we show that the presence of new COVID cases in the prior week is a negative predictor of traffic. This is a basic reality check that combines both governmental and individual responses. But these public health measures do not correlate with stories in official government newspapers that focus on reopening.[4] Government reopening announcements do, however, have a direct positive relationship with economic activity, as captured by traffic flow – more reopening news in the prior week is associated with higher traffic flow, indicating that government pronouncements likely have an impact on real economic activity, distinct from individual concerns resulting from the existence of recent COVID cases.

As a proxy for government responsiveness to citizen concerns, we use searches of keywords that are related to social unrest and economic difficulties (such as bankrutpcy, default on mortgage, protests, rights protection; see Section 2.3 for more details) on Baidu, a Chinese internet search platform.[5] We show that newspapers have more stories that headline reopening if city residents search more for these terms in the preceding week. This is true for specifications that include city and day fixed effects, so that the link between Baidu searches and reopening announcements is identified using within-city variation in expressions of economic anxieties and frustration. Finally, the relationship is driven by reopening announcements that occur relatively early in the sample period, suggesting that citizen discontent prompted leaders to prioritize economic recovery as early as possible.

[2]As we explain below, we use the last day of the Chinese Spring Festival as Day 0 because there is normally a lull in commerce leading up to this date.

[3]This comparison also preserves a comparison between the same day-of-the-week in 2020 versus 2019.

[4]We can speculate on the reasons for this lack of correlation. Possibly, it results from the difficulty in pinning down the timing that links prior cases to reopening announcements. It may also be that by February, the appearance of individual cases were not seen by individual municipalities as representing substantive public health threats. On an anecdotal level, we observed an immediate and complete shutdown of Beijing following the appearance of a larger COVID-19 cluster in early June, 2020, indicating that wider health threats were seen as reason for a strong governmental response.

[5]It is a common perception that the Chinese government does not tolerate any dissent. However, as we explain in greater detail below, smaller-scale protests and criticism of officials are tolerated and even encouraged in China, as in many non-democracies.

Our findings contribute to the already-vast literature on the political economy of COVID responses globally. Much of this work has emphasized partisan differences across U.S. states (e.g., Adolph et al., 2020; Allcott et al., 2020; Barrios and Hochberg, 2020, to name just a few). To our knowledge we are the first to study COVID responses in a non-democratic system. We see our main contribution as *using* these events to understand more broadly the attentiveness of officials to citizen concerns in China, and in non-democratic systems more generally. Particularly in recent years, political economy scholars have looked more rigorously at the incentives and objectives of Chinese officials, documenting, for example, the link between promotion and local economic growth (Jia et al., 2015), pollution (Kahn et al., 2015), and workplace safety (Fisman and Wang, 2017). Most directly related, a small number of recent papers have shown a link between the *direct* expression of political concern and bureaucratic responses: Our findings complement those of Chen et al. (2016), who show in an audit study that Chinese city leaders are more likely to reply to requests for an unconditional cash transfer program (*Dibao*) when the letter includes threat of collective action. Our findings indicate that this responsiveness extends to substantial policy actions (whereas in Chen et al., 2016 the outcome is only whether an official provides a written response). Our work contributes to the nascent literature that aims to better understand when and how the Chinese bureaucracy responds to such concerns; most notably Jiang and Zeng (2020) show that responsiveness to citizen petitions on land reform is contingent on city leaders' connections to higher-level officials, which may allow them to overcome potentially powerful local real estate business interests.

More broadly, our work speaks to the objectives of leaders in non-democracies. As we noted at the outset, a range of models suggest that non-democratic leaders may attend to the preferences of their citizens, even in the absence of direct accountability. Our findings do suggest that in the case of China, leaders heed the expressed concerns of their citizens. (Note that this is by no means an endorsement of the system overall – in the model of Acemoglu and Robinson (2005), for example, elites may cater to the concerns of others to retain power, because the alternative – revolution and democracy – is worse for elites, even if it improves the well-being of the median citizen.) As such we add to the literature in political science and economics which considers how non-democratic leaders maintain control. For earlier contributions see, especially, Svolik, 2012 and citations therein; and for recent related work on China specifically, see Li (2014) on labor disputes and public goods provision, and Distelhorst and Hou (2017) for a field experiment on local government responsiveness to citizens' complaints.

2 Background and Data

We draw on a range of distinct data sources to conduct our main empirical tests. In the subsections that follow we provide overviews of each data component.

2.1 News reports on COVID-19 reopenings

To measure the extent of reopening we utilize news reports via official "mouthpiece" newspapers in each city. Before proceeding to describe our measure, we clarify a few aspects of reopening plans and their communication to the general public.

Most importantly, reopening was a local decision – the central government specified the earliest possible reopening date, which applied uniformly across the country, but beyond this constraint, the decision was decentralized to each province, which in turn delegated the decision to each city.[6] Within each city, the government rarely provided explicit pronouncements, perhaps to avoid taking responsibility for new cases that emerged in the wake of reopenings.[7] Rather, city leaders provided policy guidance via official media announcements as described below, and also broadcast guidelines simultaneously via social media outlets like WeChat (See Qin et al. (2018) for a reference). Thus, our best proxy for reopening plans come via these official media sources, whose communications signal the local government's intentions and desires. Because cities opened district by district and sector by sector, and directives varied in their forcefulness, we cannot generate a simple event study type of analysis with a single reopening date. (Some sample news stories may help to illustrate. We provide some examples from the *Jiefang Daily*, Shanghai's official newspaper. Reopening reports in our dataset include, among others, the following, which illustrate the geographic and sectoral specificity of announcements: "93 percent of regional headquarters of international companies in Shanghai

[6]The State Council issued such a guidance on Feb 8, 2020. See http://paper.people.com.cn/rmrb/html/2020-02/10/nw.D110000renmrb_20200210_4-03.htm for the full text (Accessed on Aug 12, 2020). For example, Jiangxi Province, like almost all other provinces in China apart from Hubei Province, immediately issued a directive on reopening guidance. This directive echoed the State Council's order. We emphasize two features of these directives. First, both the central government order and the province directive only outline a set of principles and genereal measures without specifying any particular reopening date. Second, the Jiangxi province directive, which was addressed to all prefectures and counties within Jiangxi Province, explicitly stated in its opening paragraph that its instructions were only guidelines, and that each prefecture/county should implement their own policies based on local conditions. See http://www.jiangxi.gov.cn/art/2020/2/10/art_396_1498548.html for the full text, accessed on Aug 12, 2020.

[7]For example, Article 13 of Section 4 in the Jiangxi Province directive specifies that the one who is in charge of reopening decisions should be responsible for all related safety measures and also any COVID-19 related safety issues, see http://www.jiangxi.gov.cn/art/2020/2/10/art_396_1498548.html for the full text (accessed on Aug 12, 2020). Shandong Province issued a very similar directive on Feb 11, 2011 (http://www.shandong.gov.cn/art/2020/2/11/art_97902_347668.html, accessed on Aug 12, 2020), and its last section is titled, "Further emphasizing the responsibilities of enterprises and territorial governments" which stated the same principle: whoever makes a reopening decision – whether local government or business entity – should take responsibility for new COVID-19 cases.

reopened" (February 23, 2020); "Top industrial 100 firms in Pudong mostly reopened: (February 25, 2020); "Complete reopening of household management service still needs to wait" (February 23, 2020); "More than 96 percent of large industrial firms reopened" (February 28, 2020); "More than 91.7 percent of firms affiliated with central-government-owned enterprises restarted" (March 2, 2020); "Some the parks in Shanghai gradually reopening" (March 12, 2020); "Key project recovery reaches 86 percent in Shanghai" (March 16, 2020); "Restart of cultural and tourism industries in Shanghai accelerated" (March 20, 2020).)

In China, the media is monopolized and tightly controlled by the state. Each level of government and its corresponding CPC leadership generally owns one official newspaper as its "mouthpiece" to deliver local political information, propagate official policy, and guide public opinions (Qin et al., 2018).[8] The news reported in these local papers thus represent the views and policies of the local government and its CPC counterpart, rather than those of individual citizens.

Our starting sample of news stories includes the titles of 452,965 articles published between February 10 and April 15, 2020 from 216 local official newspapers, belonging to local government entities for 212 locally-controlled prefectural cities and the 4 municipalities that are directly controlled by the central government (Beijing, Chongqing, Shanghai and Tianjin).[9] As noted earlier, we use February 10 as the start date because it is the first business day after the Chinese Spring Festival; we ended our data collection on April 15.

We first identify whether these news reports are related to the recovery of the economy after the epidemic of COVID-19 based on a matching of "reopening" keywords. These are terms that relate to the recovery of firms, recovery of schools, and recovery of the market.[10] Stories with titles that include the name or names of other countries are excluded since these reports generally refer to news of reopenings external to the prefecture. In addition, a title with negative words is also excluded.[11] We count the number of reopening-related reports for each day in each city and use

[8]China has a parallel power structure, with representation at each level of the Communist Party of China (CPC) – which is largely tasked with formulating policy – and the government, which implements policies. For example (and of particular relevance for our application), the top bureaucrats in each prefecture are the city mayor (representing the government) and the municipal party secretary (representing the CPC).

[9]Reopening is sometimes mentioned in commercial advertisements in government-controlled newspapers. These are not included in our sample, as they reflect private intentions rather than official policy.

[10]Specifically, our list of keywords is as follows (rough translations in parentheses): FuGong (workers returning to the plant, or employees returning to their offices), FuChan (workers going back to the plant), FuXue (students returning to school), FuKe (students returning to school); FuShi (markets are reopened); FuYe (business operations resume); and also these combination of the following keywords: HuiFu (recovery)+QiYe (firm); HuiFu (recovery)+Shengchan (production); HuiFu (recovery)+Xuexiao (school); HuiFu (recovery)+ShangKe (back to school); HuiFu (recovery)+KaiFang (reopen); HuiFu (recovery)+YingYe(business operation); HuiFu (recovery)+KaiYe (open business); ChongXin (re-)+KaiFang (open business); ChongXin (re-)+YingYe (business operation); ChongXin (re-)+KaiYe (open business).

[11]In our practice, we exclude titles with the following Chinese words: "ZanTing"(suspension),"ZanHuan"(postpone), "Yanchi"(delay), "TuiChi"(delay), "TingZhi"(stop), "YanChang"(extend).

it to measure the extent of local reopening and recovery as proclaimed by the local government. The main variable we use in our analysis is $log(1 + Reopening)$ because of the long right tail in reopening announcement frequency. (In practice our results are qualitatively the same in terms of implied magnitudes and statistical significance if we use *Reopening* or the inverse hyperbolic sine transformation.)

2.2 Within-city traffic flow

We obtain traffic flow data from Baidu Qianxi (https://qianxi.baidu.com/), which constructs various daily indices of population movements across and within cities, by tracking geographical coordinates of mobile phone users (also see Chen et al. (2020)for a reference).

We use the Baidu Qianxi index for within-city traffic flow, which captures daily human movement within a city. Baidu Qianxi defines the index as the number of people who left their homes on a given day as a fraction of overall city population. To capture the influence of COVID-19 on city traffic flow, we calculate abnormal daily traffic by dividing the daily traffic index for each day during February 10 – April 15, 2020, by the corresponding daily traffic index in 2019. To generate this excess traffic measure ($\Delta Traffic$) – as with other "excess activity" metrics we describe below – we match Feb 10, 2020 to Feb 11, 2019. These dates are both Mondays, and both are the first working day after the Spring Festival, when economic activity in China typically returns to normal after the Chinese New Year holidays. This normalization is central, since traffic indexes are entirely non-comparable across prefectures. For example, on most dates throughout 2019-2020, Beijing's traffic index is lower than Bayannur, a virtually unknown municipality in Inner Mongolia.

2.3 Measuring social unrest

Our measure of socia unrest comes from Baidu Index (http://index.baidu.com/), which is similar to Google Trends and is widely used in academia (see Liu et al. (2016) and Li et al. (2019) among many others for references). Baidu records daily searching behavior of all users, and provides search indices disaggregated to the city-level. According to public information provided by Baidu, its search index is based on search volume in a given period, standarized by the past 30-day historical average value of the searching volume of the same key words. [12] We may thus capture the prevalence of certain keyword searches at the city-date level, which proxy for the attention paid by city residents to particular topics at a given point in time.We calculate the average number of searches for a group of keywords related to social unrest and economic difficulties on each day for each city in the preceding seven day period (i.e., our February 10 measure would capture keyword searches during February

[12]See for example, https://zhidao.baidu.com/question/17067070.html for a discussion. Accessed on Aug 12, 2020.

3 – 9). These keywords include default (WeiYue), strikes (BaGong), rights protection (WeiQuan), bankruptcy (PoChan), mortgage default (DuanGong), protest (KangYi), unemployment (ShiYe), stagnation (TingZhi), deficit (KuiSun), and going down/declining (XiaHua). We further distinguish these keyword into those that are more politics-related (strikes, rights protection, and protest) versus economic-related (default, bankruptcy, mortgage default, unemployment, stagnation, deficit, and going down/declining) to generate two distinct measures of discontent. The resultant variable is $BaiduDissent\_7Day$; we also report results that use a two-week window ($BaiduDissent\_14Day$).

In closing this subsection, we note that our measure of dissent based on Baidu searches is highly correlated with historical collective actions. The China Labor Bulletin (https://clb.org.hk/) has recorded strikes and worker protests in China since 2011, which we use to calculate the number of such collective actions during 2019, and also averaged during 2017-2019. In Appendix Table A2, we show that this historical measure of unrest is correlated with our Baidu-based measures over our sample period, after controlling population and GDP per capita.

2.4 Daily City-level COVID-19 Cases

The daily case count of COVID-19 in Chinese cities is collected from the Chinese Center for Disease Control and Prevention (http://2019ncov.chinacdc.cn/2019-nCoV/). It reports the confirmed cumulative, dead, and recovered COVID-19 cases in each city each day. We do not include any cities in Hubei province in our sample, as these numbers experienced major adjustments offically after the Wuhan lockdown. Much more important, the reopening of Hubei province was managed by the central government rather than any policies initiated by the local governments, with the Chinese vice Premier Sun Chunlan dispatched to Wuhan in late January to manage Hubei's coronavirus response; Sun Chunlan was not approved by the CPC Central Committee to return to Beijing until April 27, 2020. [13] The main variable we use in our panel analysis is an indicator variable for any new reported COVID-19 infections in the prior 7 day period ($AnyCOVID$); the log of (one plus) the number of recent COVID-19 infections yields very similar results.

2.5 Air Quality

We obtain air quality data from the China National Environmental Monitoring Center, which operates over 1600 monitoring stations throughout China and provides a daily air quality index (AQI) for each city.[14] To capture the impact of COVID-19, we again deflate daily AQI in 2020 by corre-

[13] See "Efforts to contain the coronavirus outbreak a test of China's centralized control," *Los Angeles Times*, January 27, 2020, among many other sources, for news reporting about the central government takeover.

[14] See, e.g., Dong et al. (2019), for details on the AQI index.

sponding daily AQI in 2019.[15] Because of the very long tails in the AQI distribution, we use the log value; the resultant variable has a roughly normal distribution ($log(\Delta AQI)$).

We provide summary statistics for city-date variables in Appendix Table 1. Note that since we exploit both cross-sectional and time variation, we do not require time-invariant city controls. The data reflect observations from 216 prefectures, out a total of 292 in China. As noted earlier, we exclude the observations from Hubei province, and also those lacking newspaper records or population data. Collectively, our 216 prefectures capture 82.9 percent of China's population and 84.1 percent of the country's GDP. [16] In Appendix Figure A1, we provide a map of China, labeling the cities that are in our sample, and also those that we do not include. The one notable pattern is that most cities in far north province of Heilongjiang are missing from the sample. Otherwise, our sample is well-distributed throughout the country.

3 Results

3.1 Preliminaries: COVID cases, reopening plans, and economic activity

We begin by exploring whether our measure of government reopening is correlated with standard measures of economic activity, in particular Δ *Traffic* (Baidu traffic index relative to 2019) and $log(\Delta AQI)$ (air quality index relative to 2019).We emphasize that in this section we do not necessarily ascribe any strong causal interpretation to the patterns we document – rather, our goal is to examine whether reopening announcements are correlated with observables (traffic and pollution) which reflect real economic activity.

To account for risk from COVID exposure, which may affect economic activity regardless of government reopening plans, we also include as a covariate $AnyCOVID$, an indicator variable which denotes that there has been at least one new coronavirus case in city c in the 7 days preceding t. Thus, our specifications take the following form:

$$\Delta Traffic_{ct} = \beta_1 * log(1 + Reopening)_{ct} + \beta_2 * AnyCOVID_{ct} + \upsilon_t + \gamma_c + \epsilon_{ct} \quad (1)$$

[15] That is, for Feb 10, 2020, we would deflate by February 11, 2019, since both are the first workday after the Chinese Spring Festival and both are Mondays, and so forth.

[16] Note that there are fewer observations for a subset of variables. The Baidu traffic indices are available only through March 27, 2020, so the panel is somewhat shorter for that variable. Additionally, some basic controls are unavailable in city yearbooks: of the 216 cities that serve as our main sample, GDP data are unavailable for three cities; two others have not yet reported GDP growth for Q1 of 2020. Finally, data on government finances are unavailable for some cities: 4 do not have fiscal revenue data for 2018, while debt data for 2019 is missing for 22 cities.

These specifications include both date (υ_t) and city (γ_c) fixed effects, so that the relationship between reopening announcementsand economic activity comes from variation across cities at a particular point in time, and across time within a particular city (recall also that both outcomes are differenced relative to the equivalent figure in 2019). In all cases, standard errors are clustered at the city level.

These results appear in Table 1, columns (1)-(3) for $\Delta\,Traffic$ and columns (4)-(6) for $log(\Delta AQI)$. Starting with $\Delta\,Traffic$ in column (1), we present a specification with *AnyCOVID* as the main covariate; its coefficient is negative and highly significant ($p < 0.001$) and large in magnitude, implying that travel is depressed in the wake of recent COVID cases. In column (2) we look at the relationship between $log(1 + Reopening)$ and $\Delta\,Traffic$; its coefficient is positive and significant at the 5 percent level. When both are included in column (3) the coefficients and their significance are virtually unchanged, suggesting that COVID risk and government reopening announcements exert largely independent effectson city residents' activities. To provide a sense of the magnitude of these effects, the within-city average standard deviation of 0.05 for $\Delta\,Traffic$, so the point estimate of -0.05 on *AnyCOVID* implies that a case in the prior week is associated with a one standard deviation reduction in driving. (The patterns are qualitatively the same (both in terms of implied effect size and statistical significance) if we use the number of cases rather than *AnyCovid*. Our preference is to use a measure which captures the existence of coronavirus since even a single case would trigger a response given its exponential growth.) The implied effect for reopening is more modest – the within-city standard deviation of $log(1 + Reopening)$ is 0.6, so that a one standard deviation increase in reopening announcements is associated with just over a 10 percent of a standard deviation increase in traffic. The results on pollution are comparable in implied magnitude (the within-city standard deviation of $log(\Delta AQI)$ is about 0.11), though less precisely estimated.

Finally, in column (7) we look at whether COVID cases in the prior week predict reopening announcements. Interestingly, they do not – this may be because of the difficulty in pinning down the timing that links prior cases to reopening announcements. It may also be that by February, the appearance of individual cases were not seen by individual municipalities as representing substantive public health threats (though the link from new cases to traffic would suggest that the broader population did react with concern). On an anecdotal level, we observed an immediate and complete shutdown of Beijing following the appearance of a larger COVID-19 cluster in early June, 2020, indicating that wider health threats were seen as reason for a strong governmental response.

We conclude from this opening set of results that there is very clear evidence that coronavirus cases reduced economic activity within a city, but did not themselves affect reopening announcements, and evidence that, independent of COVID cases, government reopening plans are correlated with local economic activity. Given the absence of any obvious link from coronavirus cases to re-

opening plans, it is natural to then ask whether other considerations, perhaps distinct from public health concerns, affected governments' decisions to restart their economies.

3.2 Citizen discontent and reopening plans

We begin by looking at daily data on reopening plans as a function of recent internet searches for words that express discontent, either economic or political. Our main specification is similar to Equation (1), with $log(1 + BaiduDissent\_7days)$, as the explanatory variable, which reflects the average number of searches of a group of keywords that are related to social unrest and economic difficulties on each day for each city in the preceding seven day period, and $log(1 + Reopening_{ct})$ (total counts of newspaper titles containing reopening-related keywords) as the outcome:

$$log(1 + Reopening_{ct}) = \beta * log(1 + BaiduDissent\_7days_{ct}) + \upsilon_t + \gamma_c + \epsilon_{ct} \quad (2)$$

We present these results in Table 2. The point estimate on $log(1 + BaiduDissent\_7Days)$ in column (1) is 0.029 ($p < 0.01$). If we think about this as a semi-elasticity, the implied effect is that a doubling of $BaiduDissent$ will lead to a three percent increase in reopening announcements, a small but discernable impact. In column (2) we allow for a longer, two week window for $BaiduDissent$, which generates a similar point estimate. Column (3) distinguishes between political-based and economic-based dissent. Interestingly, both contribute to the overall correlation between dissent and reopening, though neither is significant at the 5 percent level, perhaps resulting from great noise resulting from the disaggregation. (Note that the within-city correlation between these two variables is very close to zero, so they contribute independent variation to the within-city results.) In Appendix Table A3, we present a placebo regression in which we predict reopenings with our dissent measures 7 and 14 days in the future; we find no significant relationship or even any consistent sign.

We look at the particular timing of the link between discontent-related searches and reopening in Figure 1, which provides a week-specific coefficient for each 5-day work week following February 10 (i.e., the variable $BaiduDissent\_7days$ is separated into 9 distinct variables that reflect Baidu searches in each of the 9 weeks following February 10, and zero otherwise). Interestingly, the overall positive relationship is driven entirely by reopening announcements in the first part of the sample, which by definition reflect earlier reopenings. Indeed, beyond the first month the relationship is zero or even negative, perhaps reflecting a substitution to earlier openings for locales that anticipate discontent.

4 Conclusion

We document a link between citizen discontent as captured via online searches and prefecture reopening announcements, following economic shutdowns caused by the COVID-19 epidemic in China. We suggest that these findings help to shed light on the incentives and motivations of Chinese bureaucrats more generally, supporting the view that officials are motivated to defuse social unrest.

We see the main takeaway from our work as showing that incentives for non-elected officials in China are such that they still attend to citizens' concerns, thus providing a measure of direct acocuntability (in addition to accountability to higher-level officials who decide on promotions). Of course, social unrest itself may impede promotion, given higher-level priorities, but even if this is the underlying explanation for our results, it still leads to local responsiveness to citizen concerns.

Turning to the specific setting of COVID-19, our results emphasize the pressures that governments face in balancing public health and economic concerns. As we write in November, 2020, many developing (and some developed) economies have continued their reopening plans despite rising case counts. Our findings indicate that unless leaders find ways of addressing individuals' economic concerns, citizens may have limited patience for strict public health measures.

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Table 1: Reopening announcements, COVID-19 infections, and proxies for economic activity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable		$\Delta Traffic$			$log(\Delta AQI)$		$log(1 + Reopening)$
$AnyCOVID$	-0.052***		-0.052***	-0.122***		-0.121***	-0.011
	(0.008)		(0.008)	(0.031)		(0.031)	(0.033)
$log(1 + Reopening)$		0.012**	0.012**		0.019*	0.018*	
		(0.005)	(0.005)		(0.010)	(0.010)	
City FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7342	7342	7342	9606	9606	9606	9606
R-Squared	0.896	0.894	0.897	0.229	0.226	0.230	0.342

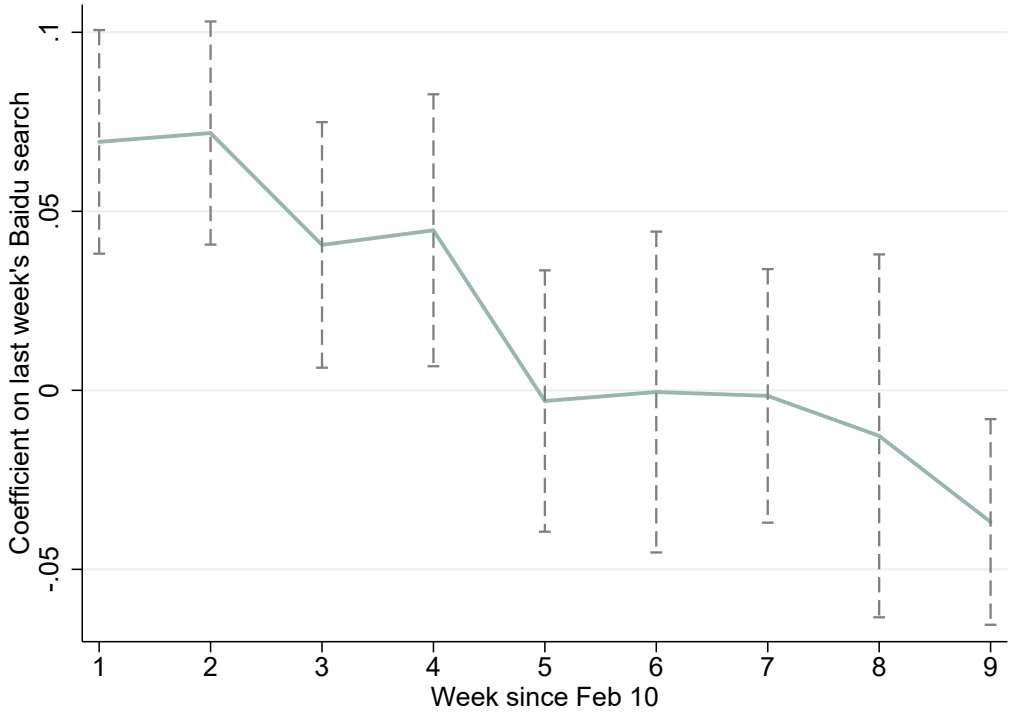
Notes: Numbers in parentheses are robust standard errors. Standard errors are clustered at the city level. The sample covers the period from Feb 10, 2020 to April 15, 2020. The dependent variable in Columns (1)-(3) is $\Delta Traffic$, the daily Baidu traffic index deflated by the corresponding daily traffic index in 2019. The dependent variable in Columns (4)-(6) is $log(\Delta AQI)$, the log of the daily AQI in 2020 deflated by the corresponding daily AQI in 2019. The dependent variable in Column (7) is $log(1 + Reopening)$, the natural log of one plus the number of reopening-related reports for each day in each city. $AnyCOVID$ is an indicator variable which denotes that there has been at least one new coronavirus case in each city 7 days preceeding each day.
Significance: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2: Baidu keywords related to dissent and city reopenings

	(1)	(2)	(3)
Dependent Variable			
$log(1 + BaiduDissent\_7days)$	0.029***		
	(0.011)		
$log(1 + BaiduDissent\_14days)$		0.050***	
		(0.019)	
$log(1 + BaiduPolitics\_7days)$			0.012
			(0.009)
$log(1 + BaiduEconomy\_7days)$			0.017*
			(0.009)
City FEs	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes
Observations	9562	9562	9562
R-Squared	0.345	0.345	0.344

Notes: Numbers in parentheses are standard errors clustered by city. The sample covers the period from Feb 10, 2020 to April 15, 2020. All columns use city-date level observations. The dependent variable in all columns is $log(1 + Reopening)$, which captures the number of reopening-related reports for each day in each city. $BaiduDissent\_7days$ and $BaiduDissent\_14days$ are the average number of searches of keywords related to social unrest and economic difficulties in the preceding 7 and 14 day period respectively. $BaiduPolitics\_7days$ and $BaiduEconomy\_7days$ are the average number of searches of keywords related to social unrest and economic difficulties, respectively, in the preceding 7 day period.
Significance: * significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 1: The timing of the relationship between dissent-related keyword searches and reopening announcements



Notes: This figure shows the coefficients from a regression that relates week-by-week Baidu keyword searches to government newspaper reopening articles. Each point indicates the point estimate from a variant on Equation (2) that allows the coefficient to vary by week. The whiskers show the 95 percent confidence interval of each coefficient estimate. See text for additional details.

Appendix Table A1: Summary Statistics, City-Date level variables

Variable Name	Mean	StdDev	Obs
$log(1 + Reopening)$	1.340	0.664	9606
$AnyCOVID$	0.228	0.420	9606
$log(\Delta AQI)$	-0.130	0.535	9606
$\Delta Traffic$	0.830	0.234	7343
$log(1 + BaiduDissent\_7days)$	3.954	1.526	9562
$log(1 + BaiduDissent\_14days)$	3.981	1.382	9562

Notes: *Reopening* is the number of reopening-related reports for each day in each city. $AnyCOVID$ is an indicator variable which denotes that there has been at least one new coronavirus case in each city 7 days preceeding each day. $log(\Delta AQI)$ is daily AQI in 2020 deflated by corresponding daily AQI in 2019. $\Delta Traffic$ is the daily Baidu traffic index deflated by corresponding daily traffic index in 2019. $BaiduDissent\_7days$ is the average number of searches of a group of keywords that are related to social unrest and economic difficulties on each day for each city in the preceding 7 day period. $BaiduDissent\_14days$ is the average number of searches of a group of keywords that are related to social unrest and economic difficulties on each day for each city in the preceding 14 day period.

Table A2: Relationship between past worker protests and Baidu keywords related to discontent

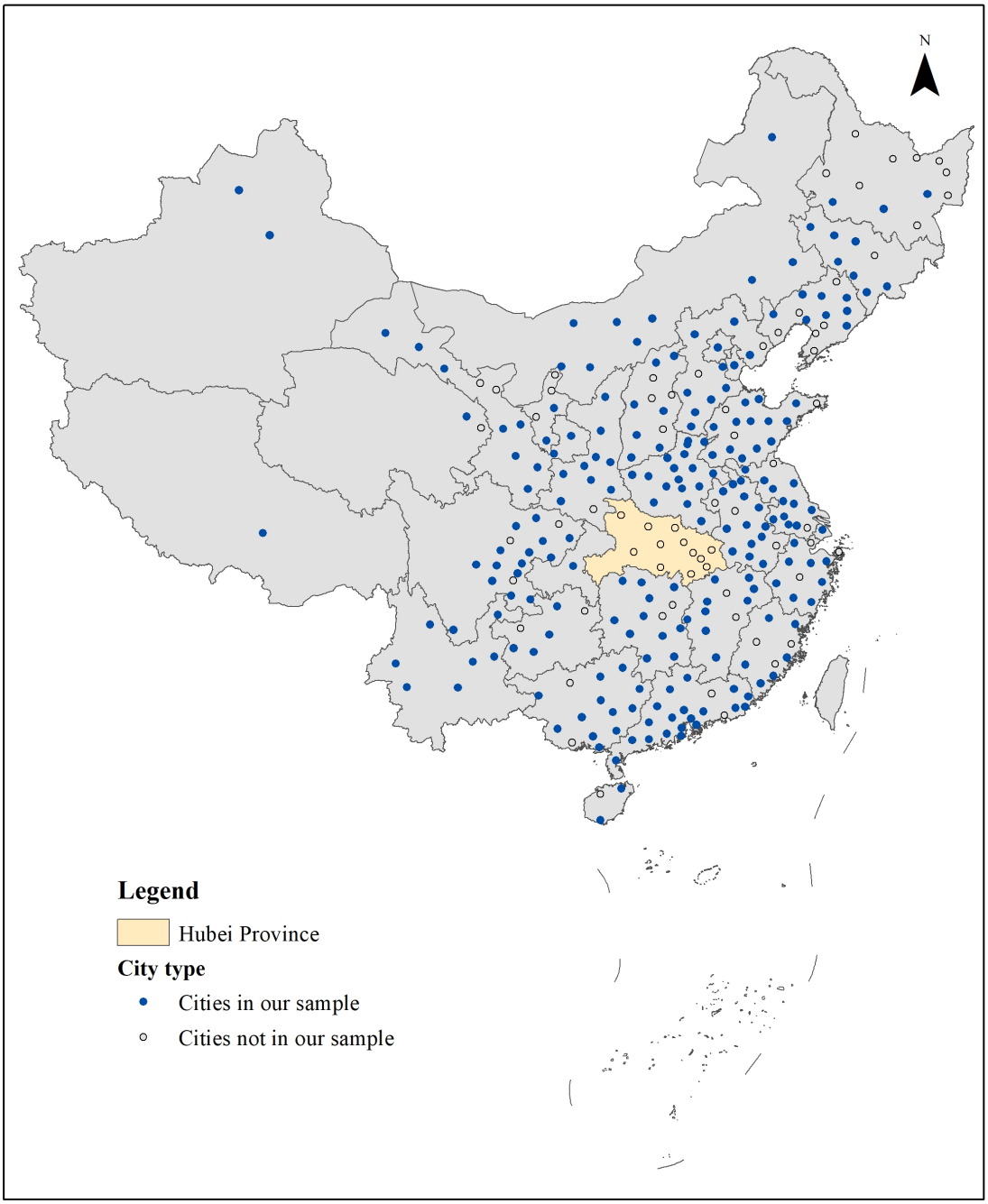
	(1)	(2)	(3)
Dependent Variable	$log(1 + BaiduDissent\_Total)$		
$log(1 + Unrest\_1yr)$	0.412***		
	(0.085)		
$log(1 + Unrest\_3yrs)$		0.551***	0.634***
		(0.130)	(0.133)
$log(Population)$	1.646***	1.533***	1.654***
	(0.108)	(0.140)	(0.156)
$log(GDPPC)$	0.823***	0.795***	0.710***
	(0.066)	(0.073)	(0.087)
Province FEs	No	No	Yes
Observations	212	212	211
R-Squared	0.814	0.814	0.885

Notes: Numbers in parentheses are robust standard errors. The sample covers the period from Feb 10, 2020 to April 15, 2020. All columns use city-level observations. The dependent variable in all columns is $log(1+BaiduDissent\_Total)$, which captures the log of the total number of searches of keywords related to social unrest and economic difficulties during our sample period. $Unrest\_1yr$ is the number of recorded strikes and worker protests during 2019. $Unrest\_3yrs$ is the average number of recorded strikes and worker protests during 2017-19. Significance: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A3: Baidu keywords related to *future* dissent and city reopenings

	(1)	(2)	(3)
Dependent Variable	$log(1 + Reopening)$		
$log(1 + BaiduDissent\_7fwd)$	-0.012		
	(0.010)		
$log(1 + BaiduDissent\_14fwd)$		-0.015	
		(0.022)	
$log(1 + BaiduPolitics\_7fwd)$			0.003
			(0.008)
$log(1 + BaiduEconomy\_7fwd)$			-0.010
			(0.009)
City FEs	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes
Observations	9562	9562	9562
R-Squared	0.344	0.344	0.344

Notes: Numbers in parentheses are standard errors clustered by city. The sample covers the period from Feb 10, 2020 to April 15, 2020. All columns use city-date level observations. The dependent variable in all columns is $log(1 + Reopening)$, which captures the number of reopening-related reports for each day in each city. $BaiduDissent\_7fwd$ and $BaiduDissent\_14fwd$ are the average number of searches of keywords related to social unrest and economic difficulties in the preceding 7 and 14 day period respectively. $BaiduPolitics\_7fwd$ and $BaiduEconomy\_7fwd$ are the average number of searches of keywords related to social unrest and economic difficulties, respectively, in the preceding 7 day period.
Significance: * significant at 10%; ** significant at 5%; *** significant at 1%.



Appendix Figure A1: Map of cities in the sample