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Clans and calamity: How social capital saved lives during China's Great Famine

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ABSTRACT

This paper examines the role of social capital, embedded in kinship-based clans, in disaster relief during China's Great Famine (1958–1961). Using a county-year panel and a difference-in-differences strategy, we find that the rise in the mortality rate during the famine years is significantly less in counties with a higher clan density. Analysis using a nationally representative household survey corroborates this finding. Investigation of potential mechanisms suggests that social capital's impact on famine may have operated through enabling collective action against excessive government procurement. These results provide evidence that societal forces can ameliorate damages caused by faulty government policies in times of crisis.

1. Introduction

An estimated 70 million people died from famines across the world during the 20th century. Among them, China's Great Famine amid Chairman Mao's Great Leap Forward (GLF) campaign was the deadliest, and probably the deadliest of all time in recorded human history. The famine extended from 1958 to 1961 and killed an estimated 16.5 to 30 million people (Aird, 1982; Ashton et al., 1984; Banister, 1984; Coale, 1981; Peng, 1987). China's official data, widely believed to be under-reporting deaths from the calamity, show that the mortality rate jumped from 12.0‰ in 1958 to 25.4‰ in 1960 while the fertility rate plunged from 29.2‰ to 20.9‰ (Figure A1). Fig. 1 shows the county-level average mortality from 1958 to 1961 based on data collected by the authors. In some counties in Anhui and Sichuan provinces, the mortality rate was over 150‰. Scholarship and official documents record multiple incidents of cannibalism in these areas (Dikötter, 2010). Although the entire country suffered great loss, Fig. 1 also suggests that the mortality rate varied considerably by region.

This paper provides evidence that social capital embedded in kinship-based clans can explain a good deal of the regional variation in famine deaths and might have saved millions of lives. Following Putnam's seminal work, we define social capital as "networks, norms, and trust that enable participants to act together more effectively to pursue shared objectives" (Putnam, 2000, pp. 664–665). Early works in the social sciences emphasize the importance of generalized trust and reciprocity among community members (e.g., Knack and Keefer, 1997; Zak and Knack, 2001; Paxton, 1999). Recent economics literature highlights shared beliefs and the free riding/collective action problem in defining social capital.[1] In this paper, we see shared beliefs and goals among the majority of community members and the community's ability to solve the collective action problem as two integral components of social capital.

Studying the role of social capital in disasters, such as floods, earthquakes, and famines, is especially meaningful because disasters impose severe stress on governments and communities, testing not only government effectiveness but also the robustness of norms, beliefs, and social institutions. Both efforts against erroneous government policies and disaster relief require community-level collective action, which is difficult to achieve precisely because of the dire situations. Under such circumstances, community members are tempted to deviate from pro-

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[1] For example, in a review of the literature, Guiso et al. (2011) defines social capital as "persistent and shared beliefs and values that help a group overcome the free rider problem in the pursuit of socially valuable activities."

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social norms and put personal gain before community interests. Trusting relationships, which involve risk-taking (Fehr, 2009), are more likely to break down in crises when the potential risks from trusting others become monumental. Moreover, local leaders may lack the incentive or ability to enforce the informal rules and norms which facilitate collective action under normal circumstances.

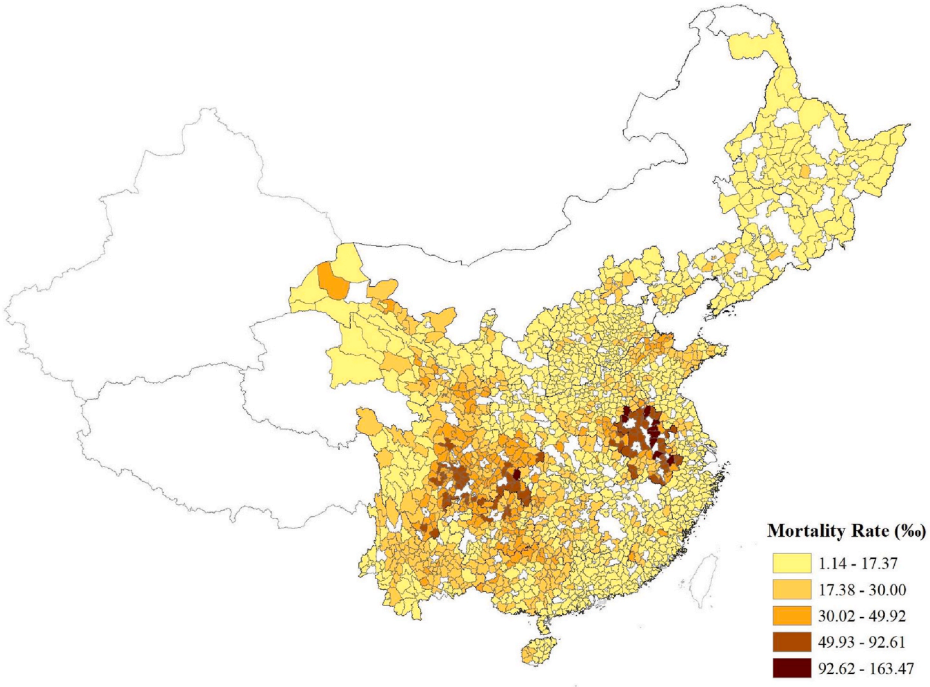
We focus on family clans, also known as lineage groups, as the main organizational foundation for social capital in rural China, because clans can enforce informal rules and norms among clan members and facilitate collective action. Clans are social organizations created to maintain social order and provide local public goods (Greif and Iyigun, 2013). They emerged in imperial China as loose associations of large numbers of people connected by kinship ties who share the same family name and all of whom are linked to a common set of ancestors (Fei and Liu, 1982; Watson, 1982). These kinship groups provide a social safety net and take care of the poor, the sick, and the aged (Greif and Iyigun, 2013).

In the early years of the People's Republic of China (PRC), clans were suppressed by the new regime and clan activities were mostly suspended. However, researchers find their impact remains strong in the reform era, likely because social capital accumulated within clans is persistent. For example, Tsai (2007) shows that rural villages with strong clans produce more public goods than villages without such clans. Likewise, Xu and Yao (2015) and Martinez-Bravo et al. (2015) show that clans complement formal institutions and help local leaders overcome the collective action problem of financing public goods. Besides working together with the government, clans may also mobilize members to fight against government policies that they perceive to hurt their interests. For example, He (2012) finds that clans in Jiangxi province unified peasants to resist the government tax burden in the 1990s. Zhang and Zhao (2014) report that kinship networks protect peasants' property rights over land through facilitating collective action against the state's coercive taking. We contribute to these studies by showing the strength of social capital in the worst possible human and societal conditions directly caused by policies.

Three main challenges arise in causally identifying the effect of social capital on famine severity. First, systematically measuring social capital in a historical setting is challenging, if not impossible. In the context of rural China, the existing literature mainly relies on retrospective surveys administrated in a sample of villages (e.g., Tsai, 2007; Martinez-Bravo et al., 2015), hence, these surveys cover only a small number of counties in China or are representative only at the national level, not at the local level. Instead, we use the number of pre-PRC genealogies—books that record family trees—at the county level to measure social capital, and therefore are able to establish a relationship between social capital and the deadliness of the famine in most parts of China. We focus on the number of genealogies because compiling a genealogy is a key element of clan activities and indicative of clan cohesion (Feng, 2013, p.218), which is required for collective action. Several previous studies have also used this measurement strategy and yielded fruitful results (e.g. Greif and Tabellini 2017; Chen et al., 2020; Zhang 2020).

The second difficulty lies in measuring famine severity at the local level. To the best of our knowledge, systematic county-level mortality data in the early years of the PRC do not exist. We manually collect such data from local government reports, compilation of statistics, and county gazettes, and construct a panel dataset covering 1854 counties from 1954 to 1966. To address the concern that data from official sources may be unreliable, we corroborate our main finding using data from a nationally representative household survey that directly asks the respondents about their hunger experience during the Mao era.

The third major challenge is identification. Because social capital embedded in clans takes a long time to build up and changes slowly over time, it is difficult to exploit its temporal variations. Hence, the main source of variations in social capital is cross-sectional, and identification therefore relies on a selection-on-observable assumption. To alleviate this problem, we employ a difference-in-differences estimator that compares changes with changes. Specifically, using the county-year panel, we compare the differences in the sudden increase in the mortality rate in the famine years compared with normal years between



Notes: County-level average mortality rate from 1958 to 1961 (deaths per thousand people). Data for regions in white are unavailable.

Fig. 1. Severity of famine. *Notes*: County-level average mortality rate from 1958 to 1961 (deaths per thousand people). Data for regions in white are unavailable.

places with high and low levels of social capital. Similarly, with the household survey data, we compare the differences in the probability of reporting hunger experience between individuals born before and after the famine period in communities with different levels of social capital.

Our findings are striking. A one standard deviation increase in our continuous measure of social capital is associated with a reduction of 1.41–1.85 deaths per thousand people in each year during 1958–1961, which accounts for 16–21% of the average abnormal increase in the mortality rate (8.84 deaths per thousand people) due to the famine. A back-of-the-envelope calculation suggests that, had every county in our sample had half the number of genealogies that we measured, 1.72–2.26 million more people would have died during the famine years, an almost 10% increase in our current estimate. Using data from the household survey, we find consistently that the difference in the probability of reporting hunger experience between individuals born before and after the famine period is significantly smaller in rural communities with a higher density of clans.

We explore two main mechanisms to explain these findings. First, we test whether clans reduce famine severity by preventing drastic drops in grain production before or during the famine years. The best micro-level data that we are able to find does not support this theory. Second, we investigate if clans enable peasants to organize and resist excessive grain procurement from the upper-level government at the peak of the famine. Using provincial-level crop procurement data, we find that localities with a higher clan density handed over a significantly smaller proportion of their grain output to the state. We interpret this finding as evidence of social capital enabling community-level collective action against government expropriation. We also discuss other potential mechanisms proposed by historians.

Our study deepens the understanding of state-society relations in times of crisis, especially famines. Sen (1999) famously argues that famines take place only in non-democratic countries where a free press and mechanisms of checks and balances are lacking. Along this line of thought, most studies on the Great Famine focus on failures of government policies (e.g. Lin, 1990; Li and Yang, 2005; Meng et al., 2015; Yang, 1996) and distorted bureaucratic incentives (e.g., Kung and Chen, 2011). We complement that knowledge by studying how social capital can moderate policy outcomes during times of crisis. The community-based perspective we take sheds light on the importance of local collective action and trust in resisting bad government policies and mitigating their consequences. In this way, we provide a novel explanation for the huge regional variation in mortality rate during the Great Famine beyond causes commonly known by scholars.

Our study is also relevant to a growing literature that examines how informal institutions, social capital, and culture affect socioeconomic outcomes and interact with formal institutions and the state (Guiso et al., 2006; Alesina and Giuliano, 2015). Greif and Guido, (2010), Greif and Iyigun (2013) and Greif and Guido, (2017) highlight the role of clans, as a type of social organization, in sustaining cooperation and providing social safety nets in premodern China. Recently, Mattingly (2020) emphasizes the role of kinship networks in facilitating state expropriation by lending their organizational and cultural resources to commandeer. Our study adds to this literature by demonstrating clans' ability to resist the state in turbulent times through social capital.

The rest of the paper proceeds as follows. Section 2 explains the background of the study, including a brief discussion on clans in rural China, state-peasant relations in the Mao era, and possible causes of the Great Famine. Section 3 describes data sources and our measurement strategy. Sections 4 and 5 introduce the identification strategy and present the empirical results, respectively. Section 6 explores the mechanisms. The last section concludes.

2. Background

2.1. Family clans in China

A family clan in China, also known as a lineage group, is a group of descendants of a common patrilineal ancestor. Clans facilitate social exchange among members of a kinship network. Scholars have established that clans have played a predominant role in grassroots political and socioeconomic affairs in Chinese history (e.g., Fei, 1946; Watson, 1982). Leaders of a clan, often senior members of the lineage group, cast informal but strong authority over clan members in managing clan affairs and resolving disputes both within the clan and with outsiders (Tsai, 2002, 2007). Clan organizations often keep records of their family trees, known as genealogies, which link all past and present males in the kinship group and determine membership of each household in the clan (Feng, 2013). At the top of the family tree is the ancestor of the lineage group. State and formal institutions sought to eliminate clans prior to the founding of the PRC and barely succeeded (e.g., Fei and Liu, 1982; Yu, 2001).

It is difficult to trace the origin of clan organizations or clan culture in China, but historians believe that the development of clans in China accelerated starting with the Song Dynasty (960–1279), when clans started to become an organizational force in grassroots society, and flourished in the Qing Dynasty (1636–1912) (Feng, 2013). The geographical distribution of clans drastically changed in the late Song due to military conflict causing migration from northern China to southern China.[2] As a result, clan density, which we use to proxy the amount of social capital, was the highest in China's southern and eastern provinces, such as Fujian, Guangdong, Hunan, Jiangxi, and Zhejiang beginning in the late Song and this pattern has persisted till today (Fig. 3). Others argue that clans flourished in the southern and eastern areas because they are geographically distant from the political center in the north and rice farming and water conservancy construction required more teamwork (e.g., Freedman, 1958; Huang, 1985).

Clans play important roles in local governance by providing local public goods and connecting peasants with the state (Dincecco and Wang, 2020; Greif and Tabellini, 2010). Clan members collaborate with each other on agricultural production and large construction projects. Those who contribute more materially to the clan and take care of the poor and the weak obtain moral standing within the clan (Madsen, 1984). The imperial government relied on clans for a variety of local functions, including tax collection, local conflict resolution, and even security. When clan members had disputes with the state, leaders of a clan often intervened, coordinating mediation and sometimes protecting clan members from state exploitation (Fei, 1946; Freedman, 1966; Watson, 1982). In his famous report on the peasant movement in Hunan province, Mao Zedong noted that the power of clan organizations (*zuquan*) was one of the four powers that dominated a Chinese peasant in the 1920s.[3] In the PRC era, despite political turmoil and societal changes brought about by economic development, clans remain influential in local governance, as the research cited above has shown.

2.2. State-peasant relations in the mao era

Peasants in China have lived and worked in what anthropologists call "natural villages" for thousands of years. After several waves of collectivization campaigns after the PRC was founded, by the end of the 1950s most natural villages had become production brigades (*sheng chan da dui*) as part of the much larger People's Communes (*ren* min *gong she*). A

[2] Bai (2019) provides a summary of this southward migration.

[3] Mao Zedong, Report on an Investigation of the Peasant Movement in Hunan (1927). Access online: https://www.marxists.org/chinese/maozedong/marxist.org-chinese-mao-192703.htm. The other three powers are: the power of the state, the power of folk deities, and the power of husbands (for women).

brigade consisted of several production teams (*sheng chan dui*), which comprised the lowest tier of commune administration. We refer to the upper-level government above the brigade as the state. The state is represented by its local agents, cadres, who were responsible for carrying out state policies. They also served as spokespersons for their own interests and those of the local community, which were often not aligned with those of the state. Commune-level cadres were the lowest level of state administration, receiving salaries from the state payroll, while brigade and team leaders were considered "local cadres" and the village office in a brigade paid their salaries. On a daily basis, in general, peasants only engaged with the production team leaders and they saw commune and brigade leaders as the "upper levels" (Oi, 1989, pp. 3–5).

At the end of each harvest, the production team owned the harvested grain and carried out procurement. However, because the state decided the procurement target prior to harvest, if the target was too high, peasants suffered. Production team leaders, therefore, had incentives to hide grain from the state. To address this, brigade-level and commune-level cadres, who had stronger career incentives to follow the state's directives, inspected the field or even peasants' homes to make sure they handed over as much grain as they could to meet the procurement target (Oi, 1989, p. 6). At the peak of the GLF, in addition to the collective ownership and farming of land, rural households were ordered to turn over personal possessions for communal dining halls and were no longer allowed to store and prepare their own food (Walder, 2015, p. 159).

2.3. Possible causes of the Great Famine

While the Chinese government labels 1959–1961, the period with the highest mortality rate, "Three Years of Difficulty," scholars often count 1958 as one of the famine years because the mortality rate had already begun to increase (Ashton et al., 1984; Chang and Wen, 1997a, b). Significant research has sought to pinpoint the causes of the famine. Drop in grain production is the most straightforward explanation. China's total grain output grew nearly monotonically between 1949 and 1957, but started to fall sharply in 1958 and did not recover to its 1957 level until 1965. Although the official explanations for the decline were a series of natural disasters and planning errors, several studies implicate government policies that diverted resources away from agriculture to industrialization during the GLF and weakened peasant incentives as the main culprit (e.g. Lin, 1990; Yao, 1999).

Many scholars indicate that excessive government procurement was the primary cause of famine (Kung and Lin, 2003; Li and Yang, 2005; Kung and Chen, 2011; Meng et al., 2015). During the heyday of the GLF, local Communist Party officials, including commune- and brigade-level cadres, had strong incentives to overreport output to advance their careers and engaged in what scholars call "mutual and ultimately self--deception" (Walder, 2015, pp. 159–162). A sharp increase in state procurement based on inflated output numbers during the GLF, accompanied by a drop in grain production in 1959, caused severe food shortages in the countryside. Meng et al. (2015) show that nationwide aggregate grain output during the famine years could have fed the nation and it was the misallocation of food, caused by the government's excessive procurement, that led to the famine.

Scholars have also argued that waste of food in public People's Communes dining halls played a major role (Chang and Wen, 1997; Yang, 1996). But as Chen (2010) points out, because the policy of "free food supply," which allowed peasants to eat as much as they liked, was mostly abandoned by the end of 1958, this argument does not explain why deaths peaked in the winter of 1959 and the spring of 1960. Therefore, we do not consider it as an explanation for the impact of social capital on mortality.

In terms of the relationship between clans and famine severity, Chen (2010) presents direct anthropological evidence that clans reduced the damage caused by the famine by mobilizing villagers against the state's excessive procurement. Through retrospective interviews in Anhui province, he finds that the mortality rates were much lower in villages with a strong clan presence despite similar GLP policies. We will discuss his argument as well as other possible channels in Section 4.

3. Data and measurement

We discuss our main data sources and measurement strategies in this section. Statistical analyses will rely upon both a county-year panel and an individual-level household survey.

3.1. A county-year panel

3.1.1. Mortality rate and grain output

We calculate the mortality rate (death counts per thousand people) at the county-year level using data from multiple sources, including compilation of population statistics and local gazettes. The resulting panel covers 1854 counties located in 23 provinces in mainland China spanning from 1954 to 1966.[4] These counties accounted for 95% of the total population in China in 1953, when the first national census took place. We also collect county-level grain output data from similar sources. Figure A2 in the appendix reports the number of counties covered in the dataset for each year. The appendix also contains details of the data sources.

Most of the data we use were compiled in the early years of the reform when local officials responsible for famine deaths were no longer in office and people started to look for explanations for the catastrophe.[5] While we share scholars' concern that official data from that period may be unreliable (Chen, 2010; Walder, 2015), there is reason to think it offers some truth. For example, our data show on average an over 20% drop in grain production from 1958 to 1959 (at the peak of the GLF campaign), consistent with most scholars' estimates (Li and Yang, 2005). Moreover, based on the local mortality data we have collected, we estimate at least 19.3 million people died from the famine nationally, well in the range of most independent estimates.[6] Finally, from a statistical point of view, although we cannot rule out the possibility that mortality is underreported in our data, as long as the measurement error is uncorrelated with the key independent variable, our estimates will only become less precise.

Previous studies use a cohort loss index based on relative cohort size as a proxy for famine severity (e.g. Chen and Yang, 2015; Meng et al., 2015). Given that our main purpose is to examine whether social capital embedded in clans saved lives, relative cohort size has several drawbacks. First, it captures both rise in infant mortality and drop in fertility, but not deaths of adults, thus introducing significant measurement error. Second, because cohort size during the famine years is calculated using data collected two decades later, it may suffer from survival bias: Those who were healthier in the earlier 1950s are more likely to show up in the census two decades later than those who were less healthy, hence, relative cohort size may exaggerate mortality in places with poorer

[4] Three provincial-level municipalities, Beijing, Shanghai, and Tianjin, are omitted because of their unique status and the lack of district-level data. Three minority autonomous regions, Inner Mongolia, Tibet, and Xinjiang are not covered because data are unavailable.

[5] During the GLF, provincial statisticians who complained about falsehood in statistical numbers were told, "Someday the central government will ask you for the actual figures, so you must make sure to have all the real numbers and be ready to present them at any time" (Walder, 2015, p. 162).

[6] To estimate abnormal deaths during the famine years, we first calculate the average increase in the mortality rate during famine years (1958–1961) compared to normal years (1954–1957 and 1962–1966), which leads to an estimate of 8.84‰. We then estimate the national death toll by multiplying rural population size in 1957 (547 million) by 8.84‰ and obtain an estimate of 19.3 million deaths during 1959–1961. We believe that this is a conservative estimate for two reasons. First, we exclude deaths in urban areas; second, population size during famine years had the famine not occur should be larger than the population size in 1957.

public health conditions and underestimate mortality in places with better conditions. Therefore, we prefer the mortality rate to the cohort loss index as one of the primary outcome variables of this study.

3.1.2. Measuring social capital using the number of genealogies

Because compiling a genealogy and maintaining it requires continuous effort by clan members, the presence of genealogies indicates a relatively high level of clan cohesion, hence, more social capital. Therefore, we use the density of genealogies as our main measure of social capital at the local level. Several studies adopt a similar strategy (e.g. Greif and Tabellini, 2010; Greif and Tabellini, 2017; Chen et al., 2020; Zhang, 2020). The General Catalog of Chinese Genealogy, the largest collection of Chinese genealogies, provides the genealogy data. The catalog is a product of a compilation project initiated by Shanghai Library that aims to facilitate research on Chinese lineage and help overseas Chinese trace their family roots. It consists of 52,401 Chinese genealogies compiled before the end of 2004. For each genealogy, the catalog records its written or updated date and the clan's location. Fig. 2 (a) displays the distribution of compilation dates of genealogies. There are obviously two peaks in the time when genealogies were compiled: just prior to the founding of the PRC in 1949, and in the early reform era of the 1990s. A large number of genealogies were compiled after 1980, suggesting a resurgence of clan culture and activities in post-reform China as people become richer and the social pressure to abandon lineage organizations dissipated. To avoid potential endogeneity issues, we restrict our focus to genealogies compiled before the founding of the PRC.

We construct two measures of social capital at the county level based on the number of genealogies: (1) the logarithmic number of genealogies compiled before 1950 in a county plus one, normalized by its population size in 1953 (i.e., the number of genealogies per 10,000 people)[7]; and (2) a dummy variable indicating whether the first measure is above or below the national mean. We use the second measure because of the concern that the distribution of the first measure is severely left-skewed, even after log transformation (Fig. 2(b)). Fig. 3 shows the geographic distribution of social capital using the first measure. Regions in white and yellow are places where we lack data describing the mortality rate during the investigated time span and counties where no genealogy book compiled before 1950 has been found preserved to date. Our main findings remain substantively unchanged when we remove counties with zero genealogy books from the sample.

A couple of caveats are worth noting. First, although we measure social capital at the county level at which mortality data are available, clan organizations function at the community level, as clan memebers usually live closely in a compact community (Feng, 2013). Measuring social capital at the county level presumes that when there are more genealogies within a county, a larger share of communities in that county have a clan. To complement the findings at the county level, we conduct community-level analysis using the CFPS data and obtain similar conclusions. Second, in a community with several clans competing for influence and power, the lack of bridging social forces may lead to the failure of collective action (e.g., Tsai, 2007) or even cause disruption of the social order due to a persistent power struggle (O'Brien and Han, 2009). This means that our measurement and identification strategies may result in an under-estimation, instead of exaggeration, of the effect of social capital in villages with a large, dominant clan.

3.1.3. The persistence of social capital

Although clan activities were suppressed in the Mao era and many clan organizations were destroyed or weakened, we argue that social capital accumulated over a long historical period is persistent. This is evidenced by the resurgence of clan activities in the reform era, including the recompilation of genealogies, when the political environment permits. In addition, we observe a strong correlation between the numbers of genealogies compiled before 1950 and those compiled after 1980 across China (Fig. 4(a)). This means that social capital embedded in clans must have been present in the background during the GLF, even when clans were suppressed.[8]

Because our measure of social capital is based on the number of genealogies compiled before 1950, it is possible that our measure suffers from survival bias, if, for example, more genealogies were destroyed during the 1960s in places with more prevalent persistent political radicalism. To shed light on this possibility, we leverage data on violent incidences during the Cultural Revolution. In Fig. 4(b), we show that radicalism in the Mao era does not predict the numbers of genealogies compiled in the reform era, which suggests that the likelihood that survival bias affects our results is low.

3.2. China family Panel Studies

We also take advantage of data from a household survey, China Family Panel Studies (CFPS), to corroborate our findings from the county-year panel. CFPS is a biennial survey and is designed to be a Chinese equivalent of the US Panel Study of Income Dynamics. We use the first national wave, which has relevant information and was gathered during April through August 2010. This nationally representative sample covers 14,960 households and 33,600 adults (aged 16 years or older). All respondents born before 1977 were asked whether they had experienced persistent hunger for at least one week. Because hunger experience in the pre-reform era does not carry a stigma, such data are unlikely to be subject to intentional misreporting or data manipulation. Underreporting due to memory loss, if uncorrelated to our measures of social capital, will only reduce estimation preciseness.

At the household level, CFPS records whether a family keeps a genealogy book. We construct two measures of social capital using these data: (1) the share of households in a community, meaning a rural village or an urban neighborhood, keeping a genealogy book (it is possible for multiple families to share the same one) and (2) a dummy variable indicating whether the share of households keeping a genealogy is above or below the national mean. In CFPS, approximately 23% of the households have access to a genealogy book. As a face-validity check, in Table A3 in the appendix, we show that communities with more genealogies have much closer inter-household relationships than those with fewer genealogies, suggesting that the number of genealogies is a good indicator of social capital. One limitation of these measures is that they are contemporaneous, which may leave the door open for reverse causality. However, it is reasonable to assume that the chances that hunger experience leads to more or fewer counts of genealogies are low.

4. Identification strategies

We adopt a difference-in-differences strategy for causal identification. When investigating the relationship between social capital and mortality during the Great Famine using the county-year panel, we exploit the timing of the famine as well as the cross-sectional differences in the pre-famine measures of social capital. Specifically, we estimate the following linear two-way fixed effects model:

$$Mortality_{ct} = \beta Clan_c * Famine_t + \gamma X_c * Famine_t + \delta_c + \lambda_t + u_{ct} \quad (1)$$

in which $Mortality_{ct}$ denotes the death count per thousand people in county c and year t; $Famine_t$ is a dummy variable indicating the famine

[7] Specifically, Clan = log((#Genealogies + 1)/Population). County-level population data in 1953 come from China's first national population census conducted in 1953.

[8] We thank the Editor for highlighting this line of reasoning.

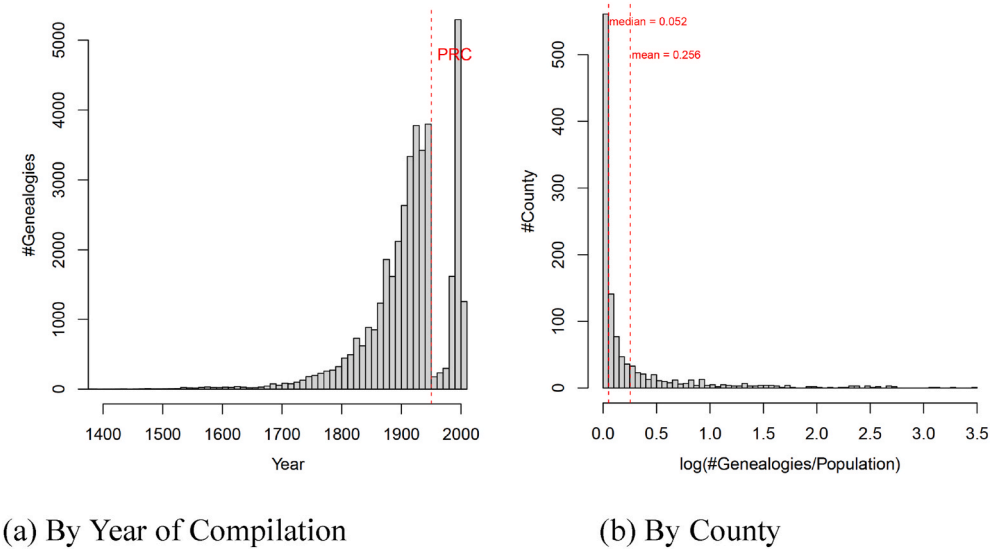


Fig. 2. Distribution of compiled genealogies.

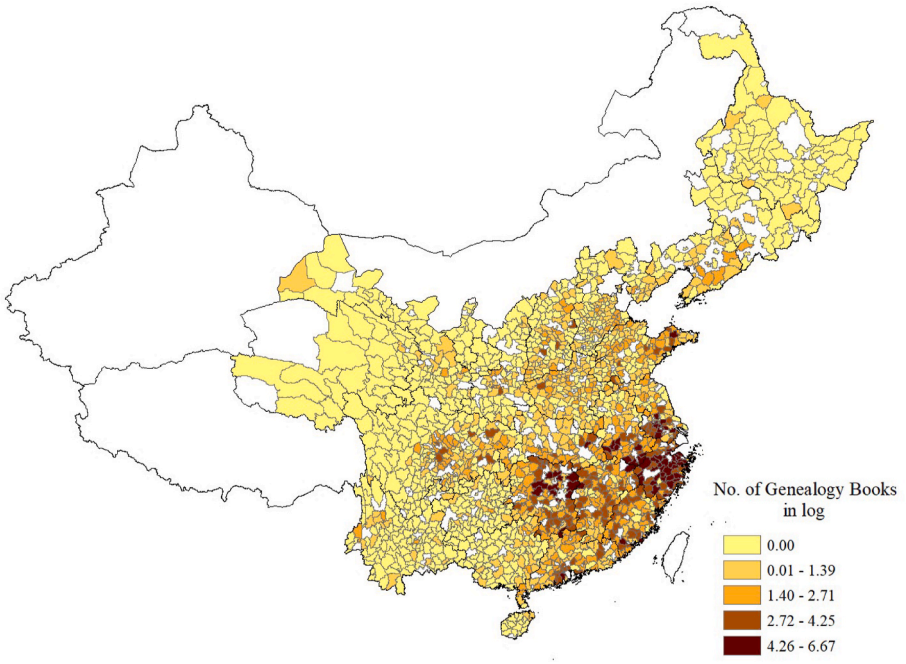
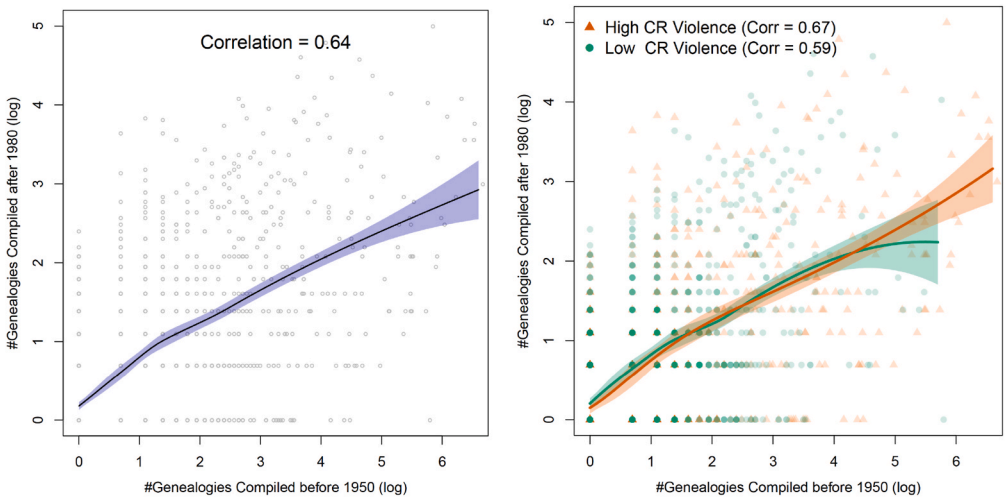


Fig. 3. Geographic distribution of clans.

year (1958–1961); $Clan_c$ is a measure of clan density at the county level, a proxy for social capital; X_c is a vector of pre-famine covariates of country c; δ_c andλ_t are counties and year fixed effects, respectively; andu_{ct} represents idiosyncratic errors. The coefficient in front of the interaction term$Clan_c$*$Famine_t$, β, is the quantity of interest. We can interpret $(-\beta)$ as the average amount of reduction in the mortality rate during the famine years, using averages in normal years as a benchmark, in places with a higher level of social capital than in places with a lower level of social capital. In other words, β captures the differential responses to the Great Famine in places with different levels of social capital.

Although the fixed effects control for time-invariant county-specific confounders and common time shocks, this estimation strategy may suffer from biases from two sources. The first is the presence of unobserved time-varying confounders—variables that change over time and potentially correlate with both the outcome and the key interaction term. For example, crop production cycles may be different in places with different levels of social capital and correlated with the mortality rate during the famine years. The second source of biases comes from cross-sectional variables that correlate with our measures of social capital and contribute to the differential responses to the catastrophe, in the form of W_c*$Famine_t$, in which W_c is a vector of unobserved time-invariant characteristics of county c. Strictly speaking, the second source of biases is a special case of the first one because we can define W_c*$Famine_t$ as a time-varying confounder. We discuss them separately to highlight the fact that our design differs from a classical difference-in-differences design in which one group is not exposed to the treatment; in our case, the Great Famine affects all counties and the treatment, social capital, varies only cross-sectionally.

The crucial difference between our design and a classical difference-in-differences design poses additional challenges to our identification strategy because observing close-to-perfect parallel trends in non-famine



(a) Full Sample (b) By Cultural Revolution Violence

Notes: The number of genealogies is in logarithmic scale. Cultural Resolution Violence is measured by the number of victims in a county divided by county population based on Andrew Walder's "China Political Events Dataset, 1966-1971."

Fig. 4. Persistence of social capital. *Notes*: The number of genealogies is in logarithmic scale. Cultural Resolution Violence is measured by the number of victims in a county divided by county population based on Andrew Walder's "China Political Events Dataset, 1966–1971.".

years—though helpful in ruling out potential slow-moving or trending time-varying confounders—is insufficient to establish a causal relationship between social capital and a lower mortality rate. This is because there may be other factors that drive the differential response to the Great Famine and are correlated with our measures of social capital. In other words, to establish such a causal linkage, we need to rely on a selection-on-observable assumption similar to what one makes in a cross-sectional setting with observational data. That is, when we control for the interactions of all observed pre-famine covariates and time dummies (captured by X_c*$Famine_t$), $Clan_c$*$Famine_t$ has an independent effect on the mortality rate.

To make this assumption more plausible, we consider a set of pre-famine covariates which are likely related to famine severity, social capital, or both. First, we include possible predictors of famine severity such as grain production, ratio of non-farming land, and urbanization rate in the year before the famine. Meng et al. (2015) show that grain production before the famine is an important predictor of famine severity. The ratio of non-farming land and the urbanization rate predict the potential for resource diversion from the agriculture/rural sector to the industrialization/urban sector, which is also believed to be one important cause of the Great Famine (Lin, 1990). Second, we include possible predictors of local social capital such as inflow of prominent families in the late Song Dynasty, farming type (proxied by crop suitability index for rice), and distance from political center i.e., Beijing or provincial capital. Scholars believe that the geographical distribution of clans in China since the late Qing Dynasty has been mainly shaped by population migration induced by military conflicts between the Song Dynasty and the late Qing Dynasty, among which the largest is the southward migration in the late Song Dynasty (Feng, 2013). Others argue that clans flourished in southern and eastern areas because these regions are far from the political center and also farm rice, which needs teamwork or cooperation (Freedman, 1958; Huang, 1985). Distance from political center may also be correlated with the level of political radicalism in the 1950s and 1960s, thus affecting famine severity. Third, we include the share of ethnic minorities and human capital, as they are both correlated with cultural norms.[9] Besides controlling for the abovementioned factors, we further conduct several robustness checks after reporting the main results in the next section.

In order to rule out the first source of biases, we also estimate the following model, which produces dynamic treatment effect estimates:

$$Mortality_{ct} = \sum_{yr=1954}^{1966} \beta_{yr} Clan_c * D_{yr,t} + \gamma X_c * Famine_t + \delta_c + \lambda_t + u_{ct} \quad (2)$$

in which $D_{yr,t}$ represents a series of dummy variables indicating a specific year from 1954 to 1966. By using a more flexible functional form, we can check whether β_{yr} for non-famine years are close to zero, which is implied by the assumption that there are no time-varying confounders.

The identification strategy with the CFPS data is similar. We exploit two sources of variations: As above, the first one is the cross-sectional difference in social capital in the communities individual respondents originally come from. The respondents' cohorts as defined by their birth years create the second difference. In other words, we compare the differences in personal hunger experience between individuals who were born before and after the end of the famine between communities with different levels of social capital. Here, we take advantage of the fact that the Great Famine never affected those who were born after 1961. We estimate a two-way fixed effects model, controlling for both community and cohort fixed effects:

$$Hunger_{ijk} = \beta Clan_{ik} * PreFamine_{ij} + \gamma Z_{ijk} + \alpha_j + \sigma_k + \varepsilon_{ijk} \quad (3)$$

in which $Hunger_{ijk}$ is a dummy variable indicating whether individual i born in year j and community k experienced hunger for at least one

[9] Because precise data on ethnicity and educational attainment during the famine period are unavailable, we calculate the share of ethnic minorities and averaged years of schooling of people who are older than 40 years old in 1982 based on the 1982 population census.

week; $Clan_{ik}$ is a measure of community-level social capital; $PreFamine_{ij}$ equals 1 if individual i (who was born in year j) was born before the end of the Great Famine, i.e. $j \leq 1961$); Z_{ijk} are individual/household level control variables, including dummies for gender, ethnicity, household registration status, education level, and number of siblings; α_j and σ_k are cohort and community fixed effects, respectively; and ε_{ijk} represents idiosyncratic errors for individual i in cohort j from community k. The key variable of interest is the interaction term between the measure of social capital and a dummy variable indicating that a respondent was born before the famine ended in 1961.

For the dynamic treatment effects, we estimate the following fixed effects model:

$$Hunger_{ijk} = \sum_{birthyr=1950}^{1965} \beta_{birthyr} Clans_{ik} * D_{birthyr.ij} + \gamma Z_{ijk} + \alpha_j + \sigma_k + \varepsilon_{ijk} \quad (4)$$

in which $D_{birthyr.ij}$ is a set of dummy variables indicating the individual's birth-year cohort. Other variables are the same as those in Equation (3).

5. Main results

In this section, we present our main empirical findings. We first show results using a panel of 1448 Chinese counties spanning 1954–1966,[10] after which we discuss findings based on the CFPS. We then summarize our results from a series of robustness checks, the details of which appear in the appendix due to space limitations.

5.1. Evidence from county-level data

Before presenting the regression results, we first plot the raw data of mortality trends in Fig. 5. We divide the sample into two groups: counties with high vs. low levels of clan density based on whether the number of pre-1950 genealogies per capita is above or below the national mean. Fig. 5(a) shows that, consistent with historical accounts, the mortality rate increased sharply in 1958, peaked in 1960, and declined to the 1957 level in 1962. However, while the average mortality rates before and after the famine period (i.e. 1958-1961) are close between the two groups, the increase in the mortality rate between 1958 and 1961 is smaller in regions with high levels of clan density (solid line) than regions with low levels of clan density (dashed line). The difference in the rise of mortality during the famine period becomes more apparent when we subtract the sample average mortality rate in each year from the raw data, as shown in Fig. 5(b). Fig. 5 demonstrates, in the simplest possible way, that the response to calamity across regions with different levels of clan density varies widely.

We then estimate the regression model specified in Equation (1). As discussed earlier, we use two indicators to measure clan density: a dichotomous variable and a continuous variable. Columns (1)–(3) and columns (4)–(6) of Table 1 are based on each of these two indicators, respectively. We cluster the standard errors at the county level at which social capital is measured.

In column (1) of Table 1, we control for county and year fixed effects. Column (1) shows that a higher level of clan density, on average, is associated with a reduction in the mortality rate of 1.456 deaths per thousand people each year during the famine years. The estimate is statistically significant at the 1% level. In column (2), we further control for the interactions between the famine indicator and a set of time-invariant county characteristics, including grain output in 1957, ratio of non-farming land in 1957, urbanization rate in 1957, distance from Beijing, distance from provincial capital, historical migrants in the late Song Dynasty, crop suitability index for rice, share of minorities, and average years of schooling. These factors are the most important influencers of famine severity and local social capital. Controlling for the interactions between these factors and the famine indicator can alleviate the concern that it is these factors, instead of clans, that drive the differential responses to famine. The coefficient for the key interaction term becomes larger, producing a reduction of 2.325 deaths per thousand people, and is highly statistically significant. In column (3), we further control for the county-specific linear time trend to mitigate the concern that trending factors drive the estimates, and, given what we observe in Fig. 5, the chances are low. Not surprisingly, the estimated coefficient for the key interaction term barely changes.

The results are robust when we use the continuous measure of clan density. For example, columns (4)–(6) of Table 1 show that one standard deviation increase in the logged number of genealogies per capita (0.43) is associated with a reduction of 1.41–1.85 deaths per thousand people in each year from 1958 to 1961. If we conduct a thought experiment and cut this continuous measure of social capital by half in each country, the national death toll would increase by 1.72–2.26 million people during the four-year period, or an 8.9–11.7% increase over our current estimate at 19.3 million.[11]

Next, we estimate the dynamic treatment effects of clans using the regression specified in Equation (2). We plot the estimates of coefficients, β_{yr} in Fig. 6, with 1957, the year just before the famine, as the baseline. Fig. 6 shows that the differences in the mortality rates between regions with high and low clan density are very stable in non-famine years—in fact, all the estimates are precisely estimated around zero—but diverge considerably during the famine years; that is, the rise in mortality during the famine years is much smaller in regions with higher clan density.

5.2. Evidence from the household survey

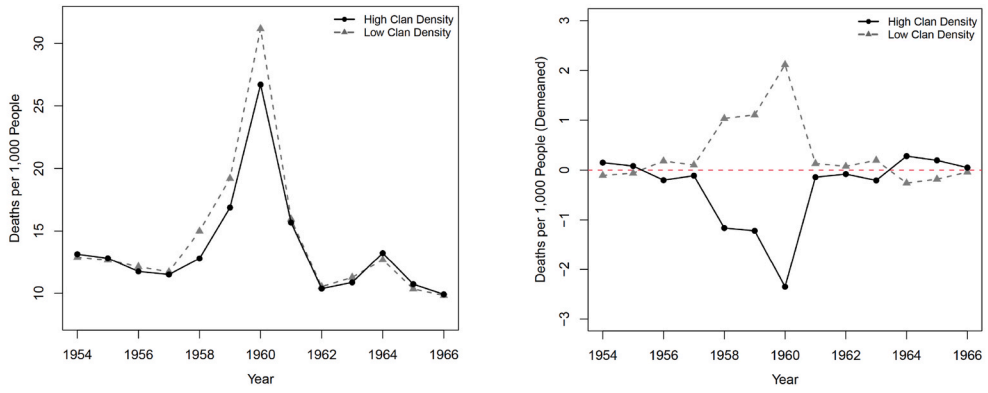
We now turn to analyses using the CFPS data. In the CFPS sample, among respondents who were born between 1941 and 1977, approximately 14% report that they had experienced persistent hunger (longer than one week). Because hunger experience in pre-reform years is neither politically sensitive nor stigmatizing for the respondents, we do not expect its reporting to suffer from the kind of measurement errors that may affect county-level data. Most of those who experienced persistent hunger say that it occurred during the Great Famine (see Figure A4 in the appendix).

Fig. 7(a) presents the probability of reporting hunger experience by clan density and birth year subtracted by the baseline probability of the 1971 cohort. The probabilities of reporting hunger experience are stable among those born after the Great Famine across different communities, but increase significantly among those born before the famine. More importantly, the increase in the probability of reporting hunger experience among those born before the famine compared to those born after the famine is smaller in communities with a higher level of social capital.

We then estimate the regression model specified in Equation (3). Table 2 shows the results using community-level genealogies to measure clan density. Column (1) of Table 2 shows that people in communities with higher clan density are less likely to have hunger experience. We include individual-level controls in Column (2) of Table 2. The estimate becomes a little larger and is still statistically significant. Because the government prioritized food supplies in urban areas, most people who died by starvation lived in rural areas. We divide the sample into rural and urban and reestimate Equation (3), using two subsamples separately. Columns (3) and (4) of Table 2 show that, as expected, the impact

[10] Our original sample covers 1854 counties. In order to make results across different model specifications comparable, we drop counties with missing values in control variables. We obtain very similar results when we use the full sample and include no control variables.

[11] Specifically, we use the following formula: $\Delta Mortality = \sum_i Population_i * \Delta Clan_i * \beta$, in which $Population_i$ is county i's population size in 1957.



(a) Mortality Rate in Level (b) Demeaned Mortality Rate

Notes: Regions are divided into two groups: high vs. low levels of clan density, based on whether the number of genealogies per capita is above or below the national mean.

Fig. 5. Mortality trends by year and social capital. *Notes*: Regions are divided into two groups: high vs. low levels of clan density, based on whether the number of genealogies per capita is above or below the national mean.

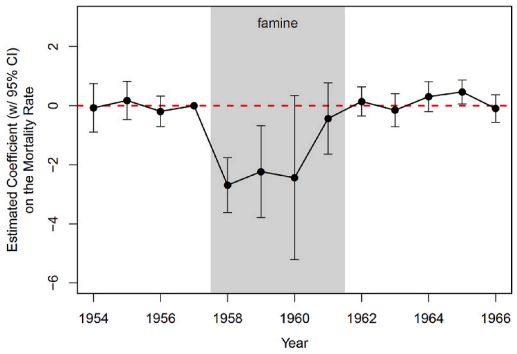
Table 1
Clans and mortality rate during the great famine.

Outcome variable mean	Outcome variable: Mortality rate (‰)					
	(1)	(2)	(3)	(4)	(5)	(6)
	13.997	13.997	13.997	13.997	13.997	13.997
High clan density x Famine period	−1.456***	−2.325***	−2.254***			
	(0.596)	(0.655)	(0.698)			
Log (#Genealogies/pop) x Famine period				−3.285***	−4.108***	−4.296***
				(0.398)	(0.597)	(0.661)
Grain output (PC) x Famine period		0.006*	0.005*		0.005*	0.005*
		(0.003)	(0.003)		(0.003)	(0.003)
Non-farming land ratio x Famine period		0.006	0.002		0.013	0.009
		(0.031)	(0.033)		(0.031)	(0.033)
Urbanization rate x Famine period		−0.075**	−0.076**		−0.088**	−0.087**
		(0.031)	(0.034)		(0.030)	(0.033)
Distance from Beijing x Famine period		0.004***	0.004***		0.004***	0.004***
		(0.001)	(0.001)		(0.001)	(0.001)
Distance from provincial capital x Famine period		0.002	0.003		0.001	0.002
		(0.003)	(0.003)		(0.003)	(0.003)
Historical migrants * Famine period		−0.078***	−0.081***		−0.053***	−0.055***
		(0.011)	(0.012)		(0.011)	(0.013)
Crop suitability index for rice * Famine period		0.379**	0.392**		0.460***	0.479***
		(0.160)	(0.171)		(0.164)	(0.175)
Share of minority * Famine period		−0.049***	−0.050***		−0.067***	−0.067***
		(0.017)	(0.018)		(0.016)	(0.018)
Averaged years of schooling * Famine period		−0.822**	−0.899**		−0.505	−0.572
		(0.406)	(0.431)		(0.408)	(0.434)
Observations	17,342	17,342	17,342	17,342	17,342	17,342
Number of counties	1448	1448	1448	1448	1448	1448
R-squared	0.388	0.407	0.428	0.390	0.409	0.430
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County-specific time trends	No	No	Yes	No	No	Yes

Notes: In columns (1)–(3), high clan density is a dummy variable indicating whether the number of genealogies in a county divided by the county's population size is above the national mean. In columns (4)–(6), we use the continuous measure. Famine period is defined 1958–1961. Grain output per capita, non-farming land ratio, and urbanization rate are measured in 1957; distance from Beijing and distance from provincial capital are spherical distances; crop suitability index for rice is from GAEZ (Global Agro-Ecological Zones); historical migrants denote the inflow of prominent families in the late Song Dynasty; the share of ethnic minorities and averaged years of schools are calculated based on people older than 40 years old in 1982 using the 1982 population census data. See Appendix B for details on data source. Standard errors clustered at the county level are reported in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. For easier comparisons of the coefficients, all regressions use the same sample in which data on all covariates are available.

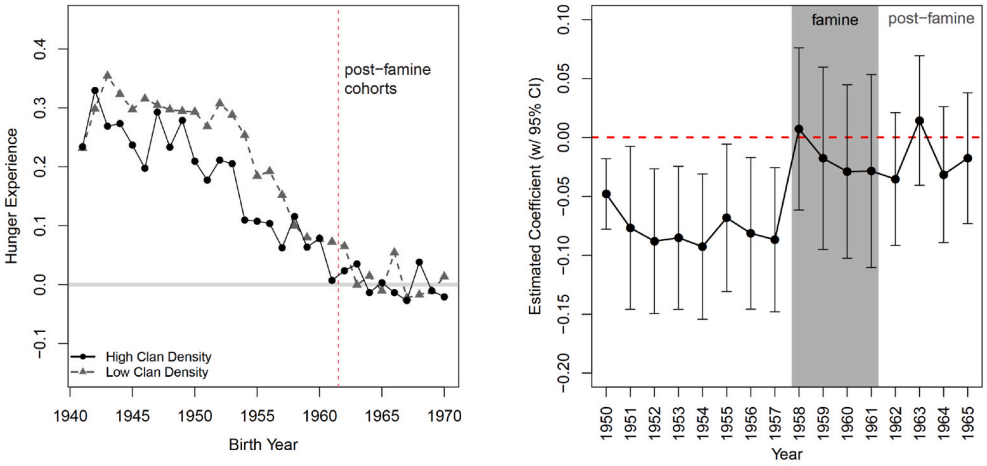
of clans on hunger experience was more pronounced in rural areas.

Next, we estimate the dynamic treatment effect of clans on hunger experience using Equation (4). In Fig. 7(b), we plot the estimated coefficients for the interaction terms between clan measure and dummy variables indicating respondents' birth year cohorts. It shows that for respondents who were born after 1958, the difference in the probability of reporting hunger experience between respondents from communities with high and low levels of clan density is stable and close to zero.



Notes: Coefficients of the interaction terms between clan measure and year dummies from estimating Equation (2) are plotted. The regression includes the same control variables presented in column 2 of Table 1. Standard errors are clustered at the county level.

Fig. 6. Effects of clans on mortality by year. Notes: Coefficients of the interaction terms between clan measure and year dummies from estimating Equation (2) are plotted. The regression includes the same control variables presented in column 2 of Table 1. Standard errors are clustered at the county level.



(a) Average Hunger Experience (b) Dynamic Effect of Clans on Hunger Experience

Notes: Subfigure (a) shows the probabilities of reporting hunger experience in communities of high and low levels of clan density for birth year cohorts 1940-1970, subtracted by their respective baseline probabilities of the 1971 birth year cohort. Subfigure (b) shows the estimated dynamic treatment effect based on Equation (4). Respondents born after 1965 are set as the reference group. High (low) level of clan density is defined as whether the village-average share of keeping a genealogy is above (below) the national mean. Both plots are based on rural respondents only. Standard errors are clustered at the village level.

Fig. 7. Hunger experience by social capital and birth year. *Notes*: Subfigure (a) shows the probabilities of reporting hunger experience in communities of high and low levels of clan density for birth year cohorts 1940–1970, subtracted by their respective baseline probabilities of the 1971 birth year cohort. Subfigure (b) shows the estimated dynamic treatment effect based on Equation (4). Respondents born after 1965 are set as the reference group. High (low) level of clan density is defined as whether the village-average share of keeping a genealogy is above (below) the national mean. Both plots are based on rural respondents only. Standard errors are clustered at the village level.

However, for those who were born before 1958, respondents from communities with a high level of clan density have a significantly lower probability of reporting hunger experience than respondents from communities with a low level of clan density. The fact that there are no systematic differences in hunger memory for cohorts who were born between 1958 and 1961 is reassuring because (1) adults rarely have any memory of events that took places when they were 0–3 years old; and (2) it shows that it is unlikely that differences in intentional misreporting across different regions or other community-specific time-varying confounders drive the observed differences in hunger experience.

Overall, the evidence from the household survey corroborates the finding from the county-level data that there is a strong negative association between social capital and famine severity.

5.3. Robustness checks

We conduct a series of robustness checks for our main findings. First, we show that the main results hold when we use the cohort loss index as

Table 2
Clans and hunger experience.

	Outcome variable: Experienced hunger (=1, yes)			
	All	All	Rural	Urban
	(1)	(2)	(3)	(4)
Outcome variable mean	0.143	0.144	0.165	0.114
Panel A				
Share of households having a genealogy	−0.075**	−0.084**	−0.121**	−0.011
	(0.036)	(0.036)	(0.046)	(0.055)
x Pre-famine cohorts				
Control variables	No	Yes	Yes	Yes
Observations	18972	18720	10985	7735
Number of communities	576	563	313	250
R-squared	0.273	0.28	0.305	0.229
Panel B				
High genealogy share (dummy)	−0.032*	−0.036*	−0.060**	0.001
x Pre-famine cohorts	(0.019)	(0.019)	(0.026)	(0.028)
Control variables	No	Yes	Yes	Yes
Observations	18972	18720	10985	7735
Number of communities	576	563	313	250
R-squared	0.273	0.28	0.305	0.229

Notes: Control variables include dummies for gender, ethnicity, household registration status, education level, and number of siblings. All regressions include dummies for birth year and community. Standard errors clustered at the community level are reported in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

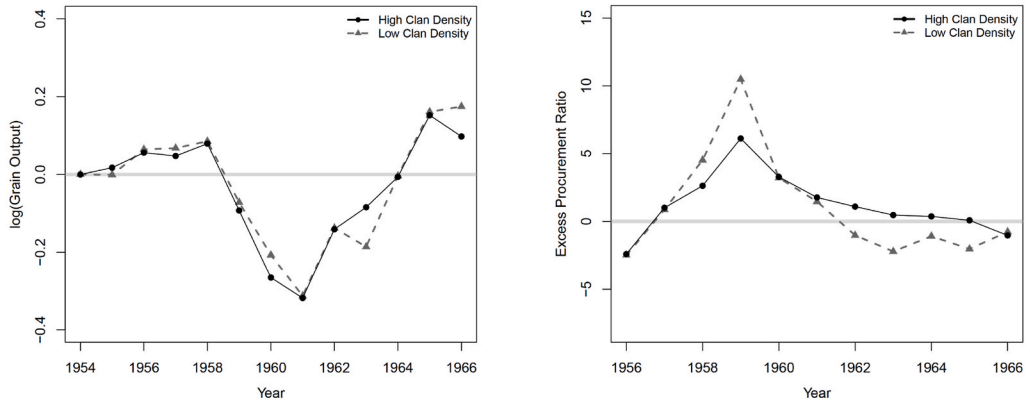
the outcome (Table A4). Second, we show that the main results hold when we use genealogies in different time periods instead of the aggregated number of genealogies across the whole history to measure social capital. This is not suprising because of the high persistence of social capital (Figure A5). Third, we show that neither religious beliefs (Table A5) nor gender norms (Table A6) drive the association between clans and mortality. Fourth, we show that our finding is robust when we add the lagged outcome and spacial lagged outcome (Table A7). Finally, we show that the result remains substantively the same if we exclude counties that do not preserve any pre-1950 genealogies (Table A8) or if we drop any of the 23 provinces from the sample (Figure A6). Due to space limitations, we report the details in the appendix.

6. Mechanisms

We explore two mechanisms through which clans could reduce famine severity. First, clan organizations managed to prevent a drastic drop in grain production. Second, clans enabled peasants to resist excessive state procurement and to conceal grain output during the peak of the famine, thus saving lives. It is obvious that each of the above two channels requires high levels of social capital, which makes collective action possible, and that local political leaders were embedded in clan networks. For example, without the help or at least acquiescence of the head of the production team and the cooperation of the rest of the villagers, it would be almost impossible for individuals to conceal food from the state inspection team. Based on oral interviews, Chen (2010) argues that clans played a key role in famine relief because "no other form of relationship—social class, friendship, comradeship, marriage, economic partnership, or political interests—could have held an entire village together for self-preservation and to save lives" (p. 164, italics original).

6.1. Grain output

Decline in grain production might have played a role in famine deaths. To examine whether clans helped villagers withstand pressure from political authorities during the early years of the GLF, thus resulting in a smaller drop in grain output during the famine, we manually collect county-level data on grain production from 1954 to 1966. In Fig. 8(a), we plot the change in grain production over time for counties with high and low levels of clan density. Specifically, we take



(a) Grain Production (b) Excess Government Procurement

Notes: We plot the average (logged) grain production (a) and excess procurement ratio (b) in counties with high and low levels of social capital, subtracting their respective baseline averages. Data on excess procurement ratio come from Kung and Chen (2011), which refers to the difference between the procurement ratio during the famine period (1958-1961) and the average procurement ratio in pre-famine years (1955-1957). High or low level of clan density refers to whether the number of genealogies per capita is above or below the mean level.

Fig. 8. Grain production and excess procurement: By social capital. *Notes:* We plot the average (logged) grain production (a) and excess procurement ratio (b) in counties with high and low levels of social capital, subtracting their respective baseline averages. Data on excess procurement ratio come from Kung and Chen (2011), which refers to the difference between the procurement ratio during the famine period (1958–1961) and the average procurement ratio in pre-famine years (1955–1957). High or low level of clan density refers to whether the number of genealogies per capita is above or below the mean level.

yearly averages of logged grain production in counties with high and low levels of clan density from 1955 to 1966 and then subtract their respective 1954 baselines (set at zero). Fig. 8(a) shows that, while grain production started to decline sharply in 1959 for both groups of counties, they followed almost exactly the same trajectories throughout the famine period, almost ruling out the possibility that places with higher levels of social capital produced more crops amid the famine. We confirm this finding using a regression model similar to that specified in Equation (1) using both logged grain output and logged per capita grain output. Columns (1)–(4) of Table 3 show that there are almost no systematic differences in changes of grain output (in aggregate or per capita levels) during famine years compared to non-famine years between regions with different levels of social capital.

The only reason for doubt is that the grain output numbers may be unreliable. For example, it seems possible that, expecting the imminent danger of a famine in 1958, villages with more social capital produced more grain and leaders of these villages concealed a significant part of it while they actually produced more. However, the difference in grain production and concealed amount would have to be almost exactly the same. We consider the chances of such perfect data manipulation to be small. A more likely scenario, we conjecture, is that on average production declined just as much in villages without much social capital (as revealed by what we believe to be corrected data), but these villages were able to resist excessive procurement from the state when a famine was looming on the horizon, as we will discuss below.

6.2. Excessive government procurement

Next, we study if social capital embedded in clans enabled peasants to resist excessive state procurement during the apex of the famine, which was a primary cause of tens of millions of abnormal deaths (Kung and Lin, 2003; Chen, 2010; Kung and Chen, 2011; Meng et al., 2015). Kung and Chen (2011), in particular, show that provincial Communist Party officials who had higher incentives to impress Mao were more likely to set ambitious (and unachievable) state procurement targets during the famine years, resulting in considerably more deaths. Using provincial-level data from Kung and Chen (2011), we plot the average changes in excess grain procurement ratio, measured by the difference between the net procurement ratio during the famine period (1958–1961) and the average procurement ratio from 1955 to 1957, by regions of high and low levels of clan density, respectively. Fig. 8(b) shows that the average increase in excess procurement is much smaller in regions with a higher level of clan density than regions with a lower level of clan density. Again, we confirm this finding using regression analyses with standard errors clustered at the provincial level. The results are shown in Table 3 columns (5) and (6). For example, column (6) suggests that a one standard deviation increase in our continuous measure of social capital (0.44) is associated with a 0.51 percentage point cut in the excess procurement ratio compared with normal years.[12]

Because the state set procurement targets ahead of each harvest season and forced procurement based on the targets regardless of real output, resisting excessive procurement means that formal leaders of a village, such as production brigade or production team leaders, either refused to endorse a severely inflated yield target, risking their political careers, or concealed crops when the procurement team from the upper-level government came down. The former required village leaders to put the interests of the villagers ahead of their own while the latter also required cooperation with the rest of the village such that no one snitched for personal gain. The cost of resistance was high. Mao personally declared the problem of "hiding grain" was "very serious" and ordered a nationwide campaign to combat "false reporting and grain hoarding"; cadres who reported starvation conditions were explicitly warned that they were expressing "right deviationist thinking" (Walder, 2015, pp. 164–165). Interviews with peasants from three villages in Anhui indicate that such refusals were more likely when the lineage system existed and political and traditional leaders of a village overlapped, as the leaders and villagers shared the same goals (survival of all) and dense kinship networks bound them together (Chen, 2010).

However, a puzzle remains: Why did villages with strong clans manage to resist excessive procurement at the peak of the famine, but failed to stand up against radical policies at the early stage of the GLF and prevent grain production from dropping? A possible explanation is that leaders of many kinship groups were winners of collectivization and lacked incentives to resist as they gained more power (Skinner, 1965; Chen, 2010). Like others, they were myopic—only when the situation became so dire that deaths began to mount did they begin putting the lives of their kinfolk before their own careers with the help of community members.

6.3. Other potential mechanisms

Finally, we discuss alternative channels through which social capital may mitigate famine severity. Accounts by historians demonstrate that activities the state deemed illegal—what Thaxton (2008) calls "anti-state resistance"—played an indispensable role in saving lives during the Great Famine (Wang and Chen, 2004; Chen, 2010). We do not have quantitative data to systematically evaluate these channels, but they are important enough to be considered. They are also relevant to our discussion of the effect of clans because engaging in these activities requires either strong, trusting relationships among community members or solving difficult collective action problems, or both.

The first form of such activities was called chi qing (literally translated as "eat green"), which means eating immature or unripe crops in the fields. The state strictly prohibited chi qing because it hurt crop yields (and hence, procurement) the following year. Another survival strategy was petty theft from the state granaries, where food was often still available. During the famine, militiamen organized by the state regularly patrolled many villages to prevent such acts. Village leaders who were members of the clan, however, may have turned a blind eye to such activities and even assisted villagers in achieving their goals. A third method is *chi kong xiang* (literally translated as "eat empty payroll"), which means freeloading by overreporting the headcount of peasant workers who were hired for state projects. This act required direct participation of village leaders, who inevitably took a significant personal political risk. Ethnographic evidence has shown that these "illegal" yet lifesaving activities were more likely to take place in communities with more social capital and where the formal leaders were embedded in the group.[13]

7. Conclusions

This paper examines the role of social capital in disaster relief amid the deadliest famine in recorded human history. Specifically, we study whether a higher level of clan density, a proxy for more social capital, in a locality is associated with fewer abnormal deaths during China's Great Famine from 1958 to 1961. Our county-level analysis shows that the rise in the mortality rate during the famine years is significantly smaller in

[12] A potential spill-over effect seems possible in which resistance to procurement in one locality might incentivize state collectors to increase procurement effort in another one within the same administrate unit. Because procurement data we use are at the provincial level, we consider the chances of this to be low.

[13] It is also worth noting that Xiaogang Village in Anhui province—the first village that divided the common farmland from the People's Commune in 1978 (an illegal act at that time), which kicked off China's agricultural reform—also has strong clan organizations. In fact, those who divided the farmland mostly came from the same kinship group and the initiator was both a leader of the group and the head of the production team.

Table 3
Clans, grain output and grain procurement.

	Outcome variables					
	Log grain output		Log grain output per capita		Excess grain procurement ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
Outcome variable mean	10.98	10.98	−1.29	−1.29	1.06	1.06
High clan density x Famine period	0.007		0.007		−0.777***	
	(0.012)		(0.019)		(0.342)	
Log (#Genealogies/pop) x Famine period		0.025		0.025		−1.162***
		(0.019)		(0.019)		(0.455)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,489	13,489	13,489	13,489	15,083	15,083
Number of clusters (counties/provinces)	1262	1262	1262	1262	21	21
R-squared	0.925	0.925	0.749	0.749	0.603	0.608

Notes: All regressions are run at the county-year level and include the same control variables presented in column 2 of Table 1. Standard errors in columns (1)–(4) are clustered at the county level; standard errors in columns (5)–(6) are clustered at the provincial level. ***p < 0.01, **p < 0.05, *p < 0.1.

counties with higher clan density, measured by the number of genealogies per capita. We corroborate this finding using individual-level survey data and show that the difference in probabilities of reporting hunger experience between individuals who were born before and after the famine is much smaller in regions with higher clan density. After controlling for the most possible confounding factors and conducting a series of robustness checks, we interpret these differences as the effects of social capital on famine relief.

We explore two main mechanisms, grain production and state procurement. We show that grain production is unlikely to explain the observed association but find suggestive evidence for the second channel that social capital enabled villagers to resist excessive procurement from the state. We also discuss the role of social capital in facilitating anti-state resistance that saved lives. These findings echo Amartya Sen's insight that food availability is often not the primary cause of famines; it is people's entitlement vis-à-vis the state, their ability to command food through legal means, that matters (Sen, 1981, p. 433). Our results can, therefore, shed light on how social forces can mitigate the consequences of erroneous government policies that lead to disasters.

While we believe that the main finding of this paper can be extended to other contexts, it needs to be interpreted with caution. First, although social exchange in clan organizations has a civic aspect in rural China, it has clear boundaries defined by kinship. Clans are much less effective in motivating leaders and fostering collective action when multiple groups are in competition in a small geographic area (Tsai, 2007). Moreover, as more people move to the city and start to enjoy an urban life style, the goal of many clan leaders may have changed in a fundamental way. Although they still command some authority over clan members, they are much more tempted to reap short-term gains at the expense of the interests of other clan members (Mattingly, 2020). Finally, as China and many other developing countries are on a fast track towards industrialization and urbanization, social capital originating from family clans may not easily transform to civic capital suitable for an industrial society of autonomous strangers; on the contrary, it can even hinder the development of civil society because of its emphasis on kinship ties and the patriarchal culture it attaches to.

Declaration of competing interest

The author declares that he has no relevant or material financial interests that relate to the paper entitled "Clans and Calamity: How Social Capital Saved Lives during China's Great Famine". The author does not belong to any relevant non-profit organizations or profit-making entities.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jdeveco.2022.102865.

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