

CODEBOOK

**Shaking Legitimacy:
The Impact of Earthquakes on Conflict in Historical China**

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Description of the Package

There are three folders under “3 Replication package” as the following

Table 1. The structure of “3 Replication package”

Folder name	Description
Data	The datasets are saved in this folder
Program	The required programs are saved in this folder
Results	The generated tables and figures (empirical analysis in the main text and appendix) are saved in this folder

The replication uses two software: Stata/MP 16.0 and ArcMap 10.4.1. The computational requirements and software requirements are provided in section 2 of this ReadMe file.

“Notes for Replication” in the following provides the instructions to replicate the results, which include 5 sections:

1. Data Availability and Provenance Statements
2. Computational requirements and Software Requirements
3. Results Replication
4. Maps Replication
5. Dataset and Variables Definition

Notes for Replication

1. Data Availability and Provenance Statements

There are three datasets required for the replication (GridYr.dta, Earthquake.dta, and GrianPrice.dta), which are saved in the folder “3 Replication package\Data”. The data were collected by the authors based on public use data. The original sources of each variable in the datasets and how to construct them from the original sources have been listed in (column 3 of) Table 5 of Section 5 (Dataset and Variables Definition).

2. Computational requirements and Software Requirements

(1) Computer specifications and OS:

Processor: Intel(R) Xeon(R) CPU E5-2603 v4 @ 1.70GHz 1.70 GHz
Installed RAM: 32.0 GB
System type: 64-bit operating system, x64-based processor
OS Edition: Windows 10 Enterprise (Version: 21H2)

(2) Stata/MP 16.0: The following ado files need to be download and installed:

Table 2. Required ado files

Ado files	Version*	To install, open Stata and run	Or to install manually, can download
<input type="checkbox"/> reghdfe:	Version: 5.7.3 13nov2019	ssc install reghdfe	reghdfe from http://fmwww.bc.edu/RePEc/bocode/r
<input type="checkbox"/> ftools	Version: 2.37.0 16aug2019	ssc install ftools	ftools from http://fmwww.bc.edu/RePEc/bocode/f
<input type="checkbox"/> outreg2	Version: outreg2 2.3.2 17aug2014	ssc install outreg2	outreg2 from http://fmwww.bc.edu/RePEc/bocode/o
<input type="checkbox"/> acreg	Version: December 2020 (1.1.0)	ssc install acreg	acreg from http://fmwww.bc.edu/RePEc/bocode/a
<input type="checkbox"/> ranktest	Version: ranktest 1.4.01 18aug2015	ssc install ranktest	ranktest from http://fmwww.bc.edu/RePEc/bocode/r
<input type="checkbox"/> hdfe	Version: reghdfe 3.2.9 21feb2016	ssc install hdfe	hdfe from http://fmwww.bc.edu/RePEc/bocode/h
<input type="checkbox"/> ivreg2	Version: ivreg2 4.1.11 22Nov2019	ssc install ivreg2	ivreg2 from http://fmwww.bc.edu/RePEc/bocode/i
<input type="checkbox"/> binscatter	Version: 7.02 24nov2013	ssc install binscatter	binscatter from http://fmwww.bc.edu/RePEc/bocode/b

* version of the ado file bases on the information listed in the beginning of the ado file.

(3) ArcMap 10.4.1

3: Results Replication

- (1) The do-files listed in the second column of Table 3 can use the data files in the first column to produce the files in the third column, based on which we can make the Tables and Figures in the main text and online appendix (the fourth column).
- (2) **Program\All_in_One.do** can produce all tables and figures in the order in which they are cited in the text. The record of all outputs that appear in the Results window is stored in **Results\All_in_One.log**.
- (3) The running time of each program in column (2) is about 1-2 minutes, except Table_2.do (4 hours), AppendixTable_B2.do (20 minutes), AppendixTable_B3.do (1 hour), AppendixTable_B4.do (1 hour), and AppendixTable_B8.do (3 hours). In total, Program\All_in_One.do take about 10 hours.
- (4) The datasets required for replication has been listed in the first column. The CSV files are also provided in the folder Data\.
- (5) All variables have been labeled in the data file.

Table 3. Description of Data and Codes for Replication

Folders			Tables and Figures	
(1) Data\	(2) Program\	(3) Results\	(4) Main text and online appendix	
GridYr.dta	Table_1.do	Tab1.xlsx	Table 1:	Variables definition and data sources
	Table_2.do	Tab2_Baseline.doc Tab2_Baseline_Acreg.doc	Table 2:	Impact of earthquakes on conflicts: Baseline results
	Table_3.do	Tab3_Baseline_cem.doc	Table 3:	Impact of earthquakes on conflicts: Coarsened exact matching
	Table_4.do	Tab4_OnConflict_rainfall.doc	Table 4:	Role of climate shocks
	Table_5.do	Tab5_Contagion.doc	Table 5:	Contagion of major shaking
	Table_6.do	Tab6_OnNomadic.doc	Table 6:	Impact on different conflict types
	Table_7.do	Tab7_OnConflict_frag.doc	Table 7:	Tab7_OnConflict_frag.doc
	Figure_3.do	Fig3_YearlyResults_Annual.xlsx ➔ Fig3a.png; Fig3b.png	Figure 3:	Impact of minor shaking on conflict: Leads versus lags

	Figure_4.do	Fig4a.png; Fig4b.png	Figure 4:	Relation of minor and major shaking to conflict
Earthquake.dta	AppendixFigure_A3.do	FigA3.png	Figure A3:	Histogram of earthquakes by magnitude and by century
GridYr.dta	AppendixFigure_B1.do	FigB1.png	Figure B1:	Correlation between minor and major shaking
	AppendixFigure_B2.do	FigB2_YearlyResults_Annual.xlsx → FigB2a.png; FigB2b.png	Figure B2:	Annual impact of minor and major shaking on conflict
	AppendixFigure_B3.do	FigB3_YearlyResults.xlsx → FigB3a.png; FigB3b.png	Figure B3:	Effects of minor and major shaking
	AppendixFigure_B4.do	FigB4.png	Figure B4:	Shaking-conflict relation with outliers included and excluded
	AppendixFigure_B5.do	FigB5_Pre_trend.doc; FigB5_Pre_trend_cem.doc → FigB5_YearlyCEM_chk.xlsx (Sheet: Results) → Figure generated in Sheet: Figure_B5 → Saved into: FigB5.pdf	Figure B5:	Checks on pre-trend
	AppendixFigure_B6.do	FigB6.png	Figure B6:	Impact of drought on conflict
GrainPrice.dta	AppendixFigure_B7.do	FigB7.png	Figure B7:	Short-term relation between minor shaking and grain prices
	AppendixFigure_B8.do	FigB8_YearlyResults_InPrice.xlsx → FigB8.png	Figure B8:	Impact of minor shaking on grain prices
GridYr.dta	AppendixFigure_B9.do	FigB9_AgeResults.xlsx FigB9_RelageResults.xlsx → FigB9.png	Figure B9:	Impact of quakes by dynasty age
	AppendixFigure_B10.do	FigB10.png	Figure B10:	Relation between minor shaking and conflict by fragmentation level
	AppendixTable_B1.do	TabB1_LinkWithClimate.doc	Table B1:	Correlation between minor shaking and climate shocks
	AppendixTable_B2.do	TabB2_Baseline_Transition.doc TabB2_Baseline_Transition_Acreg.doc	Table B2:	Transition vs. nontransition period
	AppendixTable_B3.do	TabB3_DropMajor.doc TabB3_DropMajor_Acreg.doc	Table B3:	Role of minor shaking independent of major earthquakes
	AppendixTable_B4.do	TabB4_BaselineMarginal.doc TabB4_BaselineMarginal_Acreg.doc	Table B4:	Relation of minor and major shaking to conflict with marginal areas redefined
	AppendixTable_B5.do	TabB5_Rugged.doc	Table B5:	Role of ruggedness
	AppendixTable_B6.do	TabB6_Baseline_5X5.doc	Table B6:	Robustness checks using various forms of standard errors

		TabB6_BaselineXdynasty.doc TabB6_Baseline_5X5Xdynasty.doc		
	AppendixTable_B7.do	TabB7_OnConflict_lag.doc	Table B7:	Lagged conflict
	AppendixTable_B8.do	TabB8_Baseline_OnlyMajor.doc TabB8_Baseline_OnlyMajor_Acreg.txt	Table B8:	Effect of major shaking only
	AppendixTable_B9.do	TabB9_Baseline_majorrelief.doc	Table B9:	Disaster relief and the effect of major shaking
GrainPrice.dta	AppendixTable_B10.do	TabB10_EffectOnPrice.doc	Table B10:	Impact on grain prices
GridYr.dta	AppendixTable_B11.do	TabB11_OnConflict_culture.doc	Table B11:	Role of Buddhism
	AppendixTable_B12.do	TabB12_OnDynCycle.doc	Table B12:	Legitimacy shock and dynastic cycles
	AppendixTable_B13.do	TabB13_OnUrban_conflicts.doc	Table B13:	The impact of conflicts vs. civil protests
	AppendixTable_B14.do	TabB14_AdaptToQuake.doc	Table B14:	Earthquake frequency and the effect of legitimacy shock
	AppendixTable_B15.do	TabB15_Onconflicts_relief.doc	Table B15:	Relief rate and the impact of minor shaking
	AppendixTable_B16.do	TabB16_OnConflict_academy.doc	Table B16:	Role of academies of classical learning
	AppendixTable_B17.do	TabB17_OnConflict_garrison.doc	Table B17:	Role of coercion

4: Maps Replication (Software: ArcMap 10.4.1)

The program listed in the second column can use the data files in the first column to produce the files in the third column, based on which we can make the maps (the third and fourth columns).

Table 4. Description of Maps and Codes for Replication

Data	Program and Results		
		Figure 1	Geographic distribution of earthquakes and conflicts
Data\Figure_1\Boundary\Boundary.shp	Data\Figure_1\Figure_1a.mxd (Figure will be generated by running this file)		
Data\Figure_1\Earthquake\XYEarthquake.shp		(A)	Epicenter distribution
Data\Figure_1\Earthquake\SampledEarthquake.dbf			
Data\Figure_1\Boundary\Boundary.shp	Data\Figure_1\Figure_1b.mxd (Figure will be generated by running this file)		
Data\Figure_1\Conflict\XYConflicts_Types.shp		(B)	Conflict distribution
Data\Figure_1\Grid\Grid25X25.shp			
		Figure 2	Definitions of major and minor shaking
Data\Figure_2\Boundary\Boundary.shp	Data\Figure_2\Figure_2a.mxd (Figure will be generated by running this file)		
Data\Figure_2\Grid\Grid25X25.shp		(A)	Major shaking distribution
Data\Figure_2\MajorShaking\XYEarthquake_Radius6_1300_1838.shp			
Data\Figure_2\Boundary\Boundary.shp	Data\Figure_2\Figure_2b.mxd (Figure will be generated by running this file)		
Data\Figure_2\Grid\Grid25X25.shp		(B)	Minor shaking distribution
Data\Figure_2\MajorShaking\XYEarthquake_Radius4_1300_1838.shp			
		Figure A4	Calculating minor and major shaking
Data\Figure_A4\Boundary\Boundary.shp	Data\Figure_A4\Figure_A4_1.mxd		
Data\Figure_A4\Grid\Grid25X25_1668.shp			The upper-left graph of Figure A4
Data\Figure_A4\Major1668\XYEarthquake_Radius6_1668.shp			
Data\Figure_A4\Grid\Grid25X25_1668.shp	Data\Figure_A4\Figure_A4_2.mxd		The upper-right graph of Figure A4
Data\Figure_A4\Boundary\Boundary.shp	Data\Figure_A4\Figure_A4_3.mxd		
Data\Figure_A4\Grid\Grid25X25_1668.shp			The lower-left graph of Figure A4
Data\Figure_A4\Major1668\XYEarthquake_Radius4_1668.shp			
Data\Figure_A4\Grid\Grid25X25_1668.shp	Data\Figure_A4\Figure_A4_4.mxd		The lower-right graph of Figure A4
	Figures generated by running the above files are copied into Data\Figure_A4\Figure_A4.pptx to generate Figure_A4, which is saved into Data\Figure_A4\Figure_A4.png		

5: Dataset and Variables Definition

Table 5: Dataset and Variables Definition

5.1 GridYr.dta: Grid-year level panel data

Variable	Definition	Data construction
Id	Grid ID	Constructing one 2.5-degree X 2.5-degree Grid level panel data during 1300-1838. Grid: Data\Figure_1\Grid\Grid25X25.shp
Id_5X5	5-degree X 5-degree Grid ID	
year	Year	
period50	50-year Period	
dynasty	Dynasty	
x_grid	Grid: longitude	
y_grid	Grid: latitude	
conflicts	Number of conflicts	<p>The source for the historical conflict data is A Chronology of Warfare in Dynastic China (China's Military History Editorial Committee, 2003), which provides detailed information on the year of occurrence, location, and parties involved.</p> <p>(1) Code the geographical coordinates of the location, and match with the Grid as Figure 1b shows.</p> <p>(2) Based on the parties involved, variables conflicts_sed, nomad, and japan are constructed.</p> <p>(3) Log-term and dummy indicator based on variables conflicts_sed, nomad, and japan.</p>
conflicts0	Dummy indicator of conflicts	
lnconflicts	Logged number of conflicts	
conflicts_sed	Number of conflicts: gov and Han	
conflicts_sed0	Dummy indicator of conflicts: gov and Han	
lnconflicts_sed	Logged number of conflicts: gov and Han	
nomad	Number of conflicts: gov and nomadic people	
nomad0	Dummy indicator of conflicts: gov and nomadic people	
lnnomad	Logged number of conflicts: gov and nomadic people	
japan	Number of conflicts: gov and Japanese	
japan0	Dummy indicator of conflicts: gov and Japanese	
lnjapan	Logged number of conflicts: gov and Japanese	
protest_urban	Number of city protests	Wu (2011) lists the city protests with the location of timing. I count the number of protests in each grid in each year.
smallquake	Ratio of area where shaking level is equal to MMI IV or V	The epicenter (geographical coordinates) and year of earthquakes are directly collected from <i>Catalog of Strong Earthquakes in Historical China</i> (Earthquake Prevention Division of China Earthquake Administration, 1995). Construct variable smallquake and bigquake as Figure A4 shows.
bigquake	Ratio of area where shaking level is above V	
avgsmallquake_0_past25	Average of minor shaking during the past 25 years	
avgbigquake_0_past25	Average of major shaking during the past 25 years	Using the suitability index from Global Agro-Ecological Zones (GAEZ) database, which ranges from 1 ("not suitable") to 8 ("very high") in each 0.5-degree x 0.5-degree grid cell. I measure grid-level crop suitability as the average for all cells located in each grid with a primary focus on the suitability for wheat, rice, fox millet, maize, and sweet potato.
lnwheat	Logged wheat suitability	
lnrice	Logged rice suitability	
lnfmillet	Logged fox millet suitability	
lnmaize	Logged maize suitability	
lnspotato	Logged sweat potato suitability	CHGIS (2007) provides the .shp files for coastal, river, DEM (Digital Elevation Model), the location of Buddhist temples, and basin. I spatially join them with the grid map, to define and calculate those variables at the grid level.
coast	Coast dummy	
lnrivl	Logged major river length	
slope	Average slope	
lnelevation	Logged average elevation	
rugged	Ruggedness	

buddist	Number of Buddhism temples	
frag_mbasin	Fragmentation index of basin	
lnpop1569	Logged population (in 1569)	Ge (2000) provides the level population in 13 and 1580, I linearly interpolated the population in 1569.
frag_mlang18	Ethnolinguistic fragmentation index	Wurm (1987) provides the distribution of main dialect at the county level. I match it with the grid map, and then calculate the fragmentation index of each grid.
academy	Number of academies for Confucian classics learning	Li (1996) provides a list on academy with location and the time of establishment. I count the number of academies in each grid in each year.
garrison	Number of garrison stations during the Ming	Berman, 2017 provides the location of Ming garrisons. I calculate the number of garrison stations in each grid.
drought	Dummy indictor of droughts during 1470-1838	<p>The weather data come from the State Meteorological Society (1981). Weather conditions are coded into five indicators: -2(extreme drought), -1 (drought), 0 (normal), 1 (flood) and 2 (extreme flood).</p> <ol style="list-style-type: none"> (1) Calculate the grid average and standard deviation. (2) Drought=1 if grid climate is less than average – sd (3) Flood=1 if grid climate is larger than average + sd (4) Others are generated based on drought and flood
flood	Dummy indicator of floods during 1470-1838	
temperature	Relative temperature to 1780-1879 average temperature	
avgdrought_0_past5	Average drought: year -4 -- year 0	
avgdrought_5_past5	Average drought: year -9 -- year -5	
avgflood_0_past5	Average flood: year -4 -- year 0	
avgflood_5_past5	Average flood: year -9 -- year -5	
avgtemperature_0_past5	Average tempearture: year -4 -- year 0	Wang et al. (1998) provide data on temperature for four locations – at coordinates (113E, 29N), (120E, 34N), (121E, 24N), and (114E, 23N) – I proxy grid temperature as that at the location closest to the grid.
avgtemperature_5_past5	Average tempearture: year -9 -- year -5	
noshaking	Dummy: no shaking	<p>Those variables are generated from the variables smallquake and bigquake.</p> <p>The quakes can be divided into different categories according to their magnitude. For each category, I repeat the calculation shown in Figure A4 to construct those variables.</p>
onlyminor	Only minor shaking driven by weak earthquake	
onlyminor_c0	Only minor shaking driven weak earthquake (drop possible weak quake linked with strong quake)	
avgsmallquake_bw6_0_past25	Average of minor shaking caused by quakes with magnitude under 6 during past 25 years	
avgsmallquake_up6_0_past25	Average of minor shaking caused by quakes with magnitude over or equal to 6 during past 25 years	
avgsmallquake_bw5_0_past25	Average of minor shaking caused by weak quakes (magnitude under 5) during past 25 years	
avgsmallquake_up5_0_past25	Average of mnor shaking caused by strong quakes (magnitude over or equal to 5) during past 25 years	
avgsmallquake_bw5_c0_0_past25	Average of minor shaking caused by weak quakes (main quake's magnitude under 5) during past 25 years	
avgsmallquake_up5_c0_0_past25	Average of minor shaking caused by strong quakes (main quake's magnitude over or equal to 5) during past 25 years	
avgsmallquake_09_0_past25	Average of minor shaking during past 25 years (decrease major shaking radius 10 percent)	
avgbigquake_09_0_past25	Average of major shaking during past 25 years (decrease major shaking radius 10 percent)	
avgsmallquake_11_0_past25	Average of minor shaking during past 25 years (increase major shaking radius 10 percent)	
avgbigquake_11_0_past25	Average of major shaking during past 25 years (increase major shaking radius 10 percent)	
relief_rate	Earthquake relief rate during the past 25 years	

avgsmallquake_no_0_past25	Average of minor shaking during past 25 years without relief in the damaged area	Those variables are generated from the variables smallquake and bigquake, together with the relief information provided by (Earthquake Prevention Division of China Earthquake Administration, 1995). The quakes can be divided into two categories according to their relief status. For each category, I repeat the calculation shown in Figure A4 to construct those variables.
avgsmallquake_relief_0_past25	Average of minor shaking during past 25 years with relief in the damaged area	
avgbigquake_no_0_past25	Average of major shaking during past 25 years without relief in the damaged area	
avgbigquake_relief_0_past25	Average of major shaking during past 25 years with relief in the damaged area	
rugsmallquake_0_past25	Ruggedness weighted minor shaking (average during the past 25 years)	In Figure A4, I calculate the ruggedness weighted sum of minor shaking and major shaking, instead of simple sum.
rugbigquake_0_past25	Ruggedness weighted major shaking (average during the past 25 years)	
smallquake_d	Minor shaking dummy	Those variables are generated from the variables smallquake and bigquake
bigquake_d	Major shaking dummy	
dist2quakepre1300	ln min distance to recorded earthquakes pre 1300	Earthquake Prevention Division of China Earthquake Administration (1995) provides the geographical coordinates of earthquakes before 1300. I calculate the minimum distance of each grid's centroid (x_grid, y_grid) to those earthquakes.
freq4_0_past25	Minor quake freq. during the past 25 years	Generated based on variable smallquake
freq6_0_past25	Major quake freq. during the past 25 years	Generated based on variable bigquake
chg_conflicts_25	Conflicts during year 0 - year 24, minus, conflicts during year -25 -- year -1	Generated based on variable conflicts by taking lead or lag
f30conflicts	Conflicts: year 30	
f29conflicts	Conflicts: year 29	
f28conflicts	Conflicts: year 28	
f27conflicts	Conflicts: year 27	
f26conflicts	Conflicts: year 26	
f25conflicts	Conflicts: year 25	
f24conflicts	Conflicts: year 24	
f23conflicts	Conflicts: year 23	
f22conflicts	Conflicts: year 22	
f21conflicts	Conflicts: year 21	
f20conflicts	Conflicts: year 20	
f19conflicts	Conflicts: year 19	
f18conflicts	Conflicts: year 18	
f17conflicts	Conflicts: year 17	
f16conflicts	Conflicts: year 16	
f15conflicts	Conflicts: year 15	
f14conflicts	Conflicts: year 14	
f13conflicts	Conflicts: year 13	
f12conflicts	Conflicts: year 12	
f11conflicts	Conflicts: year 11	
f10conflicts	Conflicts: year 10	
f9conflicts	Conflicts: year 9	
f8conflicts	Conflicts: year 8	
f7conflicts	Conflicts: year 7	

f6conflicts	Conflicts: year 6	Generated based on variable conflicts by taking lead or lag
f5conflicts	Conflicts: year 5	
f4conflicts	Conflicts: year 4	
f3conflicts	Conflicts: year 3	
f2conflicts	Conflicts: year 2	
f1conflicts	Conflicts: year 1	
l0conflicts	Conflicts: year 0	
l1conflicts	Conflicts: year -1	
l2conflicts	Conflicts: year -2	
l3conflicts	Conflicts: year -3	
l4conflicts	Conflicts: year -4	
l5conflicts	Conflicts: year -5	
l6conflicts	Conflicts: year -6	
l7conflicts	Conflicts: year -7	
l8conflicts	Conflicts: year -8	
l9conflicts	Conflicts: year -9	
l10conflicts	Conflicts: year -10	
l11conflicts	Conflicts: year -11	
l12conflicts	Conflicts: year -12	
l13conflicts	Conflicts: year -13	
l14conflicts	Conflicts: year -14	
l15conflicts	Conflicts: year -15	
l16conflicts	Conflicts: year -16	
l17conflicts	Conflicts: year -17	
l18conflicts	Conflicts: year -18	
l19conflicts	Conflicts: year -19	
l20conflicts	Conflicts: year -20	
l21conflicts	Conflicts: year -21	
l22conflicts	Conflicts: year -22	
l23conflicts	Conflicts: year -23	
l24conflicts	Conflicts: year -24	
l25conflicts	Conflicts: year -25	
l26conflicts	Conflicts: year -26	
l27conflicts	Conflicts: year -27	
l28conflicts	Conflicts: year -28	
l29conflicts	Conflicts: year -29	
l30conflicts	Conflicts: year -30	
f30smallquake	Minor shaking: year 30	
f29smallquake	Minor shaking: year 29	
f28smallquake	Minor shaking: year 28	
f27smallquake	Minor shaking: year 27	

f26smallquake	Minor shaking: year 26	Generated based on variable smallquake by taking lead or lag
f25smallquake	Minor shaking: year 25	
f24smallquake	Minor shaking: year 24	
f23smallquake	Minor shaking: year 23	
f22smallquake	Minor shaking: year 22	
f21smallquake	Minor shaking: year 21	
f20smallquake	Minor shaking: year 20	
f19smallquake	Minor shaking: year 19	
f18smallquake	Minor shaking: year 18	
f17smallquake	Minor shaking: year 17	
f16smallquake	Minor shaking: year 16	
f15smallquake	Minor shaking: year 15	
f14smallquake	Minor shaking: year 14	
f13smallquake	Minor shaking: year 13	
f12smallquake	Minor shaking: year 12	
f11smallquake	Minor shaking: year 11	
f10smallquake	Minor shaking: year 10	
f9smallquake	Minor shaking: year 9	
f8smallquake	Minor shaking: year 8	
f7smallquake	Minor shaking: year 7	
f6smallquake	Minor shaking: year 6	
f5smallquake	Minor shaking: year 5	Generated based on variable smallquake by taking lead or lag
f4smallquake	Minor shaking: year 4	
f3smallquake	Minor shaking: year 3	
f2smallquake	Minor shaking: year 2	
f1smallquake	Minor shaking: year 1	
10smallquake	Minor shaking: year 0	
11smallquake	Minor shaking: year -1	
12smallquake	Minor shaking: year -2	
13smallquake	Minor shaking: year -3	
14smallquake	Minor shaking: year -4	
15smallquake	Minor shaking: year -5	
16smallquake	Minor shaking: year -6	
17smallquake	Minor shaking: year -7	
18smallquake	Minor shaking: year -8	
19smallquake	Minor shaking: year -9	
110smallquake	Minor shaking: year -10	
111smallquake	Minor shaking: year -11	
112smallquake	Minor shaking: year -12	
113smallquake	Minor shaking: year -13	
114smallquake	Minor shaking: year -14	

l15smallquake	Minor shaking: year -15	
l16smallquake	Minor shaking: year -16	
l17smallquake	Minor shaking: year -17	
l18smallquake	Minor shaking: year -18	
l19smallquake	Minor shaking: year -19	
l20smallquake	Minor shaking: year -20	
l21smallquake	Minor shaking: year -21	
l22smallquake	Minor shaking: year -22	
l23smallquake	Minor shaking: year -23	
l24smallquake	Minor shaking: year -24	
l25smallquake	Minor shaking: year -25	
l26smallquake	Minor shaking: year -26	
l27smallquake	Minor shaking: year -27	
l28smallquake	Minor shaking: year -28	
l29smallquake	Minor shaking: year -29	
f30bigquake	Major shaking: year 30	Generated based on variable majorquake by taking lead or lag
f29bigquake	Major shaking: year 29	
f28bigquake	Major shaking: year 28	
f27bigquake	Major shaking: year 27	
f26bigquake	Major shaking: year 26	
f25bigquake	Major shaking: year 25	
f24bigquake	Major shaking: year 24	
f23bigquake	Major shaking: year 23	
f22bigquake	Major shaking: year 22	
f21bigquake	Major shaking: year 21	
f20bigquake	Major shaking: year 20	
f19bigquake	Major shaking: year 19	
f18bigquake	Major shaking: year 18	
f17bigquake	Major shaking: year 17	
f16bigquake	Major shaking: year 16	
f15bigquake	Major shaking: year 15	
f14bigquake	Major shaking: year 14	
f13bigquake	Major shaking: year 13	
f12bigquake	Major shaking: year 12	
f11bigquake	Major shaking: year 11	
f10bigquake	Major shaking: year 10	
f9bigquake	Major shaking: year 9	
f8bigquake	Major shaking: year 8	
f7bigquake	Major shaking: year 7	
f6bigquake	Major shaking: year 6	
f5bigquake	Major shaking: year 5	

f4bigquake	Major shaking: year 4	Generated based on variable majorquake by taking lead or lag
f3bigquake	Major shaking: year 3	
f2bigquake	Major shaking: year 2	
f1bigquake	Major shaking: year 1	
l0bigquake	Major shaking: year 0	
l1bigquake	Major shaking: year -1	
l2bigquake	Major shaking: year -2	
l3bigquake	Major shaking: year -3	
l4bigquake	Major shaking: year -4	
l5bigquake	Major shaking: year -5	
l6bigquake	Major shaking: year -6	
l7bigquake	Major shaking: year -7	
l8bigquake	Major shaking: year -8	
l9bigquake	Major shaking: year -9	
l10bigquake	Major shaking: year -10	
l11bigquake	Major shaking: year -11	
l12bigquake	Major shaking: year -12	
l13bigquake	Major shaking: year -13	
l14bigquake	Major shaking: year -14	
l15bigquake	Major shaking: year -15	
l16bigquake	Major shaking: year -16	
l17bigquake	Major shaking: year -17	
l18bigquake	Major shaking: year -18	
l19bigquake	Major shaking: year -19	
l20bigquake	Major shaking: year -20	
l21bigquake	Major shaking: year -21	
l22bigquake	Major shaking: year -22	
l23bigquake	Major shaking: year -23	
l24bigquake	Major shaking: year -24	
l25bigquake	Major shaking: year -25	
l26bigquake	Major shaking: year -26	
l27bigquake	Major shaking: year -27	
l28bigquake	Major shaking: year -28	
l29bigquake	Major shaking: year -29	
bigquake_26_post5	Major shaking: year 26 -- year 30	Taking average of the corresponding leads or lags of variable bigquake
bigquake_21_post5	Major shaking: year 21 -- year 25	
bigquake_16_post5	Major shaking: year 16 -- year 20	
bigquake_11_post5	Major shaking: year 11 -- year 15	
bigquake_6_post5	Major shaking: year 6 -- year 10	
bigquake_1_post5	Major shaking: year 1 -- year 5	
bigquake_0_past5	Major shaking: year -4 -- year 0	

bigquake_5_past5	Major shaking: year -9 -- year -5	
bigquake_10_past5	Major shaking: year -14 -- year -10	
bigquake_15_past5	Major shaking: year -19 -- year -15	
bigquake_20_past5	Major shaking: year -24 -- year -20	
bigquake_25_past5	Major shaking: year -29 -- year -25	
smallquake_26_post5	Minor shaking: year 26 -- year 30	Taking average of the corresponding leads or lags of variable smallquake
smallquake_21_post5	Minor shaking: year 21 -- year 25	
smallquake_16_post5	Minor shaking: year 16 -- year 20	
smallquake_11_post5	Minor shaking: year 11 -- year 15	
smallquake_6_post5	Minor shaking: year 6 -- year 10	
smallquake_1_post5	Minor shaking: year 1 -- year 5	
smallquake_0_past5	Minor shaking: year -4 -- year 0	
smallquake_5_past5	Minor shaking: year -9 -- year -5	
smallquake_10_past5	Minor shaking: year -14 -- year -10	
smallquake_15_past5	Minor shaking: year -19 -- year -15	
smallquake_20_past5	Minor shaking: year -24 -- year -20	
smallquake_25_past5	Minor shaking: year -29 -- year -25	

5.2. Earthquake.dta: The list of earthquakes

Variable	Definition	
equakeid	Earthquake ID	Author defined.
year	Year	Earthquake Prevention Division of China Earthquake Administration (1995) provides the geographical coordinates of earthquakes
magnitude	Magnitude	

5.3. GrainPrice.dta: Grain price data set

Variable	Definition	
year	Year	Copied from 5.1 GridYr.dta
lnprice_med	ln Grain price	Institute of Modern History, Academia Sinica (2021) provide the grain price data at prefecture level. I match it with the grid level to construct the variable lnprice_med, and the other variables can be generated by taking lags.
l1lnprice_med	ln Grain price: year -1	
l2lnprice_med	ln Grain price: year -2	
l3lnprice_med	ln Grain price: year -3	
Id	Grid ID	Copied from 5.1 GridYr.dta
period50	50-year Period	
lnwheat	Logged wheat suitability	
lnrice	Logged rice suitability	
lnmillet	Logged fox millet suitability	
lnmaize	Logged maize suitability	

lnspotato	Logged sweat potato suitability
coast	Coast dummy
lnrivl	Logged major river length
slope	Average slope
lnelevation	Logged average elevation
l0bigquake	Major shaking: year 0
l1bigquake	Major shaking: year -1
l0smallquake	Minor shaking: year 0
l1smallquake	Minor shaking: year -1
bigquake_0_past5	Major shaking: year -4 -- year 0
bigquake_5_past5	Major shaking: year -9 -- year -5
bigquake_10_past5	Major shaking: year -14 -- year -10
bigquake_15_past5	Major shaking: year -19 -- year -15
bigquake_20_past5	Major shaking: year -24 -- year -20
bigquake_25_past5	Major shaking: year -29 -- year -25
bigquake_1_post5	Major shaking: year 1 -- year 5
bigquake_6_post5	Major shaking: year 6 -- year 10
bigquake_11_post5	Major shaking: year 11 -- year 15
bigquake_16_post5	Major shaking: year 16 -- year 20
bigquake_21_post5	Major shaking: year 21 -- year 25
bigquake_26_post5	Major shaking: year 26 -- year 30
smallquake_0_past5	Minor shaking: year -4 -- year 0
smallquake_5_past5	Minor shaking: year -9 -- year -5
smallquake_10_past5	Minor shaking: year -14 -- year -10
smallquake_15_past5	Minor shaking: year -19 -- year -15
smallquake_20_past5	Minor shaking: year -24 -- year -20
smallquake_25_past5	Minor shaking: year -29 -- year -25
smallquake_1_post5	Minor shaking: year 1 -- year 5
smallquake_6_post5	Minor shaking: year 6 -- year 10
smallquake_11_post5	Minor shaking: year 11 -- year 15
smallquake_16_post5	Minor shaking: year 16 -- year 20
smallquake_21_post5	Minor shaking: year 21 -- year 25

Copied from 5.1 **GridYr.dta**

smallquake_26_post5	Minor shaking: year 26 -- year 30
drought_0_post5	Drought: year -4 -- year 0
drought_5_post5	Drought: year -9 -- year -5
flood_0_post5	Flood: year -4 -- year 0
flood_5_post5	Flood: year -9 -- year -5

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