Online Appendix

Communication Infrastructure and Stabilizing Food Prices:Evidence from the Telegraph Network in China

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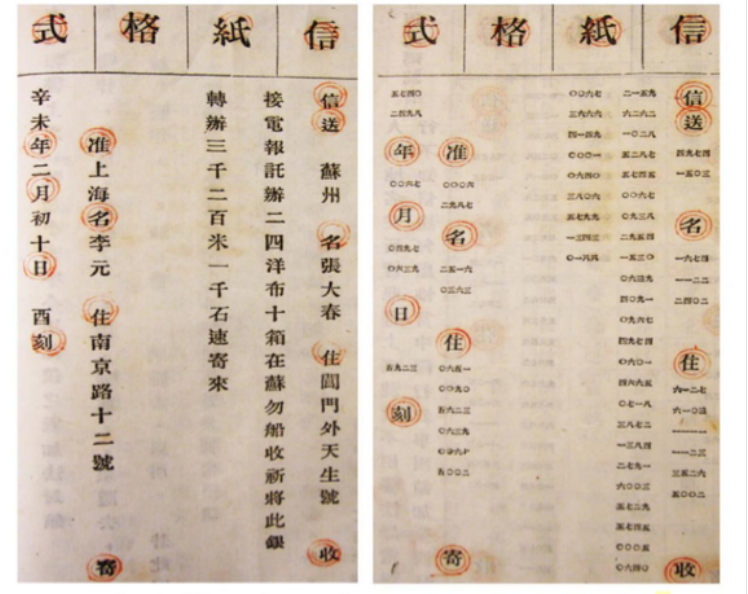

From: Shanghai To: Suzhou
Message: instead of cotton cloth, purchase 3200 *shi* rice and ship quickly

Figure A 1. Original Telegram Transmitting Commercial Information

Notes: This figure presents the original telegram transmitting commercial information on grain trade (Tsu and Elman, 2014). The right panel shows a series of four-digit codes used to transmit the telegram message, and the left panel depicts the message deciphered from the codes. The fact that code for rice existed even in the earliest version of the telegraph codebook suggests that there might have been a high volume of telegrams exchanged about rice, including those between businessmen. The telegram was sent from Mr. Li in Shanghai to Mr. Zhang, who was handling a business called Tiansheng Hao in Suzhou, which was at the time the most important grain market in southern China. The message was, "instead of cotton cloth, purchase 3200 *shi* rice and ship quickly." It is possible that there was a sudden surge in rice prices in Shanghai, and Mr. Li responded by immediately sending a telegram to his supplier in Suzhou to secure a bulk order for rice.

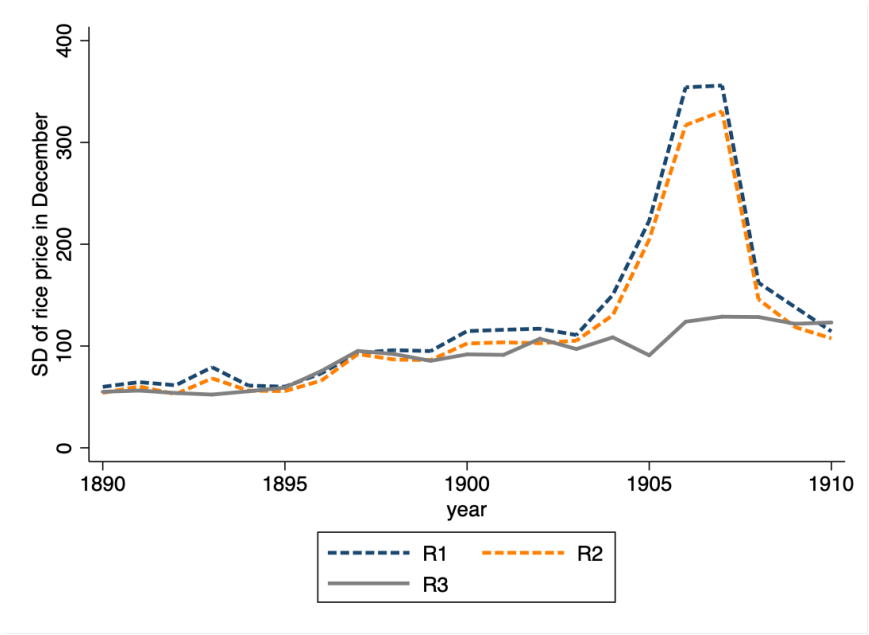

Figure A 2. The Variation of Price across Prefectures between 1890 and 1911

Notes: This figure presents the standard deviation of the maximum price for rice of all three grades from 1890 to 1904. The volatility of price for R1 and R2 (high and medium-quality rice), which are considered the commonly traded grains, increased substantially after 1904. Such structural change in rice prices could be caused by political chaos at that time. Qing government also started to employ the wireless telegraph system. Therefore, we restrict our sample between 1870 and 1904, which begins ten years before the first domestic telegraph line was introduced in China and ends before the adoption of the wireless telegraph system.

Table A 1: Telegraph-Connection Year and Prefecture Characteristics

	(1)	(2)	(3)	(4)	(5)
Dep. Var.	Telegraph-connection year				
Average max price (R1)		-0.0037			
		(0.0130)			
Average price spikes (R1)			9.230		
			(44.03)		
Average max price (R2)				-0.0030	
				(0.0139)	
Average price spikes (R2)					-16.57
					(44.75)
Average floods	-14.14	-13.70	-14.85	-13.82	-13.03
	(8.845)	(9.121)	(10.04)	(9.049)	(9.740)
Average droughts	-14.05	-14.07	-13.82	-14.15	-14.37
	(11.69)	(11.74)	(11.72)	(11.75)	(11.72)
Railway access	2.362	2.366	2.382	2.368	2.283
	(2.647)	(2.631)	(2.646)	(2.640)	(2.680)
Treaty port	-8.071	-7.978	-8.176	-7.990	-7.887
	(1.929)	(1.976)	(1.962)	(1.973)	(1.974)
Longitude	-0.122	-0.117	-0.0995	-0.118	-0.159
	(0.221)	(0.220)	(0.264)	(0.220)	(0.263)
Latitude	0.141	0.160	0.123	0.155	0.171
	(0.380)	(0.391)	(0.399)	(0.391)	(0.400)
Ln terrain ruggedness	1.691	1.729	1.676	1.724	1.722
	(1.230)	(1.262)	(1.239)	(1.264)	(1.238)
High soil suitability for rice	-0.0975	-0.0882	-0.102	-0.0902	-0.0909
	(0.109)	(0.119)	(0.113)	(0.119)	(0.113)
Ln river density	1.783	1.774	1.803	1.772	1.748
	(1.135)	(1.142)	(1.150)	(1.144)	(1.153)
Coastal access	-0.0902	0.0101	-0.0762	-0.0255	-0.0939
	(3.060)	(3.102)	(3.071)	(3.100)	(3.074)
Observations	130	130	130	130	130
R-squared	0.335	0.335	0.335	0.335	0.336

Notes: This table shows the associations between a list of prefecture-specific features and the year in which telegraph connection starts. Those prefectures without telegraph access during the sample period are assumed to access to the telegraph in 1905. Robust standard errors are in the parentheses.

Table A 2: Robustness – Assumptions on Telegraph Connection Time

Assumption:	(1)	(2)	(3)	(4)	(5)	(6)
The month of the telegraph's arrivial	March		September		December	
	High-quality Rice (R1)	Medium-quality Rice (R2)	High-quality Rice (R1)	Medium-quality Rice (R2)	High-quality Rice (R1)	Medium-quality Rice (R2)
Panel A: Outcome variable - Maximum Price						
Telegraph access	-11.690	-8.727	-11.720	-8.923	-11.450	-8.704
	(3.619)	(3.674)	(3.649)	(3.704)	(3.658)	(3.711)
Prefecture FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Province × Time	Y	Y	Y	Y	Y	Y
Time-invariant cont. × Time	Y	Y	Y	Y	Y	Y
Time-varying controls	Y	Y	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436	47,436	47,436
R-squared	0.815	0.802	0.815	0.802	0.815	0.802
Panel B: Outcome variable - Spikes of Maximum Price						
Telegraph access	-0.0070	-0.0082	-0.0054	-0.0066	-0.0048	-0.0063
	(0.0022)	(0.0024)	(0.0021)	(0.0024)	(0.0021)	(0.0024)
Prefecture FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Province × Time	Y	Y	Y	Y	Y	Y
Time-invariant cont. × Time	Y	Y	Y	Y	Y	Y
Time-varying controls	Y	Y	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436	47,436	47,436
R-squared	0.054	0.055	0.054	0.055	0.054	0.055

Notes: This table replicates the baseline results shown in Table 3 but assumes that the telegraph connection month to be March, September, and December instead. The dependent variable in Panel A is the maximum price; and the dependent variable in Panel B is the incidence of price spikes. $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 3: Robustness – Different Cut-offs to Define Price Spikes

Dep. Var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Price Spikes of High-quality Rice (R1)				Price Spikes of Medium-quality Rice (R2)			
	2 SD above the mean	2.25 SD above the mean	2.75 SD above the mean	3 SD above the mean	2 SD above the mean	2.25 SD above the mean	2.75 SD above the mean	3 SD above the mean
Telegraph access	-0.0055	-0.0058	-0.0065	-0.0063	-0.0059	-0.0071	-0.0083	-0.0071
	(0.0027)	(0.0024)	(0.0020)	(0.0020)	(0.0030)	(0.0026)	(0.0021)	(0.0021)
Prefecture FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Province×Time	Y	Y	Y	Y	Y	Y	Y	Y
Time-invariant cont. ×Time	Y	Y	Y	Y	Y	Y	Y	Y
Time-varying controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436	47,436	47,436	47,436	47,436
R-squared	0.0619	0.0584	0.0512	0.0489	0.0628	0.0583	0.0512	0.0492

Notes: This table shows the effect of telegraph access in mitigating the incidence of price spikes defined with different cutoff. In Table 3, we define price spikes as those month-over-month growth rates more than 2.5 standard deviations than the mean, and in this table, we change the cutoff to be 2, 2.25, 2.75, and 3 standard deviations higher than the mean respectively. Columns (1) - (4) report the results on high-quality R1 rice, and Columns (5) - (8) report the results for medium-quality R2 rice. The regressor $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 4: Robustness – Spatial Clustered Standard Errors

Dep. Var.	(1)	(2)	(3)	(4)
	Panel A: Maximum price		Panel B: Spikes of max price	
	High-quality Rice (R1)	Medium-quality Rice (R2)	High-quality Rice (R1)	Medium-quality Rice (R2)
Telegraph access	-11.95	-9.041	-0.0066	-0.0080
	(3.298)	(3.315)	(0.0023)	(0.0025)
Prefecture FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Province×Time	Y	Y	Y	Y
Time-invariant cont. × Time	Y	Y	Y	Y
Time-varying controls	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436
R-squared	0.273	0.275	0.00220	0.00244

Notes: This table replicates the baseline results shown in Table 3 but adjusts the standard errors to reflect spatial dependence as modeled in Conley (1999) and Conley (2008). Spatial autocorrelation is assumed to linearly decrease with distance up to a cut-off of 500 km. Distances are computed from prefecture centroids. The regressor $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. Spatial HAC errors in parentheses are clustered at the prefectural level.

Table A 5: The Effect of Telegraph Access on Extreme Price of Soya Bean

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Panel A: Maximum price			Panel B: Price Spikes		
Telegraph access	-15.78	-17.25	-17.54	-0.0043	-0.0040	-0.0057
	(5.391)	(4.668)	(4.834)	(0.0029)	(0.0028)	(0.0028)
Prefecture FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Province × Time	Y	Y	Y	Y	Y	Y
Time-invariant cont. × Time		Y	Y		Y	Y
Time-varying controls			Y			Y
No. of Obs.	20,014	20,014	20,014	20,014	20,014	20,014
R-squared	0.679	0.682	0.683	0.048	0.048	0.049

Notes: This table shows the effect of telegraph access on attenuating extreme price of soya bean. The dependent variable in Panel A is the maximum price; and the dependent variable in panel B is the incidence of price spikes. The regressor $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. The basic specification includes prefecture FE, time FE and provincial time trend in columns (1) and (4). In columns (2) and (5) we allow the time-invariant prefectural characteristics X_i (i.e. longitude, latitude, river density, ruggedness, rice yield potential index and coastal access) to vary over time by interacting them with the time trend; and in columns (3) and (6) we add a vector of the time-varying prefecture characteristics, Z_{ijt} (i.e. yearly extreme weather index, railway access dummy and treaty port status). Standard errors in parentheses are clustered at the prefectural level.

Table A 6: The Effect of Telegraph Access on Extreme Price of Low-quality Rice

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A:			Panel B:		
Dep. Var.	Maximum price			Spikes of maximum price		
Telegraph access	-4.219	-5.289	-5.640	-0.0011	-0.0010	-0.0012
	(3.594)	(3.789)	(3.709)	(0.0032)	(0.0030)	(0.0029)
Prefecture FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Province × Time	Y	Y	Y	Y	Y	Y
Time-invariant cont. × Time		Y	Y		Y	Y
Time-varying controls			Y			Y
No. of Obs.	41,682	41,682	41,682	41,682	41,682	41,682
R-squared	0.848	0.850	0.851	0.0634	0.0636	0.0638

Notes: This table shows the effect of telegraph access on the extreme price of low-quality rice (R3). The dependent variable in columns (1)-(3) is the maximum price; and the dependent variable in columns (4)-(6) is the incidence of price spikes. The regressor $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. The basic specification includes prefecture FE, time FE, and provincial time trend in columns (1) and (4). In columns (2) and (5) we allow the time-invariant prefectural characteristics X_i (i.e. longitude, latitude, river density, ruggedness, rice yield potential index and coastal access) to vary over time by interacting them with the time trend; and in columns (3) and (6) we add a vector of the time-varying prefecture characteristics, Z_{ijt} (i.e. yearly extreme weather index, railway access dummy, and treaty port status). Standard errors in parentheses are clustered at the prefectural level.

Table A 7: The Spillover Effect of Adopting the Telegraph

Grades of Rice:	(1)	(2)	(3)	(4)
	High-quality Rice (R1)		Medium-quality Rice (R2)	
Panel A: Outcome variable - Maximum Price				
Telegraph access	-11.620	-10.460	-8.767	-7.743
	(3.652)	(3.712)	(3.687)	(3.740)
Share of neighbors with telegraph	-9.123		-7.663	
	(6.458)		(6.605)	
Indicator for any neighbor with telegraph		-8.549		-7.462
		(3.330)		(3.146)
All baseline controls	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436
R-squared	0.815	0.815	0.802	0.802
Panel B: Outcome variable - Spikes of Maximum Price				
Telegraph access	-0.0066	-0.0066	-0.0078	-0.0077
	(0.0021)	(0.0021)	(0.0024)	(0.0023)
Share of neighbors with telegraph	-0.0003		-0.0063	
	(0.0045)		(0.0042)	
Indicator for any neighbor with telegraph		-0.0001		-0.0017
		(0.0031)		(0.0031)
All baseline controls	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436
R-squared	0.054	0.054	0.055	0.055

Notes: This table addresses the concern of spillover effect from neighboring prefectures that are connected with the telegraph. In Panel A the dependent variable is the maximum price; and in Panel B the dependent variable is the incidence of price spikes. $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. *Share of neighbors with telegraph* is defined as the share of neighboring prefectures that adopted the telegraph in a given year. *Any neighbor with telegraph* is an indicator that a prefecture has a neighboring prefecture with access to the telegraph. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 8: The Effect of Telegraph Connection and the Scale of Network

Dep. Var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Maximum price				Spikes of Maximum Price			
	High-quality Rice (R1)		Medium-quality Rice (R2)		High-quality Rice (R1)		Medium-quality Rice (R2)	
Panel A: Scale of Network I - the Number of Other Prefectures with Telegraph Access								
Telegraph access	-11.65	-18.91	-11.01	-20.10	-0.0130	-0.0014	-0.0139	-0.0050
	(5.295)	(8.282)	(5.178)	(7.920)	(0.0078)	(0.0078)	(0.0077)	(0.0074)
Tele × Scale of network I		0.0786		0.0983		-0.000125		-0.000096
		(0.0880)		(0.0847)		(0.000052)		(0.000056)
Scale of network I	0.314	0.475	-2.056	-1.854	-0.0067	-0.0070	-0.0062	-0.0064
	(4.943)	(5.017)	(4.892)	(4.973)	(0.0082)	(0.0081)	(0.0080)	(0.0080)
All baseline controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436	47,436	47,436	47,436	47,436
R-squared	0.815	0.815	0.802	0.802	0.0541	0.0542	0.0550	0.0551
Panel B: Scale of Network II - the Number of Other Prefectures with Telegraph Access (Relatice price adjusted)								
Telegraph access	-12.05	-14.59	-9.106	-11.29	-0.00659	0.0084	-0.0080	0.0045
	(3.625)	(4.034)	(3.689)	(4.233)	(0.0022)	(0.0055)	(0.0025)	(0.0066)
Tele × Scale of network II		-0.0922		-0.0754		-0.0057		-0.0048
		(0.0397)		(0.0371)		(0.0020)		(0.0022)
Scale of network II	0.0311	0.0630	0.0259	0.0507	-0.0348	-0.0438	-0.0433	-0.0508
	(0.0373)	(0.0413)	(0.0425)	(0.0489)	(0.0224)	(0.0223)	(0.0196)	(0.0200)
All baseline controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436	47,436	47,436	47,436	47,436
R-squared	0.815	0.815	0.802	0.803	0.0542	0.0543	0.0552	0.0553

Notes: This table shows whether the telegraph's effect depends on the scale of the telegraph network. In Panel A, the size of the network is simply measured by the number of other prefectures with telegraph connection, and in Panel B the measurement is adjusted by a given market's price position relative to other connected regions in the network. $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 9: Robustness for Shocks Near and Far – Assume Distance Elasticity as -1.5

Grades of Rices	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Outcome variable - Maximum price				Panel B: Outcome variable - Spikes of Max Prices			
	High-quality Rice (R1)		Medium-quality Rice (R2)		High-quality Rice (R1)		Medium-quality Rice (R2)	
Telegraph access	-11.94	-23.25	-9.040	-20.96	-0.0064	-0.0106	-0.0078	-0.0132
	(3.618)	(5.876)	(3.677)	(5.655)	(0.0021)	(0.0051)	(0.0024)	(0.0053)
Local flood	2.902	4.668	2.756	4.426	0.0039	0.0061	0.0046	0.0068
	(1.552)	(1.805)	(1.494)	(1.739)	(0.0021)	(0.0023)	(0.0019)	(0.0021)
Local drought	2.203	3.468	2.589	3.810	0.0067	0.0088	0.0059	0.0069
	(1.356)	(1.545)	(1.318)	(1.508)	(0.0024)	(0.0025)	(0.0024)	(0.0027)
Tele × Local flood		-6.468		-5.959		-0.0092		-0.0093
		(3.161)		(3.105)		(0.0041)		(0.0044)
Tele × Local drought		-7.054		-6.950		-0.0097		-0.0052
		(3.169)		(3.104)		(0.0052)		(0.0050)
Floods in other connected regions	21.30	12.76	21.41	13.19	0.0245	0.0174	0.0161	0.0095
	(7.806)	(8.341)	(8.124)	(8.889)	(0.0073)	(0.0082)	(0.0070)	(0.0080)
Droughts in other connected regions	2.808	-3.284	2.390	-4.473	0.0147	0.0136	0.0144	0.0124
	(6.955)	(7.283)	(7.428)	(7.568)	(0.0088)	(0.0090)	(0.0084)	(0.0085)
Tele × Floods in other connected regions		31.65		31.00		0.0254		0.0256
		(10.67)		(10.70)		(0.0129)		(0.0123)
Tele × Droughts in other connected regions		28.52		30.96		0.0128		0.0127
		(12.14)		(11.83)		(0.0122)		(0.0115)
All baseline controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436	47,436	47,436	47,436	47,436
R-squared	0.815	0.816	0.803	0.804	0.054	0.055	0.055	0.055

Note: This table presents a robustness check showing that with different distance elasticity assumed, the results of Table 5 remain consistent. We replicate the specification in Table 5 but set the distance elasticity of trade to -1.5. In Panel A the dependent variable is the maximum price; and in Panel B the dependent variable is the incidence of price spikes. *Telegraph access*$_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. *Local flood/drought*$_{i,t}$ is a dummy variable indicating whether the extreme flood/drought occurred in a given prefecture. *Flood/drought in other telegraph-connected regions* are constructed by taking a sum of the indicator for weather shocks in other telegraph-connected prefectures, weighted by the (inverse) bilateral distance. We set the distance elasticity of trade to -1.5. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 10: Placebo – Shocks In Regions with No Telegraph Access

Grades of Rices	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Outcome variable - Maximum price				Panel B: Outcome variable - Price Spikes of Max Prices			
	High-quality Rice (R1)		Medium-quality Rice (R2)		High-quality Rice (R1)		Medium-quality Rice (R2)	
Telegraph access	-11.88	-17.27	-8.999	-13.91	-0.0063	-0.0125	-0.0078	-0.0163
	(3.607)	(6.162)	(3.666)	(5.903)	(0.0022)	(0.0049)	(0.0024)	(0.0046)
Floods in other regions without telegraph	1.537	1.266	1.034	1.047	-0.0011	-0.0030	-0.0028	-0.0045
	(4.139)	(4.118)	(4.094)	(4.091)	(0.0043)	(0.0045)	(0.0037)	(0.0037)
Droughts in other regions without telegraph	5.460	4.503	4.398	3.629	-0.0041	-0.0073	-0.0057	-0.0081
	(3.300)	(3.384)	(3.058)	(3.171)	(0.0045)	(0.0047)	(0.0045)	(0.0047)
Tele × Floods in other regions without telegraph		-16.26		-24.15		0.0269		0.0201
		(16.34)		(15.49)		(0.0202)		(0.0212)
Tele × Droughts in other regions without telegraph		-24.46		-30.13		0.0141		0.0380
		(26.21)		(25.78)		(0.0213)		(0.0235)
Local droughts/ floods	Y	Y	Y	Y	Y	Y	Y	Y
Local droughts/ floods × Telegraph		Y		Y		Y		Y
Droughts/Floods in other connected regions	Y	Y	Y	Y	Y	Y	Y	Y
Droughts/Floods in other connected regions × Telegraph		Y		Y		Y		Y
All baseline controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436	47,436	47,436	47,436	47,436
R-squared	0.815	0.816	0.803	0.804	0.054	0.055	0.055	0.056

Notes: This table performs a placebo test to see whether the telegraph's arrival makes local price respond to extreme weather shocks in distant regions that had no telegraph access. In Panel A the dependent variable is the maximum price; and in Panel B the dependent variable is the incidence of price spikes. *Telegraph access*$_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. *Local flood/drought*$_{i,t}$ is a dummy variable indicating whether the extreme flood/drought occurred in a given prefecture. *Flood/drought in other telegraph-connected regions* are constructed by taking a sum of the indicator for weather shocks in other telegraph-connected prefectures, weighted by the (inverse) bilateral distance. *Flood/drought in other regions without the telegraph* measure weather shocks in prefectures without telegraph access. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 11: Robustness for Shocks Near and Far – Excluding Prefectures with Disaster Relief

Grades of Rices	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Outcome variable - Maximum price				Panel B: Outcome variable - Spikes of Max Prices			
	High-quality Rice (R1)		Medium-quality Rice (R2)		High-quality Rice (R1)		Medium-quality Rice (R2)	
Telegraph access	-12.19	-18.42	-9.304	-16.13	-0.0056	-0.0077	-0.0062	-0.0102
	(3.565)	(5.240)	(3.604)	(5.107)	(0.0022)	(0.0043)	(0.0024)	(0.0045)
Local flood	2.522	4.230	2.335	3.971	0.00386	0.0058	0.0042	0.0062
	(1.618)	(1.855)	(1.572)	(1.798)	(0.0022)	(0.0024)	(0.0021)	(0.0022)
Local drought	1.835	3.244	2.235	3.620	0.0066	0.0094	0.0056	0.0072
	(1.320)	(1.530)	(1.289)	(1.491)	(0.0024)	(0.0026)	(0.00243)	(0.0027)
Tele × Local flood		-6.824		-6.382		-0.00807		-0.0081
		(3.257)		(3.218)		(0.0042)		(0.0045)
Tele × Local drought		-7.758		-7.894		-0.0133		-0.0084
		(3.404)		(3.330)		(0.0056)		(0.0052)
Floods in other connected regions	27.50	13.34	28.59	15.15	0.0277	0.0161	0.0172	0.0050
	(12.30)	(12.68)	(12.68)	(13.31)	(0.0119)	(0.0128)	(0.0115)	(0.0124)
Droughts in other connected regions	-10.32	-19.61	-8.835	-19.69	0.0187	0.0129	0.0200	0.0131
	(9.794)	(10.48)	(10.40)	(10.36)	(0.0152)	(0.0146)	(0.0146)	(0.0141)
Tele × Floods in other connected regions		54.92		53.47		0.0435		0.0483
		(23.36)		(23.63)		(0.0239)		(0.0238)
Tele × Droughts in other connected regions		50.23		57.02		0.0409		0.0403
		(24.44)		(24.03)		(0.0270)		(0.0253)
All baseline controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	45,509	45,509	45,509	45,509	45,509	45,509	45,509	45,509
R-squared	0.819	0.819	0.806	0.807	0.055	0.056	0.056	0.057

Notes: This table shows that more effective government interventions did not drive the telegraph's mitigating effect. To do so, we replicate the specification in Table 5 but excludes prefectures with state-operated disaster relief. In panel A the dependent variable is the maximum price; and in Panel B the dependent variable is the incidence of price spikes. *Telegraph access*$_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. *Local flood/drought*$_{i,t}$ is a dummy variable indicating whether the extreme flood/drought occurred in a given prefecture. *Flood/drought in other telegraph-connected regions* are constructed by taking a sum of the indicator for weather shocks in other telegraph-connected prefectures, weighted by the (inverse) bilateral distance. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 12: Robustness – The Effect of Telegraph on Price Volatility

	(1)	(2)	(3)	(4)
Grades of Rice:	High-quality Rice (R1)		Medium-quality Rice (R2)	
Panel A: Subsample-excluding prefectures without telegraph before 1904				
Telegraph access	0.0153	0.0385	0.0151	0.0352
	(0.00401)	(0.0117)	(0.00431)	(0.0146)
Tele × Past volatility	-0.411		-0.403	
	(0.0945)		(0.106)	
Tele × Past weather-induced volatility		-1.120		-1.117
		(0.362)		(0.484)
All baseline controls	Y	Y	Y	Y
Observations	1848	1848	1848	1848
R-squared	0.384	0.379	0.359	0.354
Panel B: Similar to Panel A but also excluding major destinations of telegraph lines				
Telegraph access	0.0149	0.0369	0.0139	0.0317
	(0.00415)	(0.0118)	(0.00436)	(0.0146)
Tele × Past volatility	-0.403		-0.365	
	(0.101)		(0.114)	
Tele × Past weather-induced volatility		-1.058		-0.982
		(0.365)		(0.489)
All baseline controls	Y	Y	Y	Y
Observations	1,621	1,621	1,621	1,621
R-squared	0.379	0.375	0.359	0.355
Panel C: Subsample-excluding treaty ports and its neighboring prefectures				
Telegraph access	0.0035	-0.0046	0.0064	0.0189
	(0.0033)	(0.0096)	(0.0038)	(0.0195)
Tele × Past volatility	-0.0893		-0.146	
	(0.130)		(0.133)	
Tele × Past weather-induced volatility		0.214		-0.534
		(0.340)		(0.663)
All baseline controls	Y	Y	Y	Y
Observations	2,062	2,062	2,062	2,062
R-squared	0.405	0.405	0.400	0.400
Panel D: Change RHS to state-owned telegraph				
Public Telegraph	0.0116	0.0274	0.0123	0.0242
	(0.00323)	(0.00932)	(0.00341)	(0.0129)
Tele × Past volatility	-0.419		-0.414	
	(0.0943)		(0.0943)	
Tele × Past weather-induced volatility		-0.889		-0.829
		(0.304)		(0.434)
All baseline controls	Y	Y	Y	Y
Observations	3,529	3,529	3,529	3,529
R-squared	0.362	0.359	0.353	0.350

Notes: This table presents four robustness checks to address the potential selection bias of regions with the telegraph connection. The dependent variable is the volatility of the monthly maximum price. Panel A repeats the same exercise as the baseline in Table 3 in a subsample that only includes prefectures that had adopted the telegraph before 1904. Panel B excludes both prefectures that never adopted the telegraph and provincial capitals from our sample. Panel C performs another sub-sample analysis by excluding the treaty ports along with their bordered prefectures from our sample. Panel D changes the treatment variable to a dummy variable indicating whether a prefecture had state-owned telegraph lines. In columns (1)-(2), the dependent variable is the maximum price, and in columns (3)-(4), the dependent variable is price spikes. The controls are the same as in column (3), as in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 13: Robustness – The Spillover Effect of Telegraph on Price Volatility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	Volatility of Maximum Price							
	High-quality Rice (R1)				Medium-quality Rice (R2)			
Telegraph access	0.0125	0.0276	0.0121	0.0272	0.0129	0.0266	0.0126	0.0265
	(0.0029)	(0.0098)	(0.0029)	(0.0097)	(0.0031)	(0.0119)	(0.0031)	(0.0118)
Tele × Past volatility	-0.435		-0.431		-0.414		-0.416	
	(0.0767)		(0.0781)		(0.0794)		(0.0800)	
Tele × Past weather-induced volatility		-0.881		-0.874		-0.895		-0.903
		(0.317)		(0.316)		(0.398)		(0.397)
Share of neighbors with telegraph	0.00304	0.00214			0.0012	0.0003		
	(0.0038)	(0.0040)			(0.0037)	(0.0038)		
Indicator for any neighbor with telegraph			0.0009	0.0007			0.0019	0.0015
			(0.0022)	(0.0022)			(0.0023)	(0.0023)
All baseline controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	3,529	3,529	3,529	3,529	3,529	3,529	3,529	3,529
R-squared	0.365	0.359	0.364	0.359	0.355	0.350	0.355	0.350

Notes: This table addresses the concern of spillover effect from neighboring prefectures that are connected with the telegraph. The dependent variable is the volatility of the monthly maximum price. $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. *Share of neighbors with telegraph* is defined as the share of neighboring prefectures that adopted the telegraph in a given year. *Any neighbor with telegraph* is an indicator that a prefecture has a neighboring prefecture with access to the telegraph. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.

Table A 14: Telegraph v.s. Railway Connection

Dep. Var.	(1)	(2)	(3)	(4)
	Maximum price		Spikes of max price	
	High-quality Rice (R1)	Medium-quality Rice (R2)	High-quality Rice (R1)	Medium-quality Rice (R2)
Telegraph access	-11.98	-9.054	-0.0066	-0.0081
	(3.644)	(3.698)	(0.0021)	(0.0024)
Tele × Raiway access	6.765	2.537	0.0122	0.0154
	(9.399)	(9.243)	(0.0045)	(0.0056)
Railway access	-5.262	0.503	-0.0100	-0.0140
	(14.77)	(14.72)	(0.0038)	(0.0054)
All baseline controls	Y	Y	Y	Y
Observations	47,436	47,436	47,436	47,436
R-squared	0.815	0.802	0.0541	0.0550

Notes: This table shows whether the effect of telegraph access depends on the railroad connection. In Panel A the dependent variable is the maximum price; and in Panel B the dependent variable is the incidence of price spikes. $Telegraph\ access_{it}$ is a binary variable that takes the value of one from the month of the arrival of the telegraph onwards. *Railway* is a dummy variable indicating whether a prefecture has access to the railway in a given year. The controls are the same as in column (3) in Table 3. Standard errors in parentheses are clustered at the prefectural level.