The Effect of Natural Disasters on Economic Activity in US Counties: A Century of Data

Web Appendix

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Appendix Table 1: Descriptive Statistics by Disaster Occurrence in Decade, 1930-2010

	Difference Severe – Non-severe		Severe disaster	No severe disasters	No disasters
Geographic					
Max elevation in county	-838	(43.2)	1,572	2,410	2,897
Number lakes in county	-3.998	(0.896)	18.21	22.213	21.66
Number beaches in county	0.468	(0.06)	0.906	0.438	0.287
Dustbowl area	-0.012	(0.00168)	0.003	0.015	0.027
Time-varying					
Good weather index	0.166	(0.0125)	-6.520	-6.686	-6.694
Population	35,635	(4277)	99,462	63,826	37,320
Poverty rate	-0.00423	(0.00158)	0.163	0.167	0.175
Median house value	5,074	(574)	50,714	45,640	37,257
Housing stock (units)	15,084	(2314)	47,329	32,245	18,736
Exp. employment growth rate, 1930 weights	-0.0085	(0.00201)	0.042	0.05	0.032

Notes: Housing values and poverty rates are from NHGIS. Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. A disaster qualifies as "severe" if it was associated with 25 or more deaths. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930. Good weather index computed with data available from NOAA as: county-specific average daily temperature in the winter of year 2000 divided by its cross-county standard deviation, minus county-specific average daily temperature in the summer of year 2000 divided by its cross-county standard deviation. Standard errors from simple mean-tests are shown in parentheses.

Appendix Table 2: Summary Statistics for the US 1930–2010

	Mean	Std.Dev.	N
Population	62,713	219,101	24,432
Migration rate	-0.0119	0.198	24,432
Exp. employment growth rate, 1930 weights	0.0418	0.125	24,408
Exp. employment growth rate, 1970 weights	0.285	0.228	24,336
Median family income (dollars)	22,139	20,576	15,270
Poverty rate	0.168	0.0835	15,222
Housing stock (units)	32,911	104,239	15,270
Median house value (dollars)	44,781	27,447	15,164
Median house rent (dollars)	184	75	15,162
Log population	10.151	1.379	15,268
Log family income	9.876	0.402	15,270
Log housing stock	9.291	1.331	15,270
Log median house value	10.6	0.470	15,164
Log median house rent	5.1	0.413	15,162

Notes: All variables are at the county-by-decade level. Expected employment growth rates are a Bartik measure, computed using equation (2). House rents, house values, and family income are measured in Census years from 1970 to 2010 and expressed in 1982-84 dollars.

Appendix Table 3: Effect of Disasters on Migration Rates in 1940-2010 by Disaster Type and Severity, Excluding Time-Varying Controls

	(1) Migration rate	(2) Migration rate	(3) Migration rate	(4) Migration rate
Severe disaster	-0.015***	-0.014**	-0.015***	-0.003
	(0.005)	(0.005)	(0.005)	(0.006)
Flood count	0.006**	0.008***	0.006**	0.005**
	(0.002)	(0.003)	(0.002)	(0.002)
Storm count	-0.001	-0.002	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Tornado count	-0.002	-0.002	-0.002	-0.008**
	(0.003)	(0.003)	(0.003)	(0.003)
Hurricane count	-0.008**	-0.008**	-0.008**	-0.006*
	(0.004)	(0.004)	(0.004)	(0.003)
Fire count	-0.013**	-0.013**	-0.013**	-0.013***
	(0.005)	(0.005)	(0.005)	(0.005)
Other disasters count	-0.029	-0.032	-0.028	-0.055**
	(0.025)	(0.025)	(0.025)	(0.022)
Exp. employment growth rate	0.267***		0.273***	0.317***
	(0.033)		(0.032)	(0.034)
County FE	Y	Y	Y	Y
Decade FE	Y	Y	Y	Y
State FE * time	Y	Y	Y	N
1930 population * time	Y	Y	N	Y
Observations	24,408	24,432	24,408	24,408

The reported regression of equation (1) is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930. Conley Standard errors using a distance threshold of 1,000 km and a time lag of 10 decades.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 4: Effect of Disasters on County-Level Net In-Migration Rate by Disaster Type and Severity in 1940–2010, Using State-Clustered Standard Errors

	(1) Migration rate
Severe disaster = 1	-0.015***
	(0.005)
Flood count	0.006**
	(0.003)
Winter storm count	-0.001
	(0.002)
Tornado count	-0.002
	(0.004)
Hurricane count	-0.008
	(0.008)
Fire count	-0.013*
	(0.006)
Other disasters count	-0.029
	(0.030)
Employment growth rate	0.267***
	(0.028)
County FE	Y
Decade FE	Y
State FE * time trend	Y
1930s population * time trend	Y
Observations	24,408

Notes: The reported regression of equation (1) is at the county-by-decade level. Net in-migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930. Standard errors are clustered by state.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 5: Effect of Disasters on Migration Rates in 1940-2010 with County-Specific Trends

	Migration rate
Severe disaster = 1	-0.016***
	(0.006)
Flood count	0.004
	(0.003)
Winter storm count	-0.002
	(0.002)
Tornado count	-0.003
	(0.003)
Hurricane count	-0.009**
	(0.004)
Fire count	-0.015***
	(0.006)
Other disasters count	-0.037
	(0.026)
Exp. employment growth rate, 1930 weights	0.177***
	(0.034)
County FE	Y
Decade FE	Y
County FE * time trend	Y
1930's population * time trend	Y
Observations	24,408

Notes: The reported regression of equation (1) is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930. Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 6: Effect of Disasters on Migration Rates in 1940-2010, with Lags/Leads

	Migration rate
Severe disaster = 1	-0.016***
	(0.005)
Severe disaster (lag)	0.003
	(0.007)
Severe disaster (lead)	-0.006
	(0.006)
Flood count	0.006**
	(0.003)
Winter storm count	-0.006*
	(0.003)
Tornado count	-0.003
	(0.003)
Hurricane count	-0.009
	(0.007)
Fire count	-0.041***
	(0.014)
Other disasters count	-0.000
	(0.018)
Exp. employment growth rate, 1930 weights	0.290***
	(0.040)
County FE	Y
Decade FE	Y
State FE * time trend	Y
1930's population * time trend	Y
Observations	18,306

Notes: The reported regression of equation (1) is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930. Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 7: Effect of Disasters on Migration Rates in 1940-2010 After Controlling for FEMA Transfers

	(1) FEMA transfers per capita	(2) Migration rate
Severe disaster	1.212	-0.015***
	(2.818)	(0.005)
Flood count	-0.649	0.006**
	(1.040)	(0.002)
Storm count	3.131*	-0.001
	(1.680)	(0.002)
Tornado count	-0.990	-0.003
	(1.203)	(0.003)
Hurricane count	11.902**	-0.008**
	(5.241)	(0.004)
Fire count	-3.226	-0.013**
	(3.888)	(0.005)
Other disasters count	-38.737*	-0.029
	(22.259)	(0.025)
Exp. employment growth rate	-34.403***	0.267***
	(11.793)	(0.032)
FEMA transfers per capita (1982-84 dollars)	-	-0.000**
		(0.000)
County FE	Y	Y
Decade FE	Y	Y
State FE*time trend	Y	Y
1930's population*time trend	Y	Y
Observations	24,408	24,408

Notes: The reported regression of equation (1) is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. FEMA relief expenditures and obligations from Consolidated Federal Funds Reports are presented per capita in 1982-84 dollars. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930 (columns 1-4) and 1970 (columns 5-8). Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 8: Effect of Disasters on County-Level Migration by Disaster Type in 1940-2010, Regression at the SEA level

	Migration rate
Severe disaster = 1	-0.020**
	(0.009)
Flood count	0.006**
	(0.002)
Winter storm count	-0.001
	(0.002)
Tornado count	-0.011***
	(0.003)
Hurricane count	-0.015
	(0.012)
Fire count	-0.007*
	(0.004)
Other disasters count	0.001
	(0.030)
Employment growth rate	0.262***
	(0.060)
County FE	Y
Decade FE	Y
State FE * time trend	Y
1930s population * time trend	Y
Observations	2,527

Notes: The reported regression is at the SEA-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and incidence of severe disasters are obtained from merging data from the ARC, FEMA and EM-DAT. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. The employment growth rate is estimated (see equation 2); weights are based on county employment in 1930 by industry. Standard errors are clustered by state.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 9: Effect of Disasters on County-Level Migration by Disaster Type in 1940-2010, Weighted by County Population in 1930

	(1) Migration rate
Severe disaster = 1	-0.011 (0.009)
Flood count	0.008** (0.003)
Winter storm count	-0.003** (0.001)
Tornado count	-0.001 (0.003)
Hurricane count	-0.008** (0.004)
Fire count	-0.0002 (0.002)
Other disasters count	0.017 (0.026)
Exp. employment growth rate, 1930 weights	0.228*** (0.038)
County FE	Y
Decade FE	Y
State FE* time trend	Y
1930's population* time trend	Y
Observations	24,408

Notes: The reported regression is at the county-by-decade level. Counties are weighted by their population in 1930. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and incidence of severe disasters are obtained from merging data from the ARC, FEMA and EM-DAT. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. The employment growth rate is estimated (see equation 2); weights are based on county employment in 1930 by industry. Standard errors are clustered by state; our implementation of the Conley standard errors does not support weights.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 10: Effect of Disasters on Migration by Disaster Type in 1940-2010, Severe Disasters Redefined as Those with Highest Percent of Fatalities *in Decade*

	(1) Severe =Top 50%	(2) Severe =Top 10%
Severe disaster = 1	-0.015***	-0.017***
	(0.005)	(0.006)
Flood count	0.006**	0.005**
	(0.002)	(0.003)
Winter storm count	-0.001	-0.001
	(0.002)	(0.002)
Tornado count	-0.003	-0.004
	(0.003)	(0.003)
Hurricane count	-0.009**	-0.008*
	(0.004)	(0.004)
Fire count	-0.012**	-0.012**
	(0.005)	(0.005)
Other disasters count	-0.028	-0.029
	(0.025)	(0.025)
Employment growth rate	0.267***	0.267***
	(0.032)	(0.032)
County FE	Y	Y
Decade FE	Y	Y
State FE * time trend	Y	Y
1930s population * time trend	Y	Y
Observations	15,154	15,152

Notes: The reported regression is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and incidence of severe disasters are obtained from merging data from the ARC, FEMA and EM-DAT. In this specification, a disaster qualifies as "severe" if falls within the top 50 percent (column 1) or top 10 percent (column 2) of disaster-related fatalities in a given decade. The employment growth rate is estimated (see equation 2); weights are based on county employment in 1930 by industry. Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 11: Effect of Disasters on Migration Rates of People Aged 15–64 in 1940-2010

	Migration rate (15–64)
Severe disaster = 1	-0.017***
	(0.006)
Flood count	0.007**
	(0.003)
Winter storm count	-0.001
	(0.002)
Tornado count	-0.003
	(0.004)
Hurricane count	-0.009*
	(0.005)
Fire count	-0.014**
	(0.006)
Other disasters count	-0.032
	(0.027)
Exp. employment growth rate, 1930 weights	0.342***
	(0.041)
County FE	Y
Decade FE	Y
State FE * time trend	Y
1930's population * time trend	Y
Observations	24,408

Notes: The reported regression of equation (1) is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930. Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 12: Effect of Disasters on Migration Rates for Different Age Groups in 1940-2010

	Dependent Variable = Migration Rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	0-15	15-25	25-35	35-45	45-55	55-65	65-75
Severe disaster	-0.016***	-0.013*	-0.018**	-0.022***	-0.013**	-0.009**	-0.002
	(0.005)	(0.008)	(0.008)	(0.007)	(0.005)	(0.004)	(0.005)
Flood count	0.006***	0.001	0.013***	0.008**	0.004	0.003	0.002
	(0.002)	(0.004)	(0.004)	(0.003)	(0.002)	(0.002)	(0.002)
Storm count	-0.002	-0.001	-0.000	0.000	0.001	-0.002	-0.002*
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)
Tornado count	0.000	-0.006	-0.004	-0.003	-0.003	0.000	0.002
	(0.003)	(0.005)	(0.005)	(0.004)	(0.003)	(0.002)	(0.003)
Hurricane count	-0.007**	-0.005	-0.001	-0.013**	-0.009**	-0.012**	-0.012**
	(0.003)	(0.005)	(0.006)	(0.005)	(0.004)	(0.006)	(0.006)
Fire count	-0.008*	-0.008	-0.012	-0.020***	-0.017***	-0.016***	-0.018***
	(0.004)	(0.005)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)
Other count	-0.018	-0.024	-0.028	-0.035	-0.036	-0.043	-0.053
	(0.016)	(0.023)	(0.034)	(0.032)	(0.026)	(0.032)	(0.035)
Emp growth	0.199***	0.400***	0.513***	0.273***	0.203***	0.184***	0.141***
	(0.029)	(0.057)	(0.062)	(0.038)	(0.031)	(0.026)	(0.025)
County FE	Y	Y	Y	Y	Y	Y	Y
Decade FE	Y	Y	Y	Y	Y	Y	Y
State FE * time trend	Y	Y	Y	Y	Y	Y	Y
1930's population * time trend	Y	Y	Y	Y	Y	Y	Y
Observations	24,408	24,408	24,408	24,408	24,408	24,408	24,408

Notes: The reported regression of equation (1) is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930. Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 13: Effect of Disasters on Migration Rates in 1940-2010, Controlling for Population

	Migration rate
Severe disaster = 1	-0.013**
	(0.005)
Flood count	0.005*
	(0.002)
Winter storm count	-0.001
	(0.002)
Tornado count	-0.003
	(0.003)
Hurricane count	-0.008**
	(0.004)
Fire count	-0.002
	(0.008)
Other disasters count	-0.025
	(0.022)
Population at the start of the decade	-0.000***
	(0.000)
Exp. employment growth rate, 1930 weights	0.244***
	(0.031)
County FE	Y
Decade FE	Y
State FE * time trend	Y
1930's population * time trend	Y
Observations	24,408

Notes: The reported regression of equation (1) is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and severity are assembled from the ARC, FEMA and EM-DAT data. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. We control for population at the start of the decade. We estimate the employment growth rate from IPUMS data using industrial composition and national employment trends (see equation 2); weights are based on county employment by industry in 1930. Conley standard errors adjusted

for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 14: Effect of Disasters on Migration by Disaster Type in 1940-2010, Controlling for Dam Construction

	Migration rate
Severe disaster = 1	-0.015***
	(0.005)
Flood count	0.006**
	(0.002)
Winter storm count	-0.001
	(0.002)
Tornado count	-0.002
	(0.003)
Hurricane count	-0.008**
	(0.004)
Fire count	-0.013**
	(0.005)
Other disasters count	-0.028
	(0.025)
Exp. employment growth rate, 1930 weights	0.268***
	(0.033)
New dams constructed	0.00005***
	(0.00004)
County FE	Y
Decade FE	Y
State FE* time trend	Y
1930's population* time trend	Y
Observations	24,408

Notes: The reported regression is at the county-by-decade level (1930-2010). Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and incidence of severe disasters are obtained from merging data from the ARC, FEMA and EM-DAT. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. The employment growth rate is estimated (see equation 2); weights are based on county employment in 1930 by industry. Conley standard errors adjusted for spatial and temporal

correlation within 1,000 km and 10 decades (see Hsiang, 2010).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 15: Effect of Severe Disasters on Migration for Different Severity Thresholds in 1940-2010, with County-Specific Trends

Dependent variable = Migration rate

Fatality Threshold	Severe Disaster ==1	
	Coefficient	Standard Error
10	-0.012*	(0.006)
20	-0.016**	(0.007)
30	-0.014**	(0.007)
40	-0.018**	(0.007)
50	-0.017**	(0.008)
60	-0.015**	(0.008)
70	-0.017**	(0.008)
80	-0.018**	(0.008)
90	-0.019*	(0.01)
100	-0.021**	(0.01)
200	-0.018*	(0.011)
500	-0.053**	(0.022)

Notes: This table follows the format of Table 3, after adding county-specific trends. Each row corresponds to a separate regression. We report coefficients on the indicator for "severe" disasters, varying the threshold required for a disaster to qualify as severe. Disasters qualify as severe if the percent of the county population affected by the disaster equaled or exceeded the thresholds reported in column (1). All regressions include as controls counts of natural disasters by type, county and decade fixed effects, county-specific time trends and a 1930 population time trend. Standard errors are clustered by state.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 16: Effect of Disasters on County-Level Economic Activity in 1970-2010 for Different Severity Thresholds

Fatality Threshold	(1) Migration rate	(2) Population (log)	(3) House value (log med)	(4) House rent (log med)	(5) Housing stock (log)	(6) Family income (log med)	(7) Poverty rate
10	-0.009**	-0.006	-0.022**	-0.007	-0.010	-0.017	0.005**
	(0.004)	(0.009)	(0.011)	(0.007)	(0.010)	(0.012)	(0.002)
20	-0.013***	-0.008	-0.038***	-0.016*	-0.009	-0.018	0.007***
	(0.004)	(0.007)	(0.014)	(0.008)	(0.007)	(0.011)	(0.002)
30	-0.010**	-0.013	-0.053***	-0.026***	-0.013*	-0.024**	0.008***
	(0.005)	(0.008)	(0.012)	(0.008)	(0.008)	(0.012)	(0.002)
40	-0.012**	-0.004	-0.039***	-0.025***	-0.003	-0.023*	0.008***
	(0.005)	(0.009)	(0.014)	(0.008)	(0.008)	(0.012)	(0.002)
50	-0.014***	0.004	-0.042**	-0.021**	0.009	-0.028**	0.010***
	(0.005)	(0.010)	(0.017)	(0.009)	(0.010)	(0.013)	(0.002)
60	-0.015***	-0.000	-0.034**	-0.008	0.007	-0.020	0.007***
	(0.005)	(0.011)	(0.017)	(0.010)	(0.010)	(0.015)	(0.002)
70	-0.018***	-0.003	-0.036**	-0.009	0.005	-0.014	0.006***
	(0.005)	(0.010)	(0.017)	(0.010)	(0.010)	(0.014)	(0.002)
80	-0.018***	-0.002	-0.041**	-0.015	0.005	-0.020	0.008***
	(0.005)	(0.010)	(0.016)	(0.010)	(0.010)	(0.013)	(0.002)
90	-0.021***	-0.023***	-0.052***	-0.023*	-0.016*	-0.030**	0.009***
	(0.006)	(0.009)	(0.019)	(0.012)	(0.009)	(0.015)	(0.003)
100	-0.021***	-0.024***	-0.050**	-0.022*	-0.017*	-0.026*	0.009***
	(0.006)	(0.009)	(0.019)	(0.012)	(0.009)	(0.015)	(0.003)
200	-0.017**	-0.017*	-0.027	-0.016	-0.012	-0.019	0.008***
	(0.006)	(0.010)	(0.020)	(0.013)	(0.010)	(0.014)	(0.003)
500	-0.029*	-0.027	-0.120***	-0.110***	-0.038	-0.159***	0.034***
	(0.016)	(0.031)	(0.034)	(0.032)	(0.030)	(0.037)	(0.008)

Notes: Each row corresponds to a separate regression that follows the format of Table 2. We report coefficients on the indicator for "severe" disasters, varying the threshold required for a disaster to qualify as severe. Disasters qualify as severe if they exceeded the number of fatalities reported in column (1). All regressions include counts of natural disasters by type, county and decade fixed effects, state-specific time trends and a population time trend (using 1930's baseline values). Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 17: Effect of Disasters on Migration in 1940-2010, by Political Alignment

	Migration rate	
	Coefficient	Standard Error
Severe disaster = 1	-0.014*	(0.008)
Severe disaster = 1, same party	-0.002	(0.009)
Flood count	0.005	(0.003)
Flood count, same party	0.001	(0.004)
Winter storm count	-0.001	(0.002)
Winter storm count, same party	-0.000	(0.002)
Tornado count	-0.004	(0.006)
Tornado count, same party	0.003	(0.008)
Hurricane count	0.002	(0.004)
Hurricane count, same party	-0.016**	(0.007)
Fire count	-0.014**	(0.006)
Fire count, same party	0.003	(0.008)
Other disasters count	-0.038	(0.024)
Other count, same party	0.018	(0.034)
Exp. employment growth rate, 1930 weights	0.268***	(0.032)
Same party	0.004	(0.008)
County FE	Y	
Decade FE	Y	
State FE * time trend	Y	
1930s population * time trend	Y	
Observations	24,408	

Note: The reported regression is at the county-by-decade level. Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and incidence of severe disasters are obtained from merging data from the ARC, FEMA and EM-DAT. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. We interact each disaster variable with an indicator for whether the state's governor belongs to the same party as the President. The employment growth rate is estimated (see equation 2); weights are based on county employment in 1930 by industry. Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 18: IV Effect of Disasters on Migration in 1940-2010, for Different Severity Thresholds

Dependent variable = Migration rate

	IV			OLS	
Fatality Threshold	Coefficients	Standard Errors	F	Coefficients	Standard Errors
10	-0.054	(0.043)	10.7	-0.012**	(0.005)
20	-0.064	(0.052)	6.47	-0.018***	(0.006)
30	-0.041	(0.049)	6.86	-0.018***	(0.006)
40	-0.056	(0.050)	6.82	-0.021***	(0.007)
50	-0.082	(0.065)	5.47	-0.020***	(0.007)
60	-0.128	(0.080)	4.9	-0.021**	(0.008)
70	-0.127	(0.081)	5.01	-0.021**	(0.009)
80	-0.153	(0.094)	4.3	-0.021**	(0.009)
90	-0.135	(0.121)	2.16	-0.021*	(0.011)
100	-0.177	(0.138)	1.97	-0.021*	(0.011)
200	0.112	(0.182)	2.4	-0.018	(0.013)
500	0.758	(0.506)	1.61	-0.040	(0.028)

Notes: Each row corresponds to a separate regression. We report coefficients on the indicator for "severe" disasters for an IV specification and the corresponding OLS that follows Table 2 but omits the disaster counts by type. In each row we vary the threshold required for a disaster to qualify as severe. Disasters qualify as severe if they equaled or exceeded the number of fatalities reported in column (1). The instruments for "severe" disasters are the maximum and minimum daily temperatures recorded in the year and total annual precipitation averaged out across the decade. All regressions include counts of natural disasters by type, county and decade fixed effects, state-specific time trends and a population time trend (using 1930's baseline values). Standard errors are clustered by state.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

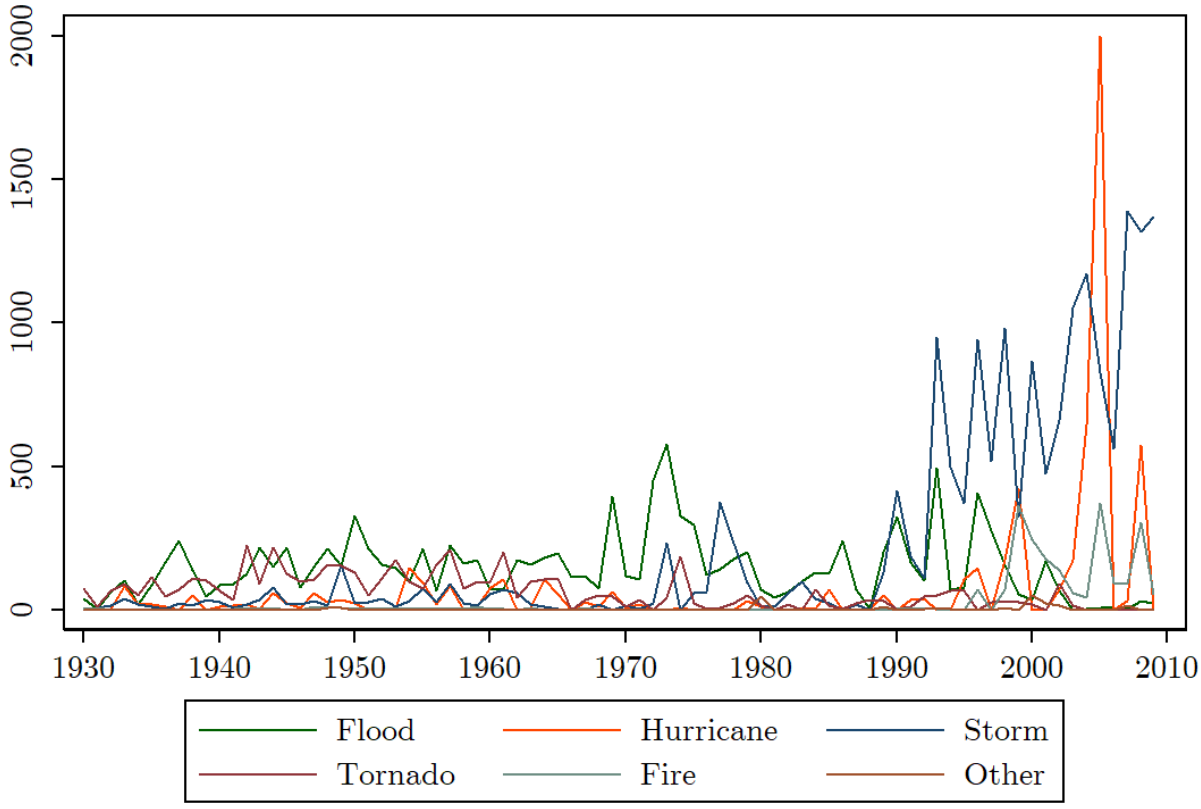
Appendix Table 19: Effect of Disasters on County-Level Migration by Disaster Type in 1940-2010, Including Droughts

	Migration rate
Severe disaster = 1	-0.014***
	(0.005)
Flood count	0.006**
	(0.002)
Drought count	0.018*
	(0.01)
Winter storm count	-0.001
	(0.002)
Tornado count	-0.002
	(0.003)
Hurricane count	-0.008**
	(0.004)
Fire count	-0.013**
	(0.005)
Other disasters count	-0.029
	(0.025)
Employment growth rate	0.266***
	(0.032)
County FE	Y
Decade FE	Y
State FE * time trend	Y
1930s population * time trend	Y
Observations	24,408

Notes: The reported regression is at the county-by-decade level (1930-2010). Net migration rates are from Winkler, et al. (2013a, b) and Gardner and Cohen (1992). Counts of natural disasters by type and incidence of severe disasters are obtained from merging data from the ARC, FEMA and EM-DAT. In this specification, a disaster qualifies as "severe" if it was associated with 25 or more deaths. The employment growth rate is estimated (see equation 2); weights are based on county employment in 1930 by industry. Conley standard errors adjusted for spatial and temporal correlation within 1,000 km and 10 decades (see Hsiang, 2010).

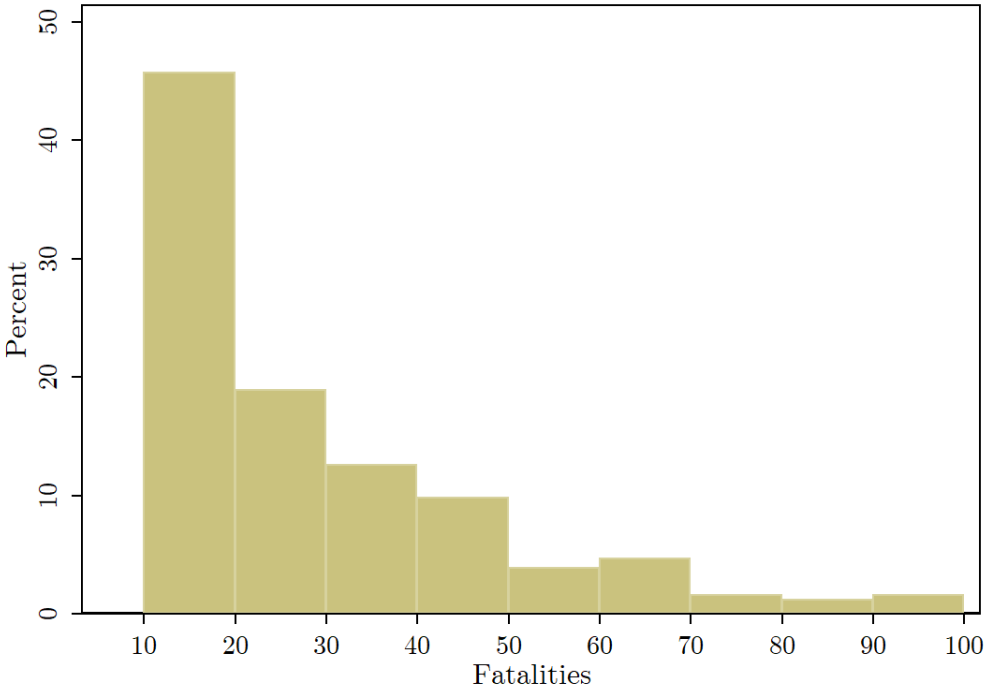
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix Figure 1: Annual Disaster Count in the US 1930–2012, by Type



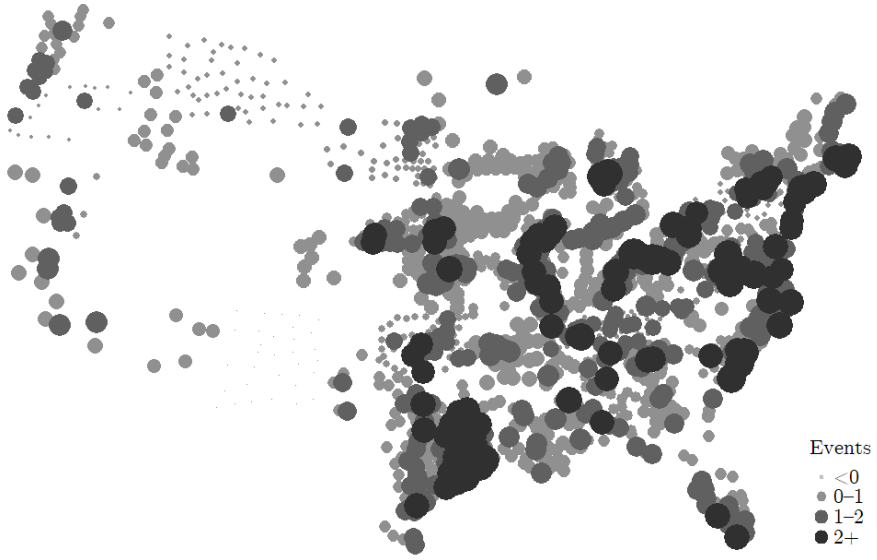
Notes: This graph plots the sum of county-level disaster counts by year and type between 1930 and 2012. Note that this measure will treat a given natural event that occurred in two separate counties as two different disaster events. The hurricane count is truncated at 2,000. Sources: American National Red Cross (ARC) and various federal sources, including Federal Emergency Management Agency (FEMA).

Appendix Figure 2: Histogram of Fatalities for Natural Disasters with 10 or More Deaths 1930–2010



This histogram shows the distribution of fatalities associated to natural disasters with at least 10 deaths affecting the US from 1930 to 2010. The histogram was capped at 100 fatalities. The maximum number of fatalities is 1833. Source: EM-DAT and ARC.

Appendix Figure 3: Count of Decades with a Severe Disaster Event by US County, 1930–2010, Accounting for State Fixed Effects



Notes: This map shows the number of decades with severe events per county in the period 1930–2010, as a residual after accounting for state fixed effects. Severe events are disasters associated with 25 or more deaths. The marker size and color are increasing in the number of events. The maximum number of occurrences is 3.75. Sources: American National Red Cross and various federal sources, including Federal Emergency Management Agency.