# Online Appendices for "Structural Change and Internal Labor Migration: Evidence from the Great Depression"

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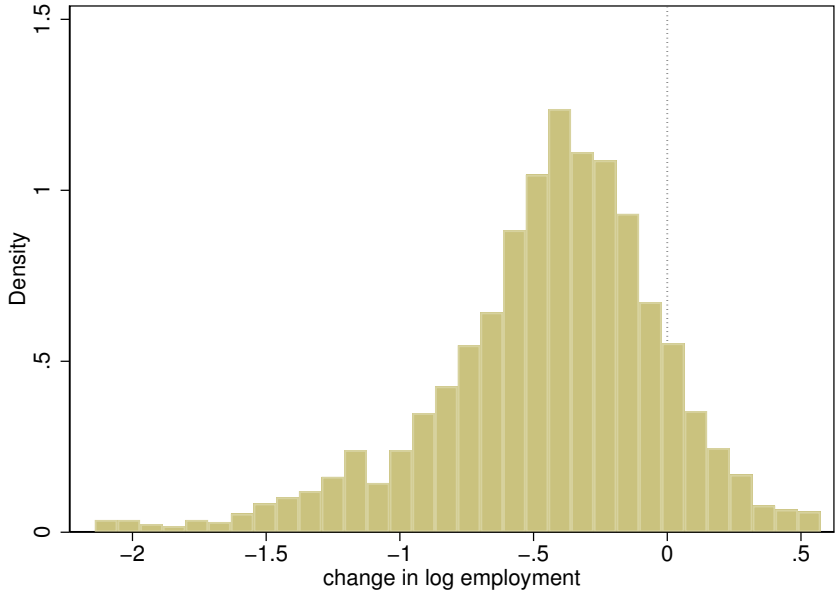
# A Additional Figures and Tables

Figure A1: Migration between farm and nonfarm residences

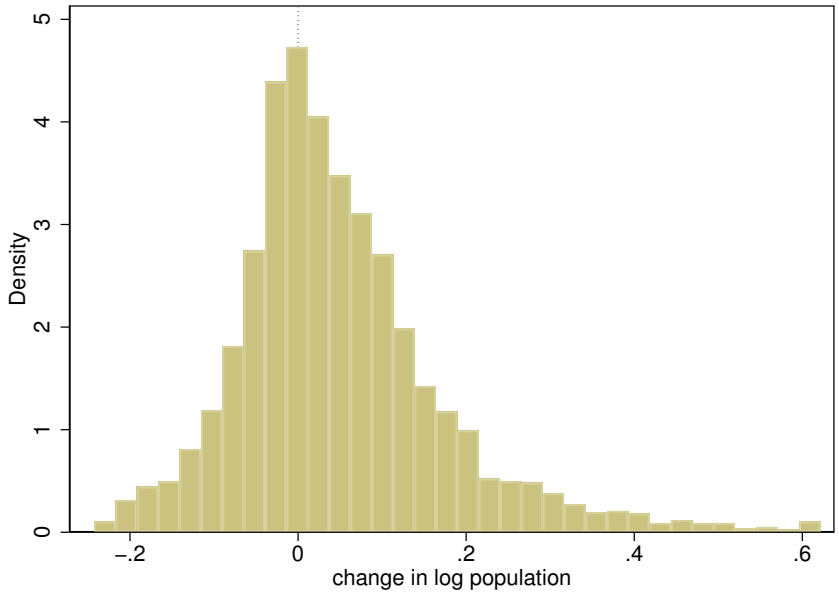

*Notes:* This figure shows the yearly change in the farm population resulting from internal migration between farms and nonfarm residences. The series labeled "from farms," for example, represents the number of people (in thousands) who move from a farm to a nonfarm residence in that year. *Source:* Series Ac416, Ac417 and Ac418 from Ferrie (2006).

Figure A2: County-level change in log manufacturing employment, 1929-1933



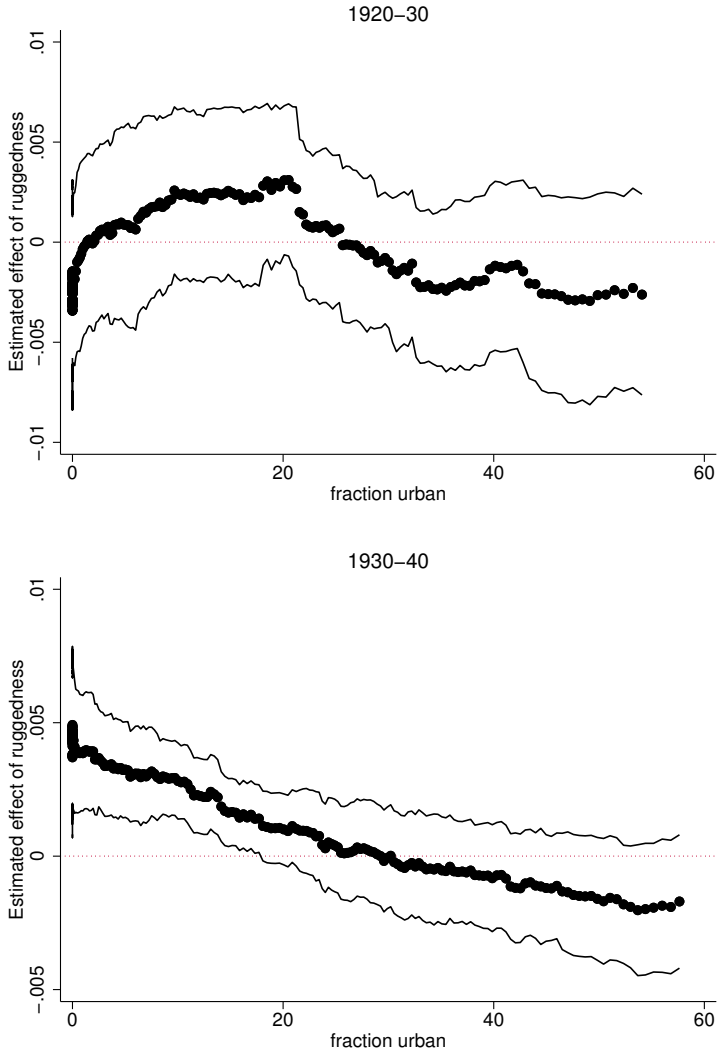

*Notes:* Histogram of the county-level changes in log manufacturing employment between 1929 and 1933 (i.e., log employment in 1933 minus log employment in 1929). Most counties witness a decline in manufacturing employment, but there is substantial variation in the size of the shock. The upper and lower 1% of counties are dropped (trimmed).

Figure A3: County-level change in log farm population, 1930-1935



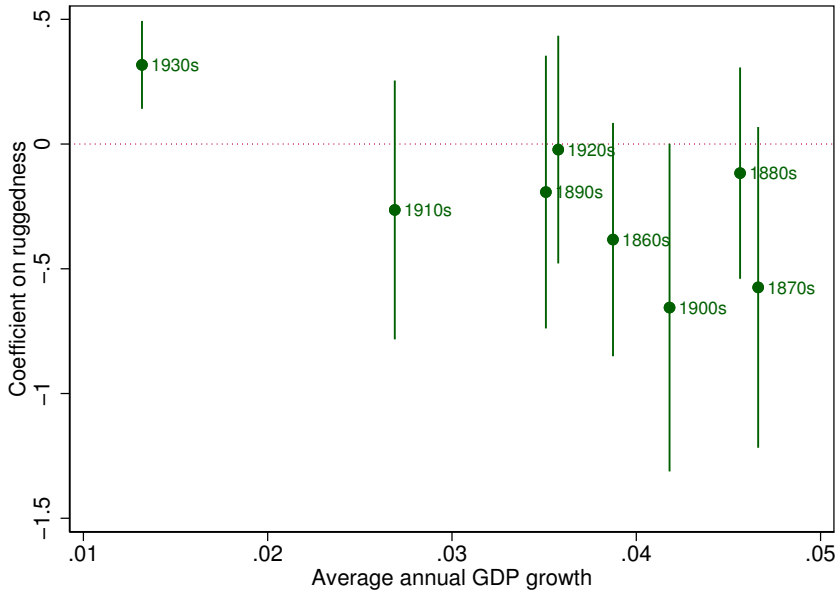

*Notes:* Histogram of the county-level changes in log farm population between 1930 and 1935 (i.e., log farm population in 1935 minus log farm population in 1930). While many counties witness an increase in their farm population over this time period, a substantial portion (37%) see a decline. The upper and lower 1% of counties are dropped (trimmed).

Figure A4: Effect of ruggedness on change in county-level total population 1920-30 and 1930-40, by percent urban



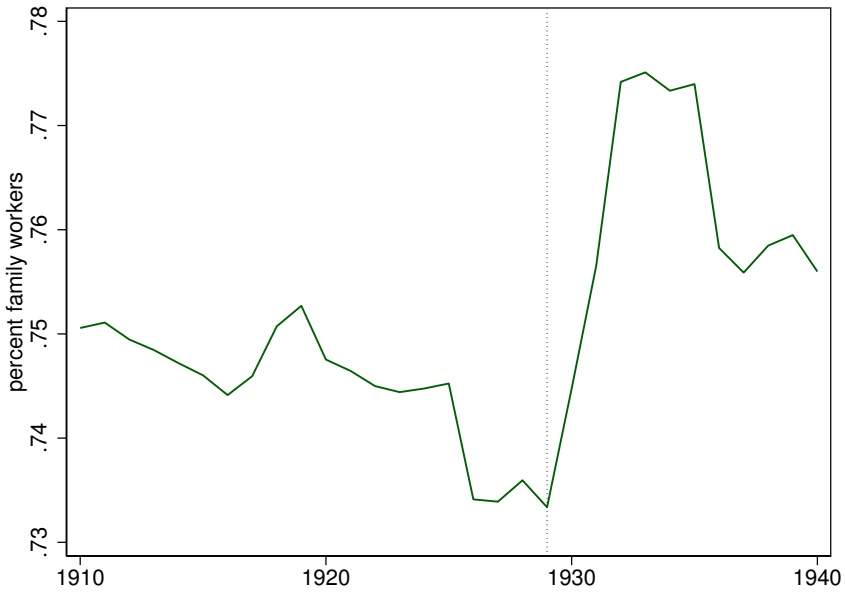

*Notes:* This figure reports the coefficients from a series of regressions of county-level log population in 1930 (top panel) or 1940 (bottom panel) on ruggedness of nearby areas, controlling for log population 10 years earlier. Counties are first ordered according to percent urban, and then a series of regressions are run using adjacent subsamples, ranging from the 800 least urban counties to the 800 most urban counties. The coefficient on ruggedness is then plotted against the average percent urban value of the 800 counties in the estimation sample. (There are actually 1578 counties that are 0% urban, hence the large collection of estimates at 0.) The ruggedness measure used here is the simple average of own-county ruggedness and the average of all neighboring counties, or (own + nbr_avg)/2. The regression specification includes census division fixed effects, and standard errors are adjusted for clustering at the state level; 95% confidence intervals are displayed. The bottom panel indicates a strong relationship between ruggedness and population during the 1930s, with the effect concentrated in rural counties; the effect is decreasing in percent urban and becomes negative (though not statistically significant) for the most urban areas. In contrast, we see no relationship during the 1920s (top panel). Also see Figure 5 for a similar result.

Figure A5: Effect of ruggedness (on population) vs. national GDP growth




*Notes:* The figure plots the estimated effect of ruggedness on the change in total county population in each decade between 1860 and 1940. Each marker represents the point estimate (and 95% confidence interval) on ruggedness from a separate specfication, plotted against the average national-level GDP growth during the corresponding decade. Each specification regresses log county population at the end of the decade on ruggedness, initial log population, and state fixed effects; standard errors are clustered at the state level. The results suggest that the effect of ruggedness on population movement may be related to the performance of the overall economy.

Figure A6: Percent farm workers that are family members




*Notes:* This figure displays the percentage of all workers on farms who are related to the farm operator. Workers are classified as either hired or family. This percentage increases during the early years of the Depression, as the total number of paid workers falls while the total number of family workers increases. *Source:* Farm Employment and Wage Rates 1910-1990. National Agricultural Statistics Service, Estimates Division, U.S. Department of Agriculture. Statistical Bulletin No. 822 (March 1991).

Table A1: Descriptive statistics

| Variable | Mean | Std. Dev. | n |
|---|---|---|---|
| ***Counties*** | | | |
| % Manufacturing in durables 1930 | .521 | .303 | 2,935 |
| % Employment in manufacturing 1930 | .12 | .124 | 3,092 |
| Bartik 1930-40 | .159 | .104 | 3,087 |
| Change in log manufacturing employment 1929-33 | -.456 | .467 | 2,002 |
| Ruggedness (average slope of the county) | .0958 | .0816 | 3,100 |
| % Farms in 1935 with to-farm mover | .104 | .0686 | 3,070 |
| % Change in farm population 1930-35 | .0648 | .176 | 3,069 |
| ***1930 Complete Count 100% Sample*** | | | |
| On farm in 1930 | .248 | .432 | 122,789,967 |
| Age in 1930 | 28.8 | 19.8 | 122,789,977 |
| Female | .489 | .5 | 122,789,977 |
| Black | .0969 | .226 | 122,789,977 |
| Ruggedness of 1930 county | .0894 | .0743 | 122,770,236 |
| ***1940 Complete Count 100% Sample*** | | | |
| On farm in 1935 | .262 | .44 | 92,806,497 |
| On farm in 1940 | .225 | .417 | 132,400,000 |
| ***Linked Sample*** | | | |
| On farm 1930 | .251 | .434 | 9,340,586 |
| On farm 1935 | .265 | .441 | 7,443,805 |
| On farm 1940 | .225 | .418 | 9,340,588 |
| Migrate 1930-35 (changes county) | .272 | .445 | 8,974,389 |
| Migrate 1930-40 (changes county) | .32 | .467 | 9,340,588 |
| Migrate 1935-40 (changes county) | .104 | .306 | 8,974,389 |
| Age in 1930 | 26.9 | 18.2 | 9,340,588 |
| Black | .0656 | .248 | 9,340,588 |
| Female | 0 | 0 | 9,340,588 |
| Ruggedness of 1930 county | .089 | .0741 | 9,338,827 |
| ***Linked Sample: 1930 Farm Residents Only*** | | | |
| Migrate 1930-35 (changes county) | .273 | .446 | 2,231,892 |
| Migrate 1930-40 (changes county) | .328 | .469 | 2,346,080 |
| Migrate 1935-40 (changes county) | .118 | .322 | 2,231,892 |
| Age in 1930 | 25.8 | 18.8 | 2,346,080 |
| Ruggedness of 1930 county | .0868 | .0737 | 2,345,540 |
| Ruggedness of 1935 county | .0877 | .0752 | 2,231,234 |
| Ruggedness of 1940 county | .0888 | .0764 | 2,344,053 |
| Owned dwelling 1930 | .558 | .497 | 2,346,080 |

*Notes:* Descriptive statistics for the county-level data set as well as the individual-level data sets. The "Linked Sample" is the data set used for the individual-level regressions in the paper.

Table A2: Movement to farms vs. tractors and farm equipment

| | % Farms w/ Movers 1935 | | | | Log Farm Population 1935 | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) OLS | (2) IV | (3) OLS | (4) IV | (5) OLS | (6) IV | (7) OLS | (8) IV |
| % farms w/ tractors 1930 | -0.0609*** | -0.367*** | | | -0.257*** | -1.341*** | | |
| | (0.0207) | (0.103) | | | (0.0437) | (0.458) | | |
| log value farm equipment 1930 | | | -0.0108*** | -0.0552** | | | -0.0748*** | -0.202*** |
| | | | (0.00397) | (0.0222) | | | (0.0161) | (0.0476) |
| Observations | 2127 | 2127 | 2127 | 2127 | 2127 | 2127 | 2127 | 2127 |
| F statistic on ruggedness | | 11.43 | | 16.33 | | 11.43 | | 16.33 |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties |

*Notes:* County-level regressions. The dependent variable in columns (1)-(4) is the percentage of farms in the county reporting at least one to-farm migrant and in columns (5)-(8) it is the log of the farm population in 1935. All specifications include controls for log population and log farm population in 1930, as well as state fixed effects. Even-numbered columns instrument for tractors or farm equipment using county-level ruggedness. The sample is restricted to rural counties only, defined as those with less than 30% of the population located in urban areas in 1930. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Movement to farms vs. county-level agricultural characteristics

| | % Farms w/ Movers 1935 | | | | Log Farm Population 1935 | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Log value per acre 1930 | -0.00813** | | | | -0.0316** | | | |
| | (0.00345) | | | | (0.0139) | | | |
| Log value farm equipment 1930 | | -0.0108*** | | | | -0.0748*** | | |
| | | (0.00397) | | | | (0.0161) | | |
| Log crop value per farm pop 1930 | | | -0.0152*** | | | | -0.0683*** | |
| | | | (0.00532) | | | | (0.0151) | |
| Average suitability, 8 crops | | | | -0.0460*** | | | | -0.0948 |
| | | | | (0.0133) | | | | (0.116) |
| Observations | 2127 | 2127 | 2125 | 2118 | 2127 | 2127 | 2125 | 2118 |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties |

*Notes:* County-level regressions. All specifications include controls for log population and log farm population in 1930, as well as state fixed effects. The sample is restricted to rural counties only, defined as those with less than 30% of the population located in urban areas in 1930. "Log value per acre" is the value of land and buildings on farms, and "Average suitability, 8 crops" is the simple average of the crop suitability index (rainfed, intermediate inputs, baseline time period) for cotton, maize, oats, sugar beet, sugar cane, tobacco, wet rice, and wheat; these data were obtained from the Global Agro-ecological Zones project (http://www.gaez.iiasa.ac.at/). Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Farm mechanization and farm migration: excluding nonfarm employment controls

| | Move to Farm 1930-35 | | Moved out of 1930 County | | | Off-Farm Mover |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Ruggedness | 0.227*** | 0.160*** | -0.0373 | -0.253*** | 0.0764 | 0.00953 |
| | (0.0727) | (0.0441) | (0.0553) | (0.0581) | (0.0719) | (0.0329) |
| Observations | 5482230 | 1909625 | 8972684 | 2231362 | 6741320 | 2345540 |
| State FE | Y | Y | Y | Y | Y | Y |
| Reference Year | 1930 | 1935 | 1930 | 1930 | 1930 | 1930 |
| Sample | Nonfarm in 1930 | On farm in 1935 | All males in 1930 | On farm in 1930 | Nonfarm in 1930 | On farm in 1930 |

*Notes:* Individual-level regressions. This table corresponds to Table 4 but omits the nonfarm employment variable. All specifications include controls for age and age-squared, as well as state fixed effects. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: County-level population outcomes vs. ruggedness and non-farm employment shock

| | 1935 | | 1940 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) % Farms w/ to-farm movers | (2) Log Farm Population | (3) Log Total Population | (4) Log Rural Population | (5) Log Urban Population | (6) Percent Urban | (7) Percent Farm | (8) Percent Employed |
| Ruggedness | 0.163*** | 0.568*** | 0.291*** | 0.370*** | -0.115 | -0.0697*** | 0.0721** | -0.111*** |
| | (0.0357) | (0.0617) | (0.0986) | (0.0958) | (0.0703) | (0.0244) | (0.0300) | (0.0145) |
| % Mfg in durables 1930 | 0.00952* | 0.0144 | 0.00126 | 0.0316** | -0.0709*** | -0.0212*** | 0.0214*** | -0.0178*** |
| | (0.00474) | (0.0176) | (0.0139) | (0.0134) | (0.0224) | (0.00479) | (0.00528) | (0.00276) |
| Bartik 1930-40 | 0.00940 | -0.0941*** | 0.0978*** | 0.0897*** | 0.165*** | 0.0169 | -0.0400*** | 0.0200* |
| | (0.0142) | (0.0345) | (0.0268) | (0.0310) | (0.0486) | (0.0174) | (0.00901) | (0.0107) |
| % Emp in mfg 1930 | 0.0974*** | 0.0255 | 0.0586 | 0.0668 | 0.0118 | -0.0165 | -0.0262 | 0.0182 |
| | (0.0240) | (0.0459) | (0.0413) | (0.0477) | (0.0577) | (0.0134) | (0.0170) | (0.0148) |
| Observations | 2907 | 2907 | 2926 | 2892 | 1660 | 2926 | 2925 | 2926 |
| Sample | All counties | All counties | All counties | All counties | All counties | All counties | All counties | All counties |

*Notes:* County-level regressions. The column headers indicate the dependent variable for each specification. The specifications in columns (2)-(8) control for the initial 1930 value of the outcome variable. This table shows how rugged counties experience a relative increase in population; this increase is driven by the gain in the rural population. All specifications include controls for log population and log farm population in 1930, as well as state fixed effects. The sample includes all counties (i.e., both rural and urban). Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: County population and farm population growth: comparison with earlier periods

*(a) County-level log population*

| | 1860-70 | 1870-80 | 1880-90 | 1890-1900 | 1900-10 | 1910-20 | 1920-30 | **1930-40** |
|---|---|---|---|---|---|---|---|---|
| ruggedness | -0.383 | -0.575* | -0.116 | -0.192 | -0.655* | -0.264 | -0.0222 | 0.317*** |
| | (0.239) | (0.328) | (0.216) | (0.279) | (0.335) | (0.265) | (0.233) | (0.0899) |
| Observations | 2249 | 2533 | 2694 | 2866 | 2873 | 2949 | 2951 | 2952 |

*(b) County-level log population, adding control for lagged log farm population*

| | 1900-10 | 1910-20 | 1920-30 | **1930-40** |
|---|---|---|---|---|
| ruggedness | -0.486 | -0.230 | 0.0390 | 0.322*** |
| | (0.331) | (0.262) | (0.171) | (0.0974) |
| Observations | 2816 | 2881 | 2895 | 2946 |

*(c) County-level log farm population*

| | 1900-10 | 1910-20 | 1920-25 | 1920-30 | 1925-30 | **1930-35** | **1930-40** | 1935-40 |
|---|---|---|---|---|---|---|---|---|
| ruggedness | -0.503* | -0.479* | 0.0131 | -0.0329 | -0.120 | 0.576*** | 0.559*** | 0.0545 |
| | (0.296) | (0.242) | (0.133) | (0.171) | (0.118) | (0.0678) | (0.102) | (0.0952) |
| Observations | 2768 | 2851 | 2892 | 2889 | 2925 | 2904 | 2939 | 2908 |

*Notes:* County-level regressions of the log value of the dependent variable at the end of the period specified on the log initial value at the beginning of the period, ruggedness, and state fixed effects. Panel (b) includes controls for log farm population in the initial period (which is only available after 1900). In panel (c), the specifications additionally control for log total population in the initial period (or, in the 5th and 8th specifications, the immediately preceding decennial census year). The periods 1930-40 and 1930-35, containing the initial crisis of the depression, are in bold. To get a consistent series over time, counties are adjusted to 1910 county boundaries using area weights. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: The movement to and from farms, 1929-30

| | Moved from cities | | Left for cities | |
|---|---|---|---|---|
| | (1) % Farms | (2) Log movers | (3) % Farms | (4) Log movers |
| Ruggedness | -0.00552 | 0.00107 | -0.00542 | -0.892 |
| | (0.0124) | (0.562) | (0.00895) | (0.621) |
| Observations | 2129 | 2120 | 2129 | 2110 |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties |

*Notes:* These regressions analyze county-level data from the 1930 Census of Agriculture on migration between cities and farms from 1929 to 1930. The first two columns use information on the number of farm residents who moved from cities or towns in the previous 12 months (and the percent of farms reporting at least one such migrant). The final two columns use information on the number of residents from farm households who left for towns or cities in the previous 12 months. All specifications include controls for log population and log farm population in 1930, as well as state fixed effects. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Descriptive statistics: migration rates by race

| Variable | White | Black |
|---|---|---|
| ***All males in linked sample*** | | |
| On farm 1930 | .24 | .402 |
| Change counties 1930-35 | .26 | .432 |
| Move to farm 1930-35 | .0623 | .109 |
| Move off farm 1930-35 | .0605 | .114 |
| ***1930 farm residents only*** | | |
| Change counties 1930-35 | .254 | .432 |
| Move off farm 1930-35 | .239 | .274 |
| ***1930 nonfarm residents only*** | | |
| Change counties 1930-35 | .262 | .433 |
| Move to farm 1930-35 | .0834 | .187 |

*Notes:* These statistics are for the linked sample. For the period 1930-35, migration rates are higher for black men compared to white men.

Table A9: Descriptive statistics: migration rates by race and region

| Variable | Black Non-South | Black South | White Non-South | White South |
|---|---|---|---|---|
| ***All males in linked sample*** | | | | |
| On farm in 1930 | .0344 | .518 | .191 | .408 |
| Change counties 1930-35 | .395 | .444 | .244 | .315 |
| Change counties 1930-35 & in Non-South 1935 | .219 | .0621 | .229 | .0536 |
| Change counties 1930-35 & in South 1935 | .176 | .382 | .0149 | .261 |
| Moves to farm 1930-35 | .109 | .109 | .0539 | .0913 |
| Moves off farm 1930-35 | .0158 | .143 | .05 | .0968 |
| ***1930 farm residents only*** | | | | |
| Change counties 1930-35 | .411 | .432 | .224 | .302 |
| Change counties 1930-35 & in Non-South 1935 | .28 | .0471 | .213 | .0367 |
| Change counties 1930-35 & in South 1935 | .131 | .385 | .011 | .265 |
| Moves off farm 1930-35 | .418 | .271 | .244 | .231 |
| Moves to nonfarm residence in Non-South 1930-35 | .357 | .039 | .238 | .0279 |
| Moves to nonfarm residence in South 1930-35 | .0608 | .232 | .00579 | .203 |
| ***1930 nonfarm residents only*** | | | | |
| Change counties 1930-35 | .394 | .457 | .249 | .324 |
| Change counties 1930-35 & in Non-South 1935 | .217 | .0781 | .233 | .0651 |
| Change counties 1930-35 & in South 1935 | .178 | .379 | .0158 | .259 |
| Moves to farm 1930-35 | .113 | .232 | .0678 | .157 |
| Moves to farm in Non-South 1930-35 | .0368 | .00956 | .0641 | .0118 |
| Moves to farm in South 1930-35 | .0764 | .223 | .00364 | .145 |

*Notes:* These statistics are for the linked sample. The statistics are tabulated based on the region of residence in 1930.

Table A10: Black vs. white differences in migration patterns

| | Change counties | | | | | | Off-farm mover | | To-farm mover | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Black | 0.172*** | 0.131*** | 0.178*** | 0.124*** | 0.171*** | 0.135*** | 0.0348** | 0.0509*** | 0.104*** | 0.0612*** |
| | (0.0103) | (0.00646) | (0.0131) | (0.00721) | (0.0110) | (0.00711) | (0.0157) | (0.00684) | (0.0117) | (0.00638) |
| Observations | 8901009 | 8901008 | 2210912 | 2210910 | 6690095 | 6690094 | 1942078 | 1942076 | 5438329 | 5438327 |
| Age & State FE | | Y | | Y | | Y | | Y | | Y |
| Sample | All males | All males | On farm in 1930 | On farm in 1930 | Nonfarm in 1930 | Nonfarm in 1930 | On farm in 1930 | On farm in 1930 | Nonfarm in 1930 | Nonfarm in 1930 |

*Notes:* Individual-level regressions of the indicated outcome variable on an indicator for Black. Some specifications include age and state fixed effects: the higher migration rates shown in Table A8 remain even after adjusting for age and state. The sample is restricted to white and black individuals only.

Table A11: Self-sufficing farms

| | (1) % Farms | (2) Log number |
|---|---|---|
| Ruggedness | 0.200*** | 4.402*** |
| | (0.0581) | (0.824) |
| Observations | 443 | 420 |
| Sample | All counties | All counties |

*Notes:* These regressions analyze county-level data from the 1930 Census of Agriculture on the number of farms that are classified as "self-sufficing." Unfortunately this information is only available for a subset of counties, mostly in the West. Nonetheless we see a strong relationship with ruggedness. The dependent variable in the first column is ratio of the number of self-sufficing farms to all farms; in column 2 it is the log number of self-sufficing farms in the county. All specifications include controls for log population and log farm population in 1930, as well as state fixed effects. Given the small sample size, we do not restrict the analysis to rural counties. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A12: Farm labor

| | Farm Labor 1930 | % Farms w/ to-farm movers 1935 | | Log Farm Population 1935 | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Ruggedness | -4.253*** | | 0.138*** | | 0.369*** |
| | (0.427) | | (0.0373) | | (0.0874) |
| Cash expenditure on farm labor 1930 | | -0.00706** | -0.00317 | -0.0537*** | -0.0433*** |
| | | (0.00303) | (0.00257) | (0.00954) | (0.0122) |
| Observations | 2128 | 2126 | 2126 | 2126 | 2126 |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties |

*Notes:* County-level regressions. The dependent variable in column (1) is the log of total cash expenditure on farm labor in 1930. All specifications include controls for log population and log farm population in 1930, as well as state fixed effects. The sample is restricted to rural counties only, defined as those with less than 30% of the population located in urban areas in 1930. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A13: Farm tenancy and migration 1930-35

| | % Farms w/ to-farm movers 1935 | | Log Farm Pop 1935 | | Leaves county 1930-35 | Off-farm mover 1930-35 |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| % Owner-operated farms 1930 | 0.0611*** | 0.0447*** | 0.149*** | 0.0829 | | |
| | (0.0107) | (0.0127) | (0.0535) | (0.0551) | | |
| Ruggedness | | 0.125*** | | 0.504*** | | |
| | | (0.0382) | | (0.0709) | | |
| Ruggedness, 1930 county | | | | | -0.261*** | 0.103** |
| | | | | | (0.0739) | (0.0500) |
| Owner | | | | | -0.140*** | -0.0302*** |
| | | | | | (0.0107) | (0.00509) |
| Owner × ruggedness | | | | | 0.168** | -0.101** |
| | | | | | (0.0708) | (0.0420) |
| Observations | 2127 | 2127 | 2127 | 2127 | 2231362 | 2345540 |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties | On farm in 1930 | On farm in 1930 |

*Notes:* Columns (1)-(4) are county-level regressions, and include controls for log population and log farm population in 1930, as well as state fixed effects. The sample is restricted to counties with no more than 30% of the population in urban areas. Columns (5) and (6) are individual-level regressions, and include controls for age and age-squared, as well as state fixed effects; the sample is restricted to people living on farms in 1930. "Owner" is an indicator variable equal to 1 if their household owns their farm and 0 if they rent the farm. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A14: County unemployment vs. ruggedness

| | Log unemployed people 1930 | Log number of unemployed people 1937 | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness | -0.0692 | 2.301*** | 2.239*** | 1.774*** |
| | (0.540) | (0.358) | (0.351) | (0.333) |
| Log unemployment 1930 | | | 0.0152 | 0.0221 |
| | | | (0.0392) | (0.0333) |
| Log Farm Pop 1935 | | | | 0.542*** |
| | | | | (0.193) |
| Log Population 1940 | | | | 0.552*** |
| | | | | (0.109) |
| Observations | 2107 | 2127 | 2107 | 2107 |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties |

*Notes:* County-level regressions. All specifications include controls for log population and log farm population in 1930, as well as state fixed effects. The dependent variable in column (1) is the log total number of unemployed people in the county in 1930; in columns (2)-(4) it is the log number of unemployed people in the county in 1937 (from the census of unemployment in that year). While there is initially no difference in unemployment rates by ruggedness (column 1), by 1937 rugged areas have higher rates of unemployment; this is despite the fact that these areas are experiencing faster population growth and greater in-migration. The sample is restricted to rural counties only, defined as those with less than 30% of the population located in urban areas in 1930. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A15: Non-farm sectors performance (retail, wholesale, manufacturing) vs. ruggedness

*(a) Retail and Wholesale Sectors*

| | Retail | | | Wholesale | | |
|---|---|---|---|---|---|---|
| | (1) Sales | (2) Emp | (3) Avg Wage | (4) Sales | (5) Emp | (6) Avg Wage |
| 1933 × ruggedness | -0.117 | | | | | |
| | (0.104) | | | | | |
| 1935 × ruggedness | -0.209 | -0.439** | 0.143* | -0.576*** | -1.211*** | 0.253 |
| | (0.149) | (0.207) | (0.0826) | (0.191) | (0.207) | (0.156) |
| 1939 × ruggedness | -0.145 | -0.251 | 0.0393 | -0.868** | -1.091** | 0.141 |
| | (0.206) | (0.210) | (0.245) | (0.345) | (0.411) | (0.182) |
| Observations | 12123 | 9103 | 9095 | 8164 | 8039 | 8008 |
| Number of counties | 3083 | 3081 | 3079 | 2821 | 2816 | 2815 |

*(b) Manufacturing*

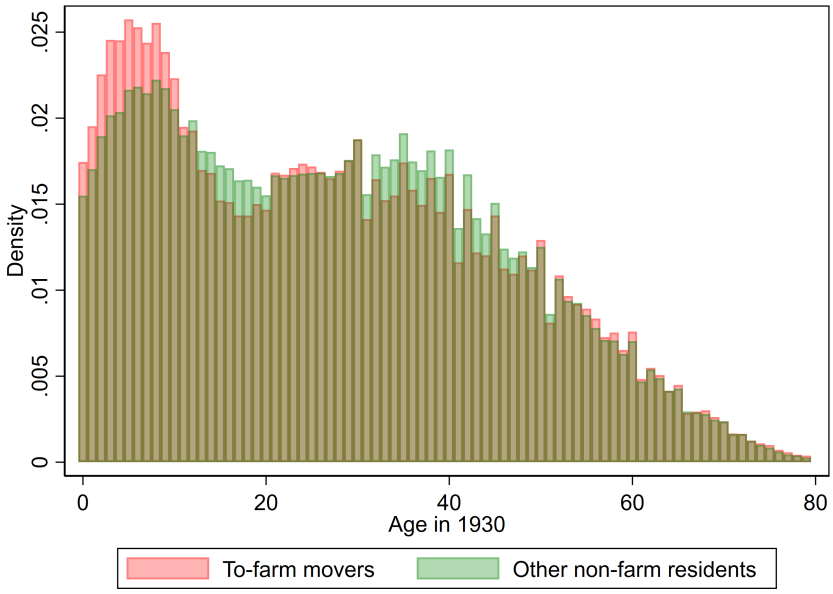
| | (1) Emp | (2) Value Added | (3) Output | (4) Avg Wage |
|---|---|---|---|---|
| 1931 × ruggedness | -0.334 | -0.260 | -0.155 | |
| | (0.257) | (0.274) | (0.218) | |
| 1933 × ruggedness | -0.465 | -0.251 | -0.143 | |
| | (0.286) | (0.410) | (0.353) | |
| 1935 × ruggedness | -0.227 | -0.226 | -0.227 | -0.0260 |
| | (0.251) | (0.326) | (0.296) | (0.190) |
| 1937 × ruggedness | 0.00964 | 0.0284 | -0.233 | |
| | (0.679) | (0.421) | (0.294) | |
| 1939 × ruggedness | 0.238 | 0.00246 | -0.121 | -0.109 |
| | (0.869) | (0.570) | (0.389) | (0.116) |
| Observations | 13523 | 12805 | 12804 | 6857 |
| Number of counties | 2556 | 2556 | 2556 | 2556 |

*Notes:* The dependent variable is (a) the log of county-level employment, log sales, or average wage (total wages divided by total employment) in the retail or wholesale sector, or (b) log of county-level employment, log value added, log total output, or average wages in the manufacturing sector. The specifications are panel regressions with county fixed effects and include data for 1929 in addition to the years displayed. The coefficients displayed are the estimates on the interaction between county-level ruggedness and year fixed effects; the first year is omitted, so coefficients should be interpreted as the change *relative to 1929*. All specifications include controls for log population and log farm population in 1930, as well as the initial 1929 level of the dependent variable, all of which are interacted with year fixed effects. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

## A.1 Migrant characteristics

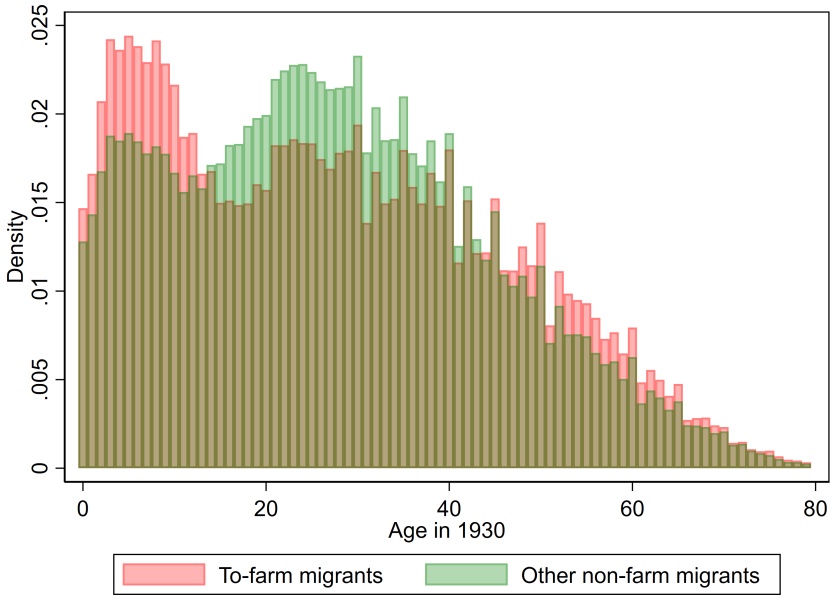
The following figures and tables examine characteristics of the various types of migrants, focusing especially on age and family status.

Figure A7: Histogram of age in 1930: To-farm movers vs. other nonfarm residents



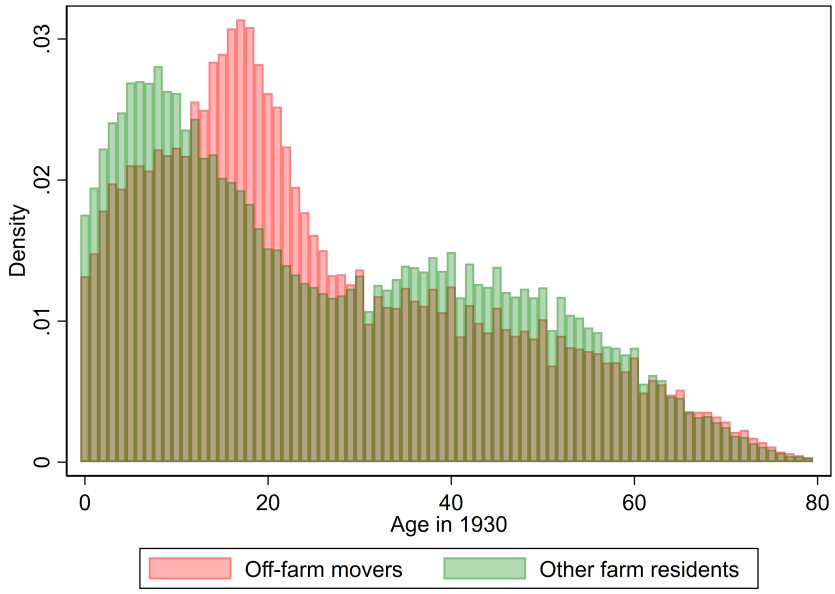

*Notes:* Restricted to people living in nonfarm areas in 1930. "To-farm movers" are people who move to a farm residence in 1935; they are more likely to be children compared to people who remain in nonfarm areas.

Figure A8: Histogram of age in 1930 among migrants who change counties: To-farm migrants vs. nonfarm-to-nonfarm migrants



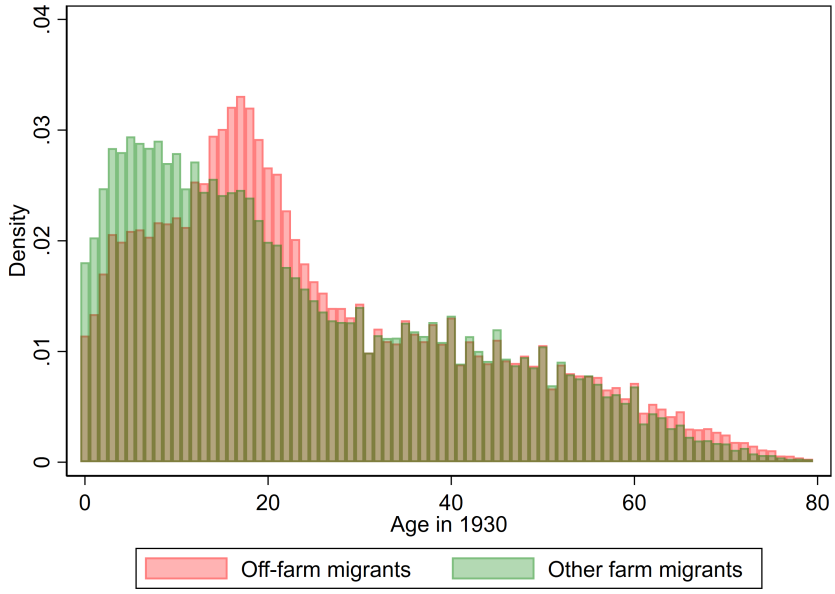

*Notes:* Restricted to people living in nonfarm areas in 1930 AND who change counties between 1930-35. "To-farm migrants" move to a farm residence in another county; they are more likely to be children, and less likely to be age 16-40, compared to people who migrate to another nonfarm residence.

Figure A9: Histogram of age in 1930: Off-farm movers vs. other farm residents




*Notes:* Restricted to people living on farms in 1930. "Off-farm movers" move to a nonfarm residence between 1930-35.

Figure A10: Histogram of age in 1930 among migrants who change counties: Off-farm migrants vs. farm-to-farm migrants




*Notes:* Restricted to people living on farms in 1930 AND who change counties between 1930-35. "Off-farm migrants" move to a nonfarm residence in another county; other farm migrants move to another farm residence.

Table A16: Compare to-farm movers to 1930 nonfarm residents and 1935 farm residents

| | (1) To-farm mean | (2) Other nonfarm 1930 mean | (3) Other farm 1935 mean |
|---|---|---|---|
| In birth state 1930 | .7358687 | .7514517 | .8719388 |
| In birth state 1935 | .8014011 | .7414375 | .8667593 |
| Age in 1930 | 27.14207 | 27.94194 | 26.67458 |
| Household size 1930 | 5.084609 | 4.938337 | 5.788665 |
| Change in HH size 1930-40 | -.1962626 | -.5896616 | -.748774 |
| Married couple household 1930 | .8389721 | .863598 | .9040254 |
| Married couple household 1940 | .8330582 | .8206954 | .8529024 |
| Non-family household 1930 | .0284456 | .0178352 | .0142241 |
| Non-family household 1940 | .0382433 | .0313043 | .0260328 |
| One-family household 1930 | .8488907 | .8624185 | .8979376 |
| One-family household 1940 | .8833261 | .8976919 | .8993793 |

*Notes:* Displays means for: (1) Nonfarm-to-farm movers 1930-35; (2) all other people living in nonfarm areas in 1930; and (3) all other people living on farms in 1935. For the group of nonfarm to farm movers, the fraction residing in their state of birth increases substantially between 1930 and 1935, suggesting that many of these migrants may be returning to live with (or near) family members. For all other groups in this table (and the following two tables), this fraction declines between 1930-35.

Table A17: Compare off-farm movers to 1930 farm residents and 1935 nonfarm residents

| | (1) Off-farm mean | (2) Other farm 1930 mean | (3) Other nonfarm 1935 mean |
|---|---|---|---|
| In birth state 1930 | .8245212 | .8719388 | .7514517 |
| In birth state 1935 | .7361308 | .8667593 | .7414375 |
| Age in 1930 | 25.97757 | 26.67458 | 27.94194 |
| Household size 1930 | 5.69653 | 5.788665 | 4.938337 |
| Change in HH size 1930-40 | -1.30951 | -.748774 | -.5896616 |
| Married couple household 1930 | .8835405 | .9040254 | .863598 |
| Married couple household 1940 | .7952305 | .8529024 | .8206954 |
| Non-family household 1930 | .0202476 | .0142241 | .0178352 |
| Non-family household 1940 | .047264 | .0260328 | .0313043 |
| One-family household 1930 | .8780053 | .8979376 | .8624185 |
| One-family household 1940 | .8787383 | .8993793 | .8976919 |

*Notes:* Displays means for: (1) Farm-to-nonfarm movers 1930-35; (2) all other people living on farms in 1930; and (3) all other people living in nonfarm areas in 1935.

Table A18: Compare to-farm and off-farm migrants to other migrants: restrict to people who change counties between 1930-35

| | (1) To-farm mean | (2) Other nonfarm 1930 mean | (3) Off-farm mean | (4) Other farm 1930 mean |
|---|---|---|---|---|
| In birth state 1930 | .6596297 | .6548609 | .8082555 | .8166605 |
| In birth state 1935 | .777912 | .6158715 | .6518856 | .7926462 |
| Age in 1930 | 27.55421 | 27.71715 | 25.64794 | 23.78263 |
| Household size 1930 | 4.993462 | 4.795244 | 5.736384 | 6.015155 |
| Change in HH size 1930-40 | -.1325549 | -.6051319 | -1.418533 | -.8255765 |
| Married couple household 1930 | .8153141 | .8086327 | .8761557 | .9024002 |
| Married couple household 1940 | .8290457 | .7910076 | .7788577 | .8578964 |
| Non-family household 1930 | .0342841 | .0323998 | .0226283 | .0163191 |
| Non-family household 1940 | .0405199 | .0472267 | .0520733 | .0282546 |
| One-family household 1930 | .813935 | .8137282 | .869988 | .8904341 |
| One-family household 1940 | .8790963 | .8729135 | .8618851 | .8944505 |

*Notes:* The table displays means for four different categories of migrants, all of whom change counties between 1930 and 1935: (1) Nonfarm to farm; (2) Nonfarm to nonfarm; (3) Farm to nonfarm; and (4) Farm to farm.

# B The Effects of the Shock to Nonfarm Employment: Additional Information

Here we elaborate on the specifications discussed in Sections 4.1 and 5.1. To determine the fraction of manufacturing workers employed in industries producing durable goods, we use the 1930 census 5% IPUMS sample and the IPUMS industry classifications that categorize manufacturing industries into either durable and non-durable (Ruggles et al. 2020). The IPUMS population census samples are also used to construct the Bartik instrument. We determine the percentage change in aggregate national employment in each of the available industrial classifications between 1930 and 1940, along with share of total county-level nonfarm employment in each industrial classification in 1930. The Bartik-predicted change in county-level employment is computed as a weighted average of the national employment growth across industries, where the weights are the county-specific initial employment shares.

In order to examine the impact of the nonfarm shock on migration, we run "reduced form" specifications of the following form, where we regress the county-level migration-related outcome $y_c$ directly on the durables instrument and a set of controls:

$$y_{c,1935} = \delta_d \text{durables}_{c,1930} + \gamma_s + \mathbf{X}_{c,1930}\Lambda_1 + \epsilon_c \tag{B1}$$

Here $\gamma_s$ is a fixed effect for state $s$ containing county $c$; all of our specifications include state fixed effects, and standard errors are clustered at the state level. The vector $\mathbf{X}_{c,1930}$ contains controls for log total population and log farm population in 1930; it also includes the percentage of all workers in 1930 working in the manufacturing sector, which ensures that we are identifying only off of the *composition* of manufacturing employment (durables versus nondurables), and not the initial size of the manufacturing sector. Our outcome variables include a measure of city-to-farm migration between 1930 and 1935, as well as log farm population in 1935. We will interpret a positive coefficient on the durables variable as evidence that the industrial downturn is responsible for some of the growth in the farm

population. We also run similar regressions using individual-level data:

$$y_i = \beta_d \text{durables}_{c,1930} + \gamma_s + \mathbf{X}_i \Lambda_2 + e_i \tag{B2}$$

where $y_i$ is one of several individual-level migration outcomes, including indicators for whether the person moved from a nonfarm to farm residence between 1930 and 1935, or whether they moved to a different county; and the vector $\mathbf{X}_i$ includes controls for age, age-squared, and the percent of workers employed in manufacturing in the county. The specifications using the Bartik instrument are analogous to those shown above.

We displayed the individual-level above in Table 2. Panel (a) of Table B1 displays the results of our county-level regressions. The first column shows the results from a regression of the change in county-level log manufacturing employment (between 1929 and 1933) on the percent of manufacturing workers employed in the durable goods sector, our first instrument for the shock to nonfarm employment. This first stage relationship is strongly significant, with an F statistic (on the instrument) of 120.

Column 2 displays the results of a reduced form specification where we regress a measure of nonfarm-to-farm migration directly on the durables instrument (Equation B1). The outcome variable is the percent of farms in the county in 1935 that contain at least one resident who had been living in a nonfarm location 5 years earlier. A higher percentage of employment in durables (which corresponds to a bigger drop in nonfarm employment during the crisis) leads to a statistically significant increase in the proportion of farms *in that same county* reporting a to-farm migrant. The most likely interpretation of this result is that it represents people who stayed within the same county, but moved onto a farm from a town, city, village, or other nonfarm location. To help interpret the magnitude of this effect, we present an IV specification in column 3, where the change in county-level manufacturing employment is instrumented using the durables percentage. While the coefficient is only marginally significant, the point estimate indicates that 10 percentage points additional growth in manufacturing employment is associated with 0.2 percentage points fewer

farms reporting to-farm migrants; this corresponds to one standard-deviation increase in manufacturing employment growth being associated with a 0.14 standard-deviation decline in the share of farms reporting to-farm migrants. Column 4 displays another reduced form specification using our alternative instrument: the Bartik-predicted change in total nonfarm employment. We see no significant relationship between our Bartik instrument and this measure of reverse migration.

In Columns 5 through 7, we display analogous specifications using a different outcome variable: log farm population in 1935. (Recall that all specifications control for the log farm population in 1930, so the regression characterizes the effects on the change in farm population between 1930 and 1935.) As before we see a negative relationship with the growth in manufacturing employment (column 6), though the reduced form estimate on the durables measure is not significant (column 5). The IV specification in column 6 suggests that a one-standard-deviation increase in manufacturing employment growth reduces the total farm population in 1935 by about 3%. There is also a strongly significant negative relationship between the Bartik-predicted growth in nonfarm employment and the change in farm population. A 10% increase in nonfarm employment over the decade (equivalent to 1 standard deviation) is associated with a drop in farm population of about 1.5%.

An additional advantage of the individual-level data is that we are able to track migration across counties. Column 1 of Table B2 shows that there is no statistically significant relationship between either of our nonfarm instruments and the probability that an individual migrates to another county between 1930 and 1935. We do see a marginally significant positive relationship between the Bartik measure for a county and the likelihood that an individual moves in to that county (column 2). Taken together the results in Tables B1 and B2 indicate that the bulk of the migration that we see in response to these nonfarm shocks consists of people moving to nearby farm residences rather than long-distance migration.

Table B1: Movement to farms vs. nonfarm employment shock

| | Δ Mfg Emp | % Farms w/ Movers 1935 | | | Log Farm Population 1935 | | |
|---|---|---|---|---|---|---|---|
| | (1) OLS | (2) OLS | (3) IV | (4) OLS | (5) OLS | (6) IV | (7) OLS |
| Δ Mfg emp 1929-33 | | | -0.0202* | | | -0.0713** | |
| | | | (0.0115) | | | (0.0357) | |
| % Mfg in durables 1930 | -0.569*** | 0.0124** | | | 0.0289 | | |
| | (0.0518) | (0.00556) | | | (0.0188) | | |
| Bartik 1930-40 | | | | 0.000563 | | | -0.165*** |
| | | | | (0.0154) | | | (0.0496) |
| % Emp in mfg 1930 | 0.347*** | 0.102*** | 0.109*** | 0.103*** | 0.0533 | 0.0594 | 0.0231 |
| | (0.128) | (0.0257) | (0.0215) | (0.0243) | (0.0469) | (0.0619) | (0.0501) |
| Observations | 1990 | 2907 | 1990 | 3058 | 2907 | 1990 | 3058 |
| F stat on instrument | 120.8 | | | | | | |
| Sample | All counties | All counties | All counties | All counties | All counties | All counties | All counties |

*Notes:* The dependent variable in column (1) is the change in manufacturing employment 1929-1933; in columns (2)-(4), it is the percentage of farms in the county reporting at least one to-farm migrant (defined as a person living on a farm in 1935 who resided in a non-farm area 5 years earlier); in columns (5)-(7), it is the log farm population in 1935. All specifications include controls for log population and log farm population in 1930, as well as state fixed effects. Columns (4) and (7) instrument for the change in manufacturing employment using the durable percentage, and column (1) displays the corresponding "first stage" relationship and the F-statistic for the durables variable. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table B2: Movement to farms vs. nonfarm employment shock

| | (1) Leaves county | (2) Moves in to county |
|---|---|---|
| % Mfg in durables, 1930 county | 0.0123 | |
| | (0.0291) | |
| Bartik, 1930 county | -0.0411 | |
| | (0.0475) | |
| % Mfg in durables, 1935 county | | -0.0143 |
| | | (0.0178) |
| Bartik, 1935 county | | 0.0440* |
| | | (0.0259) |
| % Emp in mfg, 1930 county | -0.219*** | |
| | (0.0333) | |
| % Emp in mfg, 1935 county | | -0.167*** |
| | | (0.0317) |
| Observations | 6691562 | 8879847 |
| Sample | Nonfarm in 1930 | All males |

*Notes:* The dependent variable is an indicator for whether the individual changes counties. The independent variables are the same county-level measures as in Table B1, but may be relative to the person's county in 1930 or 1935. All specifications include controls for age and age-squared, as well as state fixed effects. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# C Alternative Linking Procedures for Individual Census Data

This section reports results from our individual-level specifications using five alternative data sets. As discussed above in Section 3, we construct linked samples using data from IPUMS (Ruggles et al. 2020) and links (between the 1930 and 1940 censuses) from the Census Linking Project (Abramitzky et al. 2020). The Census Linking Project provides individual links between population censuses created using four different procedures for matching individuals across waves. These procedures differ along two dimensions: whether they use a "standard" or "conservative" procedure for determining unique observations; and whether they match on exact names or NYSIIS standardized names. As documented in Abramitzky et al. (2019), the "standard" method drops records where there is more than one person with the same name and birthplace born in the same year, while the "conservative" method requires that there be only one person with the same name and birthplace in a +/-2 year window for birth year. The NYSIIS algorithm standardizes names based on their pronunciation, and can thus link people even if their names are spelled differently.

The following tables show results using linked data sets created with each of the four possible linking procedures, as well as a fifth data set where we only keep people who were matched using all four procedures. We show results corresponding to Tables 2 and 4. We also reproduce our original results for ease of comparison; thus each of the following tables contains six sub-tables.

Table C1: Alternative linking procedures: Movement to farms vs. nonfarm employment shock (compare to Table 2)

*(a) Original*

| | Move to Farm 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| % Mfg in durables, 1930 county | 0.0548*** | | | |
| | (0.0114) | | | |
| Bartik, 1930 county | | -0.180*** | | |
| | | (0.0437) | | |
| Works in durable goods sector | | | 0.0207*** | 0.0171*** |
| | | | (0.00418) | (0.00295) |
| % Emp in mfg, 1930 county | -0.219*** | | -0.213*** | |
| | (0.0321) | | (0.0336) | |
| Observations | 5468735 | 5458889 | 5091341 | 634693 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | 1930 nonfarm labor force | 1930 mfg workers only |

*(b) Link 1: Using exact names and standard method*

| | Nonfarm to farm move 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| % Mfg in durables, 1930 county | 0.0506*** | | | |
| | (0.0108) | | | |
| Bartik, 1930 county | | -0.174*** | | |
| | | (0.0426) | | |
| Works in durable goods sector | | | 0.0184*** | 0.0165*** |
| | | | (0.00383) | (0.00286) |
| % Emp in mfg, 1930 county | -0.225*** | | -0.218*** | |
| | (0.0302) | | (0.0316) | |
| Observations | 9809956 | 9797886 | 9138804 | 1155168 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | 1930 nonfarm labor force | 1930 mfg workers only |

Table C1: (cont.)

*(c) Link 2: Using NYSIIS standardized names and standard method*

| | Nonfarm to farm move 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| % Mfg in durables, 1930 county | 0.0508*** | | | |
| | (0.0108) | | | |
| Bartik, 1930 county | | -0.167*** | | |
| | | (0.0419) | | |
| Works in durable goods sector | | | 0.0187*** | 0.0168*** |
| | | | (0.00379) | (0.00298) |
| % Emp in mfg, 1930 county | -0.223*** | | -0.217*** | |
| | (0.0295) | | (0.0310) | |
| Observations | 10687680 | 10674657 | 9943836 | 1281409 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | 1930 nonfarm labor force | 1930 mfg workers only |

*(d) Link 3: Using exact names and conservative method*

| | Nonfarm to farm move 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| % Mfg in durables, 1930 county | 0.0519*** | | | |
| | (0.0111) | | | |
| Bartik, 1930 county | | -0.178*** | | |
| | | (0.0452) | | |
| Works in durable goods sector | | | 0.0187*** | 0.0176*** |
| | | | (0.00370) | (0.00299) |
| % Emp in mfg, 1930 county | -0.236*** | | -0.228*** | |
| | (0.0305) | | (0.0318) | |
| Observations | 7260021 | 7251726 | 6765265 | 854137 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | 1930 nonfarm labor force | 1930 mfg workers only |

Table C1: (cont.)

*(e) Link 4: Using NYSIIS standardized names and conservative method*

| | Nonfarm to farm move 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| % Mfg in durables, 1930 county | 0.0544*** | | | |
| | (0.0114) | | | |
| Bartik, 1930 county | | -0.179*** | | |
| | | (0.0447) | | |
| Works in durable goods sector | | | 0.0203*** | 0.0191*** |
| | | | (0.00386) | (0.00323) |
| % Emp in mfg, 1930 county | -0.241*** | | -0.234*** | |
| | (0.0302) | | (0.0316) | |
| Observations | 6981471 | 6973006 | 6497608 | 833559 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | 1930 nonfarm labor force | 1930 mfg workers only |

*(f) Link 5: Require matches using all four alternative methods*

| | Nonfarm to farm move 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| % Mfg in durables, 1930 county | 0.0542*** | | | |
| | (0.0115) | | | |
| Bartik, 1930 county | | -0.180*** | | |
| | | (0.0456) | | |
| Works in durable goods sector | | | 0.0203*** | 0.0195*** |
| | | | (0.00381) | (0.00325) |
| % Emp in mfg, 1930 county | -0.244*** | | -0.236*** | |
| | (0.0300) | | (0.0310) | |
| Observations | 5171452 | 5164576 | 4815589 | 608599 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | 1930 nonfarm labor force | 1930 mfg workers only |

*Notes:* The dependent variable is an indicator for whether the person moves from a nonfarm to farm residence. "Works in durable goods sector" is an individual-level variable; the other independent variables are county-level measures. All specifications include controls for age and age-squared, as well as state fixed effects. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C2: Alternate linking procedures: Farm mechanization and the movement to farms (compare to Tables 4 and A4)

*(a) Original*

| | Move to Farm 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | 0.227*** | 0.122* | | |
| | (0.0727) | (0.0636) | | |
| Ruggedness, 1935 county | | | 0.160*** | 0.224*** |
| | | | (0.0441) | (0.0745) |
| Bartik 1930-40 | | -0.145*** | | 0.206*** |
| | | (0.0441) | | (0.0603) |
| % Mfg in durables 1930 | | 0.0433*** | | -0.0188 |
| | | (0.0113) | | (0.0220) |
| % Emp in mfg 1930 | | -0.210*** | | 1.008*** |
| | | (0.0304) | | (0.0885) |
| Observations | 5482230 | 5443474 | 1909627 | 1878281 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | On farm in 1935 | On farm in 1935 |

*(b) Link 1: Using exact names and standard method*

| | Move to Farm 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | 0.219*** | 0.119* | | |
| | (0.0728) | (0.0629) | | |
| Ruggedness, 1935 county | | | 0.163*** | 0.218*** |
| | | | (0.0460) | (0.0789) |
| Bartik 1930-40 | | -0.140*** | | 0.195*** |
| | | (0.0406) | | (0.0600) |
| % Mfg in durables 1930 | | 0.0392*** | | -0.0212 |
| | | (0.0105) | | (0.0212) |
| % Emp in mfg 1930 | | -0.216*** | | 0.967*** |
| | | (0.0287) | | (0.0852) |
| Observations | 9836914 | 9766680 | 3580817 | 3520023 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | On farm in 1935 | On farm in 1935 |

Table C2: (cont.)

*(c) Link 2: Using NYSIIS standardized names and standard method*

| | Move to Farm 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | 0.214*** | 0.116* | | |
| | (0.0710) | (0.0605) | | |
| Ruggedness, 1935 county | | | 0.155*** | 0.206** |
| | | | (0.0442) | (0.0784) |
| Bartik 1930-40 | | -0.136*** | | 0.214*** |
| | | (0.0394) | | (0.0593) |
| % Mfg in durables 1930 | | 0.0398*** | | -0.0203 |
| | | (0.0105) | | (0.0222) |
| % Emp in mfg 1930 | | -0.215*** | | 1.023*** |
| | | (0.0279) | | (0.0853) |
| Observations | 10718691 | 10638859 | 4066749 | 3996290 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | On farm in 1935 | On farm in 1935 |

*(d) Link 3: Using exact names and conservative method*

| | Move to Farm 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | 0.231*** | 0.130* | | |
| | (0.0767) | (0.0657) | | |
| Ruggedness, 1935 county | | | 0.199*** | 0.239*** |
| | | | (0.0418) | (0.0663) |
| Bartik 1930-40 | | -0.146*** | | 0.132** |
| | | (0.0409) | | (0.0516) |
| % Mfg in durables 1930 | | 0.0398*** | | -0.0128 |
| | | (0.0108) | | (0.0183) |
| % Emp in mfg 1930 | | -0.227*** | | 0.837*** |
| | | (0.0288) | | (0.0740) |
| Observations | 7280972 | 7227291 | 2688185 | 2639636 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | On farm in 1935 | On farm in 1935 |

Table C2: (cont.)

*(e) Link 4: Using NYSIIS standardized names and conservative method*

| | Move to Farm 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | 0.234*** | 0.131** | | |
| | (0.0765) | (0.0644) | | |
| Ruggedness, 1935 county | | | 0.199*** | 0.231*** |
| | | | (0.0400) | (0.0653) |
| Bartik 1930-40 | | -0.149*** | | 0.145*** |
| | | (0.0397) | | (0.0493) |
| % Mfg in durables 1930 | | 0.0423*** | | -0.0106 |
| | | (0.0111) | | (0.0187) |
| % Emp in mfg 1930 | | -0.232*** | | 0.863*** |
| | | (0.0283) | | (0.0732) |
| Observations | 7003267 | 6947575 | 2771784 | 2720222 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | On farm in 1935 | On farm in 1935 |

*(f) Link 5: Require matches using all four alternative methods*

| | Move to Farm 1930-35 | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | 0.240*** | 0.139** | | |
| | (0.0780) | (0.0656) | | |
| Ruggedness, 1935 county | | | 0.211*** | 0.240*** |
| | | | (0.0405) | (0.0598) |
| Bartik 1930-40 | | -0.152*** | | 0.118** |
| | | (0.0393) | | (0.0472) |
| % Mfg in durables 1930 | | 0.0418*** | | -0.00868 |
| | | (0.0111) | | (0.0173) |
| % Emp in mfg 1930 | | -0.235*** | | 0.778*** |
| | | (0.0279) | | (0.0697) |
| Observations | 5187762 | 5145326 | 2042014 | 2003304 |
| Sample | Nonfarm in 1930 | Nonfarm in 1930 | On farm in 1935 | On farm in 1935 |

*Notes:* Panel (a) reproduces the results from the first 2 columns of Tables 4 and A4. The dependent variable is an indicator variable for whether the person resides on a farm in 1935, and the sample is restricted to males living in a nonfarm residence in 1930. The ruggedness measure is based on the person's county of residence in either 1930 or 1935, as indicated; the nonfarm employment variables are based on the 1930 county of residence. All individual-level specifications include controls for age and age-squared, as well as state fixed effects. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C3: Alternate linking procedures: Out-migration and off-farm migration 1930-35 (compare to Table 4)

*(a) Original*

| | moved out of 1930 county | | | off-farm mover |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | -0.0679 | -0.256*** | 0.0105 | 0.00831 |
| | (0.0478) | (0.0553) | (0.0635) | (0.0325) |
| % Mfg in durables 1930 | 0.00135 | -0.00239 | 0.0118 | -0.00571 |
| | (0.0195) | (0.00789) | (0.0299) | (0.00506) |
| Bartik 1930-40 | -0.0165 | -0.0291 | -0.0402 | 0.0000876 |
| | (0.0319) | (0.0176) | (0.0479) | (0.0162) |
| % Emp in mfg 1930 | -0.153*** | -0.126*** | -0.218*** | 0.184*** |
| | (0.0276) | (0.0189) | (0.0320) | (0.0183) |
| Observations | 8881460 | 2191071 | 6690387 | 2303357 |
| Sample | All males in 1930 | On farm in 1930 | Nonfarm in 1930 | On farm in 1930 |

*(b) Link 1: Using exact names and standard method*

| | moved out of 1930 county | | | off-farm mover |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | -0.0889* | -0.257*** | -0.0141 | -0.00864 |
| | (0.0480) | (0.0519) | (0.0623) | (0.0332) |
| % Mfg in durables 1930 | 0.00116 | -0.000165 | 0.00808 | -0.00268 |
| | (0.0210) | (0.00751) | (0.0321) | (0.00486) |
| Bartik 1930-40 | -0.0219 | -0.0452*** | -0.0395 | -0.000494 |
| | (0.0279) | (0.0156) | (0.0439) | (0.0137) |
| % Emp in mfg 1930 | -0.151*** | -0.140*** | -0.217*** | 0.176*** |
| | (0.0293) | (0.0190) | (0.0346) | (0.0168) |
| Observations | 16180358 | 4107118 | 12073240 | 4316741 |
| Sample | All males in 1930 | On farm in 1930 | Nonfarm in 1930 | On farm in 1930 |

Table C3: (cont.)

*(c) Link 2: Using NYSIIS standardized names and standard method*

| | moved out of 1930 county | | | off-farm mover |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | -0.0947** | -0.270*** | -0.0140 | -0.0171 |
| | (0.0469) | (0.0511) | (0.0582) | (0.0324) |
| % Mfg in durables 1930 | 0.00150 | -0.00202 | 0.0110 | -0.00179 |
| | (0.0199) | (0.00751) | (0.0307) | (0.00460) |
| Bartik 1930-40 | -0.0128 | -0.0369** | -0.0323 | -0.00377 |
| | (0.0266) | (0.0153) | (0.0417) | (0.0135) |
| % Emp in mfg 1930 | -0.133*** | -0.129*** | -0.203*** | 0.177*** |
| | (0.0298) | (0.0190) | (0.0354) | (0.0169) |
| Observations | 17868804 | 4695422 | 13173382 | 4941164 |
| Sample | All males in 1930 | On farm in 1930 | Nonfarm in 1930 | On farm in 1930 |

*(d) Link 3: Using exact names and conservative method*

| | moved out of 1930 county | | | off-farm mover |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | -0.0638 | -0.197*** | -0.00740 | 0.0169 |
| | (0.0383) | (0.0354) | (0.0574) | (0.0323) |
| % Mfg in durables 1930 | -0.00216 | -0.00492 | 0.00760 | -0.00437 |
| | (0.0198) | (0.00662) | (0.0308) | (0.00497) |
| Bartik 1930-40 | -0.0185 | -0.0319** | -0.0397 | 0.00323 |
| | (0.0278) | (0.0123) | (0.0435) | (0.0151) |
| % Emp in mfg 1930 | -0.149*** | -0.124*** | -0.216*** | 0.194*** |
| | (0.0261) | (0.0167) | (0.0317) | (0.0177) |
| Observations | 11967727 | 3063966 | 8903761 | 3218905 |
| Sample | All males in 1930 | On farm in 1930 | Nonfarm in 1930 | On farm in 1930 |

Table C3: (cont.)

*(e) Link 4: Using NYSIIS standardized names and conservative method*

| | moved out of 1930 county | | | off-farm mover |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | -0.0731* | -0.209*** | -0.0118 | 0.00721 |
| | (0.0380) | (0.0365) | (0.0542) | (0.0311) |
| % Mfg in durables 1930 | -0.00229 | -0.00743 | 0.0102 | -0.00359 |
| | (0.0184) | (0.00688) | (0.0293) | (0.00466) |
| Bartik 1930-40 | -0.0129 | -0.0242* | -0.0376 | 0.00234 |
| | (0.0276) | (0.0123) | (0.0429) | (0.0150) |
| % Emp in mfg 1930 | -0.136*** | -0.119*** | -0.205*** | 0.194*** |
| | (0.0264) | (0.0167) | (0.0323) | (0.0173) |
| Observations | 11758907 | 3182960 | 8575947 | 3348543 |
| Sample | All males in 1930 | On farm in 1930 | Nonfarm in 1930 | On farm in 1930 |

*(f) Link 5: Require matches using all four alternative methods*

| | moved out of 1930 county | | | off-farm mover |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Ruggedness, 1930 county | -0.0626* | -0.177*** | -0.0130 | 0.0225 |
| | (0.0351) | (0.0313) | (0.0531) | (0.0307) |
| % Mfg in durables 1930 | -0.00199 | -0.00755 | 0.0108 | -0.00486 |
| | (0.0176) | (0.00635) | (0.0281) | (0.00494) |
| Bartik 1930-40 | -0.0141 | -0.0246** | -0.0382 | 0.00395 |
| | (0.0279) | (0.0114) | (0.0434) | (0.0156) |
| % Emp in mfg 1930 | -0.139*** | -0.116*** | -0.208*** | 0.198*** |
| | (0.0243) | (0.0157) | (0.0299) | (0.0177) |
| Observations | 8659633 | 2327962 | 6331671 | 2445564 |
| Sample | All males in 1930 | On farm in 1930 | Nonfarm in 1930 | On farm in 1930 |

*Notes:* Panel (a) reproduces the results from columns 3-6 of Table 4. The dependent variable is an indicator for whether the person changed counties (columns 1-3) or an indicator for whether the person moved from a farm to nonfarm residence (column 4) between 1930 and 1935. The independent variables are based on the 1930 county of residence. All specifications include controls for age and age-squared, as well as state fixed effects. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# D Information on Ruggedness and Farm Mechanization

In this section we provide additional details on the relationship between ruggedness and farm mechanization. In Section 2.2 above we note that the relationship between farm mechanization and land topography has been discussed (Baker 1921; USDA 1932) and documented (Sorensen et al. 2008) in the prior literature. In an early study of farm tractors in New York, Myers (1921, p. 120) notes that a number of factors influenced whether a tractor would be a good investment for farmers, including "the type of farming, the farm layout, the topography of the farm, the soil type, the drainage, the number of horses that the tractor will displace, the financial condition of the farmer, and other factors." He also notes that the usefulness of tractors in New York at the time was limited by "small fields of irregular shape and uneven elevation" or "rough topography" (p. 121). Topography has also been noted as an impediment to tractor adoption in the American South. Musoke (1981) analyzes tractor adoption in the American South and notes that the "hilly uplands ... presented tremendous problems for large-scale mechanization" in the South Carolina Piedmont compared to the Mississippi Delta which "is for the most part flat". In *Mule South to Tractor South*, Ellenberg (2007, p. 103) notes that "At first, tractors made inroads in areas of the South where geography offered large, flat acreages." This historical literature supports our argument that the impact of ruggedness on mechanization remained relevant through the period of tractorization, and that this relationship was geographically widespread.

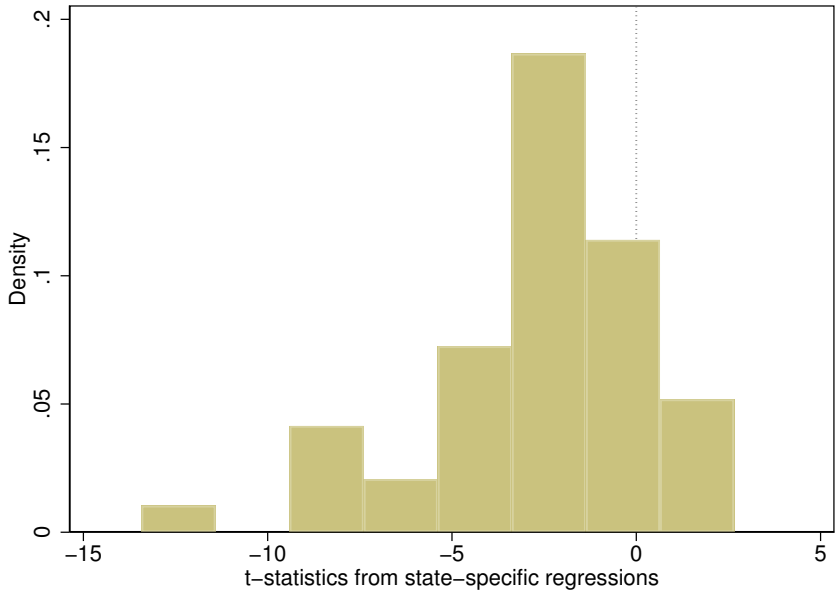
In Table 1 above, we displayed the results from a series of "first stage" regressions of various proxies for farm mechanization on ruggedness. Here we explore this first stage relationship further, by running a series of state-specific specifications where we regress the percent of farms in the county reporting tractors on average county-level ruggedness. We then take the t-statistics from the ruggedness estimate (the coefficient divided by the standard error), and plot a histogram of these t-statistics from the 48 state-specific regressions. This

histogram is displayed in Figure D1. In 41 out of 48 regressions, the estimated relationship is negative. In 27 states, the t-statistic is less than -2, compared to only one state with a t-statistic above +2. Table D1 repeats the first stage specifications from Table 1, but interacts the ruggedness measure with indicators for the four census regions. These results show that the effect of ruggedness is not driven by any particular region.

In Figure 4 above, we show a map of average county-level slope, our measure of ruggedness. As all of our empirical specifications include state fixed effects, we show in Figure D2 a map of residualized ruggedness. That is, we regress ruggedness on state fixed effects, and plot the (de-meaned) residuals. This figure better captures the identifying variation used in our regressions, and it shows that there is substantial within-state variation in topography throughout the country.

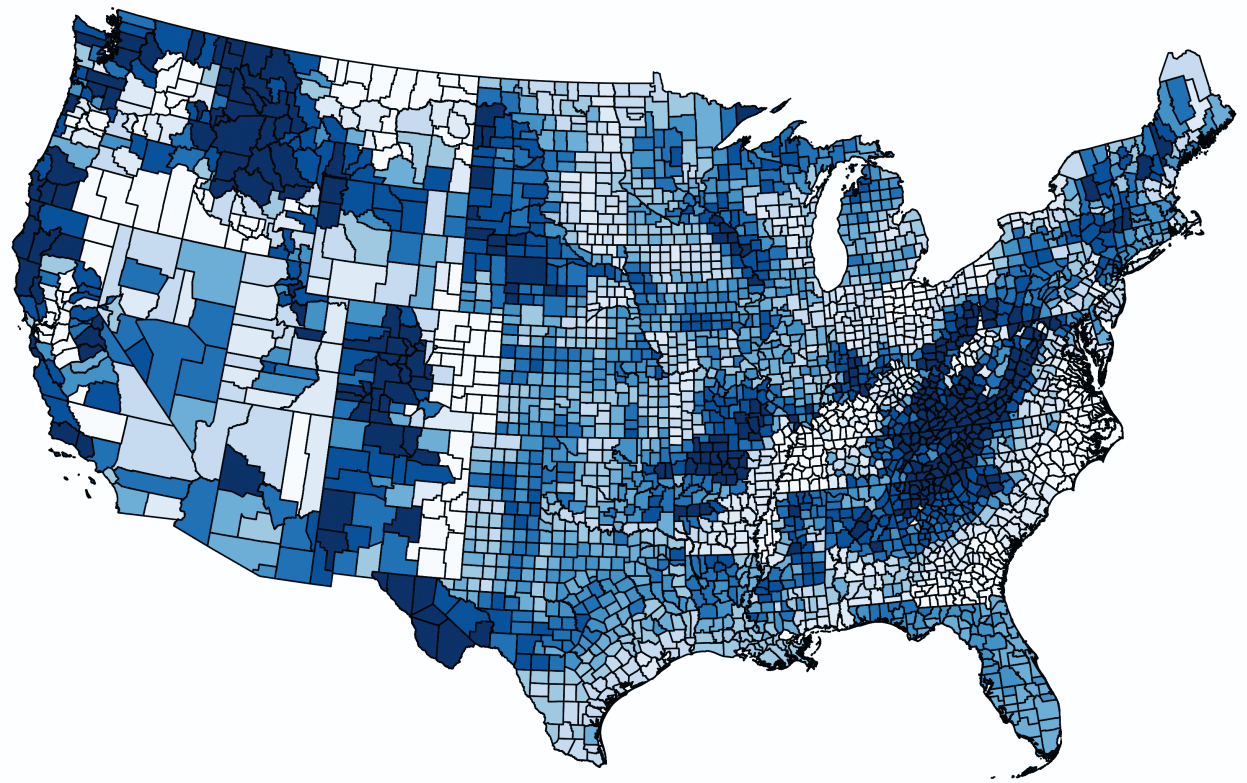
Finally, in Figure D3, we display a binned scatter plot of county-level tractors versus ruggedness, after residualizing for state fixed effects. The figure shows that the relationship between tractors and ruggedness appears relatively monotonic throughout the range of ruggedness.

Figure D1: Tractors vs. ruggedness: t-statistics by state



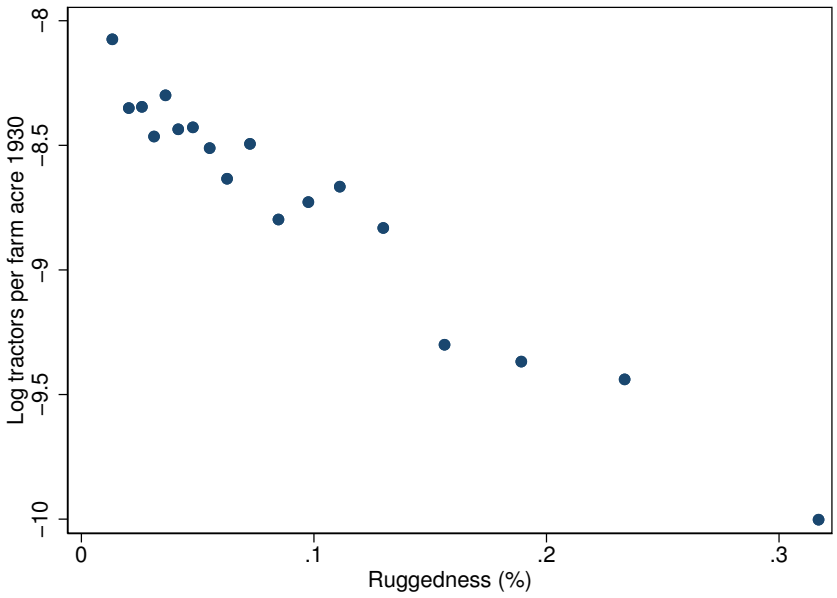

*Notes:* Histogram of t-statistics from 48 state-specific regressions of tractors on ruggedness. Separately for each state, we run a county-level regression of the percentage of farms reporting tractors in 1930 on the average ruggedness in the county. The t-statistic is the coefficient on ruggedness divided by its standard error. In 41 out of 48 regressions, the estimated relationship is negative. In 27 states, the t-statistic is less than -2, compared to only one state with a t-statistic above +2.

Figure D2: County-level ruggedness: Residuals



*Notes:* This figure plots the *residuals* from a regression of county-level average slope on state fixed effects. Compare to Figure 4.

Figure D3: Tractors vs. ruggedness: binned scatter plot




*Notes:* This figure displays a binned scatter plot of log tractors (per farm acre) in 1930 on county-level ruggedness, after controlling for state fixed effects.

Table D1: Rugged farm areas have lower rates of mechanization

| | (1) log tractors | (2) log tractors per acre | (3) % farms with tractors | (4) log equipment value | (5) log equipment value per acre |
|---|---|---|---|---|---|
| Northeast × Ruggedness | -5.967*** | -10.43*** | -1.035** | -1.811 | -6.280*** |
| | (2.081) | (1.852) | (0.426) | (1.119) | (0.545) |
| Midwest × Ruggedness | -9.246*** | -9.395*** | -1.287*** | -5.457*** | -5.586*** |
| | (1.382) | (1.483) | (0.172) | (0.697) | (1.090) |
| South × Ruggedness | -5.111** | -5.410** | -0.120*** | -2.414** | -2.552*** |
| | (2.172) | (2.289) | (0.0348) | (0.942) | (0.853) |
| West × Ruggedness | -6.338*** | -3.698*** | -0.909*** | -2.486*** | 0.239 |
| | (1.539) | (0.946) | (0.254) | (0.566) | (1.136) |
| Observations | 2114 | 2114 | 2129 | 2129 | 2129 |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties |

*Notes:* County-level regressions. Corresponds to Table 1, except that ruggedness is interacted with Census region. The column headers indicate the dependent variable for each specification, representing alternative measures of farm mechanization. All specifications additionally control for log population and log farm population in 1930, along with state fixed effects. The sample is restricted to counties with less than 30% of the population living in urban areas in 1930. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# E Threats to Validity and Alternative Interpretations

In this section, we provide further information on the robustness of our main results, expanding on the analysis described in Section 5.4. We begin by examining alternative agriculture-related channels by which ruggedness could be associated with the population and migration outcomes that we observe.

As noted above, parts of the country were faced with high temperatures, drought, and erosion. During our main time period of focus (1930-35), the years 1932-34 were most severely affected. In Table E1 we show that our main results are robust to a number of weather-related controls. Column 1 repeats our baseline estimates from earlier. In column 2 we add a number of control variables for temperature and precipitation, including each of the following variables separately for each of the years 1932 through 1934: the number of days that the high temperature exceeded 90°F; the number of days the high temperature was between 80 and 90; and the number of months of extreme drought, of severe drought, and of moderate drought. Including these 15 variables for temperature and precipitation has very little effect on our estimated ruggedness parameter. In column 3 we include an indicator for whether the county was classified as being impacted by the Dust Bowl in 1934, while the specification in column 4 controls for the fraction of the county experiencing medium and high levels of erosion.[49] Our estimates are very robust to the inclusion of these weather-related controls, indicating that the effects of ruggedness are unlikely to be driven by the weather shocks of the 1930s.

Another potential concern relates to the effect of ruggedness on the crop mix. Because ruggedness affects the suitability for large-scale, commercial, mechanized agriculture, less rugged areas are likely to be more integrated into the market-based agricultural economy. To the extent that ruggedness influences the crop mix, one possibility might be that farms in these areas are specializing in crops that experience larger price declines. The results in

[49] The weather variables used in columns 2 and 3 are from Fishback et al. (2011), while the erosion measures in column 4 are from Hornbeck (2012).

columns 5-7 of Table E1 suggest that this explanation is unlikely to fully account for our results. We add to our main county-level specifications a number of variables intended to control for the crop mix and the magnitude of exposure to the price decline.[50] The estimated effect of ruggedness remains highly significant in all specifications and declines in magnitude only slightly. While the mechanized farm areas may be more affected by the negative shock to the agricultural economy, this is not simply a function of the composition of crop production but likely due to their overall level of market integration more broadly.

We also examine whether differences in spending under the Agricultural Adjustment Act (AAA) could explain our findings. There is overlap between our sample period (1930-35) and the implementation of the AAA (passed in 1933), and AAA payments were more likely to be directed to the less rugged areas. Nonetheless we present several pieces of evidence that indicate that our results do not simply reflect the differences in AAA spending. First, we show that there is a statistically significant negative relationship between ruggedness and farm out-migration for farm owners as well as tenants (column 5 of in Table A13). The literature on the AAA argues that the policy led to out-migration from farm areas because many farm owners preferred to evict their tenants rather than share the AAA payments. This phenomenon would not explain our results for farm owners. (It is also not the case that our results are driven by farm owners using AAA payments to finance their own move out of agriculture, since we show in column 6 of Table A13 that ruggedness has no impact on their propensity to move to a nonfarm residence.) Second, we see a correlation between the overall performance of the national economy and the effects of ruggedness on population (Figure A5), which is consistent with the argument that the changing nature of the relationship between ruggedness and migration is driven by economic conditions as

[50] Our measures of the magnitude of the crop price shock are area-weighted averages based on the average annual growth rate in crop-specific prices between 1928 and 1932 and the county-level area reported in the 1920 agricultural census, following the procedure used by Rajan and Ramcharan (2015). We construct two alternative measures that differ based on the price series and crops covered. The first measure uses international prices provided by Blattman et al. (2007) for seven crops (cotton, wheat, maize, rice, tobacco, small fruits and sugar cane); the second uses U.S. prices from the Historical Statistics of the United States (see Olmstead and Rhode 2006a and Tables Da661-1062) for a larger number of crops (16 in all).

opposed to idiosyncratic policies of the 1930s. Third, national-level estimates of migration indicate that much of the movement to farms from towns and cities occurred during the earliest and deepest years of the crisis, before falling off substantially after 1933, when the recovery and the New Deal began (Figure A1). Finally, we include the total county-level AAA payments as a covariate in our regressions and display the results in column 8 of Table E1. We continue to see a very strong relationship between ruggedness and our migration outcomes, though the magnitude of the effect in panel (b) is reduced.

At the same time, it is possible that the AAA interacts with the phenomenon we are describing in this paper. The spatial pattern of AAA payments could be influenced by ruggedness and farm mechanization, and the effects of the AAA could also reflect the institutions of ownership and access to the land, which we identify as potentially important mechanisms above. While we are not able to fully characterize the interactions between the AAA programs and farm mechanization, these results suggest that the New Deal programs are unlikely to be driving our findings.

Finally, we show the results of additional robustness checks in Table E2. Column 1 again reproduces our baseline results for comparison. In columns 2 and 3, we show regressions controlling for the share of black population in the county and a crop suitability index, respectively, both of which are negatively correlated with ruggedness. The effect of ruggedness remains strongly significant. We also show that our results are not driven by any region in particular. To do so, we estimate a series of specifications excluding each of the four individual census regions as well as Appalachia. The results are displayed in columns 4-8. In each sample, the effect of ruggedness remains significant.

Table E1: Robustness

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| *Panel A. Dependent variable: % Farms w/ Movers 1935* | | | | | | | | |
| Ruggedness | 0.140*** | 0.143*** | 0.140*** | 0.142*** | 0.104*** | 0.116*** | 0.106*** | 0.110*** |
| | (0.0349) | (0.0411) | (0.0360) | (0.0352) | (0.0330) | (0.0333) | (0.0331) | (0.0380) |
| 1934 Dust Bowl | | | -0.0138*** | | | | | |
| | | | (0.00236) | | | | | |
| Medium Erosion | | | | -0.0140* | | | | |
| | | | | (0.00821) | | | | |
| High Erosion | | | | -0.0128 | | | | |
| | | | | (0.00771) | | | | |
| Crop price shock (1) | | | | | 0.231*** | | 0.232*** | |
| | | | | | (0.0819) | | (0.0842) | |
| Crop price shock (2) | | | | | | 0.119** | | |
| | | | | | | (0.0552) | | |
| Fraction wheat acreage | | | | | | | -0.0148 | |
| | | | | | | | (0.00974) | |
| Fraction corn acreage | | | | | | | -0.00571 | |
| | | | | | | | (0.00983) | |
| AAA spending 1933-35 | | | | | | | | -0.00319** |
| | | | | | | | | (0.00137) |
| *Panel B. Dependent variable: Log farm population 1930* | | | | | | | | |
| Ruggedness | 0.520*** | 0.475*** | 0.485*** | 0.526*** | 0.535*** | 0.516*** | 0.528*** | 0.306*** |
| | (0.0535) | (0.0633) | (0.0627) | (0.0529) | (0.0475) | (0.0551) | (0.0472) | (0.0882) |
| 1934 Dust Bowl | | | -0.0953*** | | | | | |
| | | | (0.0337) | | | | | |
| Medium Erosion | | | | -0.0228 | | | | |
| | | | | (0.0238) | | | | |
| High Erosion | | | | -0.0226 | | | | |
| | | | | (0.0225) | | | | |
| Crop price shock (1) | | | | | 0.104 | | -0.00310 | |
| | | | | | (0.314) | | (0.370) | |
| Crop price shock (2) | | | | | | 0.136 | | |
| | | | | | | (0.196) | | |
| Fraction wheat acreage | | | | | | | -0.00852 | |
| | | | | | | | (0.0320) | |
| Fraction corn acreage | | | | | | | 0.0456 | |
| | | | | | | | (0.0411) | |
| AAA spending 1933-35 | | | | | | | | -0.0173** |
| | | | | | | | | (0.00737) |
| Observations | 1967 | 1794 | 1941 | 1965 | 1870 | 1945 | 1870 | 1894 |
| Nonfarm employment | X | X | X | X | X | X | X | X |
| Temperature and Precip | | X | | | | | | |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties |

*Notes:* County-level regressions. All specifications include three "nonfarm employment" variables as controls (the percent of manufacturing employment in durables, the percent of employment in manufacturing, and the Bartik measure), as well as log population in 1930, log farm population in 1930, and state fixed effects. The sample is restricted to counties with no more than 30% of the population in urban areas. "Temperature and Precip" controls include 15 weather controls for the years 1932-1934; see Section 5.4 for details. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table E2: Additional Robustness

| | | | | Excludes: | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) Baseline | (2) | (3) | (4) Northeast | (5) Midwest | (6) South | (7) West | (8) Appalachia |
| *Panel A. Dependent variable: % Farms w/ Movers 1935* | | | | | | | | |
| Ruggedness | 0.140*** | 0.116*** | 0.137*** | 0.138*** | 0.159*** | 0.186** | 0.0987*** | 0.233*** |
| | (0.0349) | (0.0403) | (0.0375) | (0.0348) | (0.0392) | (0.0717) | (0.0317) | (0.0670) |
| Fraction Black | | -0.0267** | | | | | | |
| | | (0.0104) | | | | | | |
| Average suitability, 8 crops | | | -0.0159 | | | | | |
| | | | (0.0124) | | | | | |
| *Panel B. Dependent variable: Log farm population 1930* | | | | | | | | |
| Ruggedness | 0.520*** | 0.507*** | 0.495*** | 0.521*** | 0.529*** | 0.374*** | 0.545*** | 0.353*** |
| | (0.0535) | (0.0513) | (0.0515) | (0.0541) | (0.0580) | (0.104) | (0.0544) | (0.0911) |
| Fraction Black | | -0.0149 | | | | | | |
| | | (0.0340) | | | | | | |
| Average suitability, 8 crops | | | -0.0357 | | | | | |
| | | | (0.0762) | | | | | |
| Observations | 1967 | 1967 | 1960 | 1904 | 1353 | 897 | 1747 | 1191 |
| Nonfarm employment | X | X | X | X | X | X | X | X |
| Sample | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties | Rural counties |

*Notes:* County-level regressions. The estimates in column 1 correspond to columns 2 and 4 in Table 3a. "Fraction Black" is the share of the county population that is black. For "Average suitability, 8 crops", see notes to Table A3. The final column excludes the following states containing any counties in Appalachia: NY, PA, OH, WV, MD, VA, KY, TN, NC, SC, GA, AL, and MS. All specifications include three "nonfarm employment" variables as controls (the percent of manufacturing employment in durables, the percent of employment in manufacturing, and the Bartik measure), as well as log population in 1930, log farm population in 1930, and state fixed effects. The sample is restricted to counties with no more than 30% of the population in urban areas. Robust standard errors in parentheses, adjusted for clustering at the state level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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