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ENVIRONMENTAL MIGRATION AND RACE DURING THE GREAT AMERICAN DROUGHT, 1935-1940

Christopher Sichko
Ariell Zimran
Aparna Howlader

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ABSTRACT

We study racial differences in internal migration responses to one of the most severe climatic shocks in US history—the drought of the 1930s. Using data from the 1940 census on 65 million adults, we find that individuals exposed to more severe drought between 1935 and 1940 were more likely to make an inter-county move and that this responsiveness was greater for black individuals than white individuals. This racial difference was particularly pronounced among the rural population. Black individuals' migration premium came despite their systematic disadvantage in the economy of the 1930s and evidence along dimensions other than race that disadvantage limited individuals' ability to adapt to the drought through migration. Federal relief spending under the Agricultural Adjustment Act (AAA) magnified this racial difference, reducing the migration response to drought for white individuals and increasing it for black individuals. These results help to better understand how the reaction of different groups aggregate to determine the magnitude and composition of migration responses to natural disasters, as well as the roles of migration and government policy in disadvantaged groups' responses to natural disasters.

Christopher Sichko
Economic Research Service
USDA
Christopher.Sichko@usda.gov

Ariell Zimran
Department of Economics
Vanderbilt University
2301 Vanderbilt Place
Nashville, TN 37235
and NBER
ariell.zimran@vanderbilt.edu

Aparna Howlader
Department of Economics
School of Business and Enterprise
Chatham University
Pittsburgh, PA 15206
a.howlader@chatham.edu

A data appendix is available at http://www.nber.org/data-appendix/w33409

1 Introduction

As the effects of climate change manifest in the form of more frequent and more severe natural disasters (Banholzer, Kossin, and Donner 2014), understanding whether, to what extent, and under what circumstances individuals respond to such disasters through migration has become an increasingly important goal of the economics of migration.[1] The effects of natural disasters on the magnitude and composition of migration are theoretically ambiguous and empirical estimates are highly context dependent (e.g., Mahajan and Yang 2020; Spitzer, Tortorici, and Zimran 2025). Nonetheless, a body of research has emerged documenting a series of natural disasters with no effect or a negative effect on migration.[2] Such findings raise concerns regarding *trapped populations* and an *immobility paradox*—a situation in which some individuals want to respond to a climatic shock through migration but for some reason, usually a liquidity constraint that may have been exacerbated by the shock itself,[3] are unable to (e.g., Beine, Noy, and Parsons 2021; Hirvonen 2016; Nawrotzki and DeWaard 2018). Together with evidence that disadvantaged groups may be more affected by climatic shocks,[4] such findings that economic disadvantage might hinder the ability to adjust to environmental shocks through migration suggest that systematically disadvantaged groups might disproportionately bear the burden of environmental shocks. That is, such individuals might both be more likely to be exposed to natural disasters and less likely to be able to move to escape their effects,[5] leading natural disasters to exacerbate inequality. However, scholarship illuminating differences in migration responses to natural disasters between relatively advantaged and disadvantaged groups is lacking.

In this paper, we study differences in black and white individuals' internal migration responses to one of the most severe climate shocks in US history—the Great American Drought of the 1930s.

[1] See Berlemann and Steinhardt (2017), Black et al. (2013), Boustan et al. (2020), Deryugina, Kawano, and Levitt (2018), and Deryugina and Molitor (2020).

[2] See, for instance, Beine and Parsons (2015), Cattaneo and Peri (2016), Gröschl and Steinwachs (2017), Halliday (2006), Hunter, Murray, and Riosmena (2013), Spitzer, Tortorici, and Zimran (2025), and Yang (2008b).

[3] See, for instance, Beine and Parsons (2017), Cattaneo and Peri (2016), Gröschl and Steinwachs (2017), Nawrotzki and DeWaard (2018), Sheldon and Zhan (2022), and Sichko (2024) for evidence that natural disasters generate greater migration responses for better off individuals, households, regions, or countries.

[4] See Benevolenza and DeRigne (2019), Capelli, Costantini, and Consoli (2021), Deuchert and Felfe (2015), and Sakai et al. (2017).

[5] Interestingly, in this case, black individuals were less likely to experience the drought.

This shock, of which the Dust Bowl is the most widely known portion (Cook, Seager, and Smerdon 2014), comprised the worst decade of drought in US history, with the Great Plains in particular experiencing severe or worse drought conditions every year from 1934–1939 except 1938 (Cook et al. 2010; Seager et al. 2008). Striking in tandem with the Great Depression, the drought was responsible for substantial economic turmoil and hardship (Sichko 2021). The effects of this drought and the related shocks of wind erosion and the Dust Bowl on the quantity and selection of internal migration have been studied in detail (e.g., Gutmann et al. 2016; Hornbeck 2023; Long and Siu 2018; Sichko 2024, 2025). However, differences in the effects of this drought on migration according to race have not been studied. As a result of the substantial racial disparities of the period, investigating such differences is essential to a study of this context. Furthermore, given the continued presence of racial disparities in the modern economy, understanding this dimension of response to the drought can help to bring the effects of modern natural disasters into sharper focus.

Our primary data source is the complete US Census of 1940 (Ruggles et al. 2021, 2023). The 1940 census was the first in US history to document internal migration, inquiring about individuals' place of residence 5 years prior in 1935. This enables us to observe the migration decisions of all 65 million adults, both male and female, simply by comparing their places of residence in 1935 and 1940. The 1940 census also provides a wealth of individual-level data, most importantly enabling us to determine individuals' race and their level of education. We combine these data with county-level drought severity measures derived from Cook et al. (2010), and data on federal spending on the Agricultural Adjustment Act (AAA) and other New Deal programs by county (Fishback, Horrace, and Kantor 2005, 2006).

The 1940 census data provide an important benefit in studying internal migration in US history because they enable us to observe internal migration without the need to make links between censuses—an approach that is highly error prone (Sasaki and Zimran 2025; Zimran 2024). Nonetheless, we also use a dataset of men linked from the census records of 1930 to 1940 to supplement our analysis. The chief benefit of this dataset is that it enables us to observe directly individuals' pre-migration characteristics. This includes their homeownership status, which is our main focus in using these linked data, as well as other valuable pre-migration controls, such as occupational

status.

Our main focus is on the difference in migration responses to the drought by race. Conditioning on a broad set of individual- and county-level controls, as well as geographic fixed effects, we find, as has previously been shown by Gutmann et al. (2016) and Sichko (2021), that individuals whose 1935 residence was in a county that experienced moderate or severe drought from 1935–1939 were more likely to make an inter-county move by 1940 as compared to similar individuals from similar places who experienced no or mild drought. We add to this by showing that the degree to which individuals responded to drought conditions through migration differed by race, and in particular that black individuals were more likely to migrate in response to drought than were white individuals. The magnitude of this difference is large: whereas white individuals experiencing drought were about 1.4 percentage points more likely to migrate than otherwise similar white individuals in the same state experiencing no or mild drought, this difference was 2.6 percentage points for black individuals relative to a lower base rate in no- or mild-drought counties.[6] The black drought migration premium was particularly large in the rural sector: among those living in rural areas in 1935, white individuals experiencing drought were 1.7 percentage points more likely to migrate than similar white individuals who did not experience drought, whereas for black individuals this premium was 4.1 percentage points. Black individuals' greater migration responsiveness to drought is surprising, both in light of the literature on trapped populations and given evidence along other selection dimensions that disadvantage may have hindered individuals' ability to respond to the drought shock through migration. In particular, consistent with Sichko (2024), we find that, for individuals of either race, greater education was associated with a greater migration response to drought—a result that Sichko (2024) attributes to liquidity constraints inhibiting migration, as envisioned by the trapped populations literature.

The Agricultural Adjustment Act (AAA) provided financial inflows to the drought-affected region as part of a federal effort to provide relief from the combined shocks of the drought and the Great Depression. This spending was distributed to drought-stricken agricultural communities, but

[6]The figure for black individuals is the sum of the drought main effect and the interaction of drought and a black indicator. Our results are robust to the use of a logit specification instead of a linear probability model, to the use of linked data, to the inclusion of county fixed effects in the regression, and to the limitation of the sample to states with a particularly dense black population in the drought area.

was limited in large part to land owners and required that land be taken out of production as a condition of receipt (Rasmussen 1983). Fishback, Horrace, and Kantor (2006) have shown that AAA spending was associated with greater out-migration from targeted counties in the 1930s,[7] which they argue was the product of farmers' incentives to remain and receive payments being outweighed by the underlying incentive to leave due to the combined shocks of drought and depression and the reductions in labor demand coming from the removal of land from production. Consistent with this result, we find that greater AAA spending in a county was associated with higher rates of out migration. We also find that this impact was larger for black individuals, consistent with black individuals being less likely to receive relief payments and more likely to have been affected by reductions in agricultural labor demand due to lower rates of land ownership (Collins, Holtkamp, and Wanamaker 2024; Collins and Margo 2011).[8] Indeed, consistent with land ownership moderating the migration-inducing impact of AAA spending, we use linked data with information on individuals' 1930 homeownership status to find that home owners of both races were less responsive in migration to AAA spending.

We then study how AAA spending affected the migration response to drought. We find that greater AAA spending widened the gap between black and white individuals' migration responses to drought. For white individuals, our analysis indicates that AAA spending provided relief from drought in the sense that greater AAA spending was associated with a smaller migration response to drought, suggesting that it enabled them to weather the shock without migrating—a result consistent with the effects of other financial inflows to disaster-affected regions (e.g., Paul 2005). But for black individuals, AAA spending was associated with a greater drought migration premium. Coupled with the general migration premium associated with AAA spending in general, and for black individuals in particular, these results paint a mixed picture of the role of government spending in the context of the drought: while government spending provided relief for some, it did not do so for the main disadvantaged minority group in this context, and, in fact, drove displacement more broadly.

[7] Their focus, however, was on the Cotton South, whereas our sample includes the entire United States.

[8] This result is consistent with results for net changes in tenancy and sharecropping by race in the South (Depew, Fishback, and Rhode 2013).

This paper contributes to the literature on US internal migration in modern (Jia et al. 2023; Molloy, Smith, and Wozniak 2011) and historical (Ferrie 2006; Rosenbloom and Sundstrom 2004; Zimran 2024) contexts, and in particular to the portion of this literature focusing on migration by black individuals in the early twentieth century (e.g., Boustan 2017; Collins and Wanamaker 2014, 2015). It also adds to the literature on the effects of the drought and Dust Bowl of the 1930s (e.g., Arthi 2018; Hornbeck 2012), on the broader economic situation of the 1930s (Fishback 2017), and on the intersection of these shocks with migration (e.g., Fishback, Horrace, and Kantor 2006; Gutmann et al. 2016; Hornbeck 2023; Long and Siu 2018; Sichko 2024, 2025).[9] These literatures have developed a detailed understanding of migration patterns in the 1930s for the population as a whole,[10] and separately by race, as well as of the effects of exposure to natural disasters on migration. Investigating the intersection of these—the differential migration responses to the 1930s drought along the dimension of race—is our contribution to these literatures.

This paper also contributes to the economics of migration in response to natural disasters. First, this paper adds to the literature on migrant selection in response to natural disasters and climate shocks. Difficulties in accessing individual-level data have hampered this literature,[11] forcing researchers in many cases to use aggregate-level data that make results susceptible to the ecological fallacy. Moreover, much of the recent literature on disaster migration is situated in the modern migration environment in which selective and restrictive policy can artificially alter the composition of flows of disaster migrants. Our setting of internal migration and individual-level data obviate these concerns. Indeed, the intersection of a shock of historic proportions with a uniquely detailed

[9]Related research focuses on dust storms and soil erosion (Hornbeck 2012, 2023; Long and Siu 2018). Dust storms, soil erosion, and drought were related but distinct environmental disasters. Dust storms and soil erosion were caused by farming practices unique to the 1930s US and drought (Hansen and Libecap 2004). Therefore, studying dust storms and soil erosion is, in part, studying the impact of an environmental shock and, in part, farming practices. Drought was the underlying environmental shock that contributed to dust storms and soil erosion, and droughts remain among the most common and destructive environmental shocks, while the farming practices that contributed to 1930s dust storms and erosion changed starting in the late 1930s. The study of the drought is also more appropriate to the time horizon that we cover—soil erosion constituted a long-term shock to the attractiveness of a location (Hornbeck 2023), but the 1940 census data only enable us to observe short-term effects, and so we focus on the more immediate—though still substantial—shock.

[10]See Boone and Wilse-Samson (2023) and Zimran (2024) for discussions of the changing nature of internal migration in the United States in the 1930s.

[11]See, for instance, Beine and Parsons (e.g., 2017), Cattaneo and Peri (2016), Gröschl and Steinwachs (2017), Nawrotzki and DeWaard (2018), and Spitzer, Tortorici, and Zimran (2025). Gutmann et al. (2016), Hornbeck (2023), Sedova and Kalkuhl (2020), and Sichko (2024, 2025) do use individual-level data.

dataset provides a unique setting to study. To our knowledge, selection in the sense of the differential responses of disadvantaged minority groups, which is our focus, has not been studied either in this context or more broadly.[12]

In addition to helping to expand this limited literature, our results make several interesting contributions in this regard. First, we show that, even in a situation in which one dimension of selection (education) shows evidence of positive selection, it need not be the case that disadvantaged minority groups are less likely to migrate. This finding has important implications for understanding the extent to which such groups may be subject to concerns over trapped populations. We also show that migration may be a different adjustment mechanism for disadvantaged minorities than for more advantaged groups, as they may migrate not only to avoid the shock but also in response to governmental reactions that make remaining home less tenable. Indeed, we find that government policy is an important determinant of how minority groups react to environmental shocks, thus adding to a growing body of literature documents the consequences of government spending, laws, and regulations that are ostensibly race-neutral but nonetheless have implications for racial inequality (Muhammad, Sichko, and Olsson 2024).

Our second contribution to the disaster migration literature is to illuminate mechanisms by which natural disasters may affect migration. Financial (Bettin and Zazzaro 2018; David 2011; Mohapatra, Joseph, and Ratha 2009; Yang 2008b), and especially governmental relief (Paul 2005), inflows have been shown to follow natural disasters and to impact migration responses to them. Attachment to land has also been posited as a factor limiting migration responses to natural disasters (Spitzer, Tortorici, and Zimran 2025). Our findings regarding the role of AAA spending and land ownership illustrate how these factors can intersect to shape migration responses to natural disasters and show how the particular structure and targeting of relief spending can determine its effects on migration as an adjustment mechanism.

[12]Mastrorillo et al. (2016) study racial differences in migration responses to climate variability in South Africa, but in that context the disadvantaged group is the majority, not the minority. Nonetheless, the results are likely informative for our case.

2 Background

2.1 Migration responses to natural disasters

A simple push-pull view of migration views natural disasters as reducing the utility of remaining in the affected area—for instance by reducing incomes or destroying capital in the affected area—thus increasing individuals' incentives for and probability of emigration.[13] In practice, however, several forces have been shown to dampen or even reverse such a positive effect of disasters on migration.[14] The most commonly cited such mechanism is that natural disasters might exacerbate liquidity constraints, thus reducing individuals' ability to finance migration.[15] Migration in response to natural disasters has also been shown to be potentially hindered by agricultural institutions that bind individuals to the land. For instance, Spitzer, Tortorici, and Zimran (2025) show that agricultural relationships such as ownership, tenancy, and sharecropping, as opposed to unattached day laboring, were associated with reduced responsiveness to a major earthquake.

Mechanisms such as these have been hypothesized as explanations for cases in which natural disasters are not followed by migration responses—a confluence of circumstances that has led some researchers to speculate that, in some cases, poor and otherwise disadvantaged populations would want to respond to disasters by leaving the affected area but are unable to do so. These so-called trapped populations, already disadvantaged, may have their disadvantage compounded by being even more strongly affected by disasters (Beine, Noy, and Parsons 2021; Nawrotzki and DeWaard 2018).

Other mechanisms, however, might limit migration responses to natural disasters by counteracting the greater incentive to move generated by the shock rather than by preventing individuals

[13] On the effects of natural disasters on incomes see, for instance, Baez and Santos (2008), Banerjee (2007), Cai et al. (2016), Caruso (2017), Deryugina, Kawano, and Levitt (2018), Gröger and Zylberberg (2016), and Spitzer, Tortorici, and Zimran (2025). For examples of natural disasters increasing migration probabilities, see, for instance Bohra-Mishra, Oppenheimer, and Hsiang (2014), Dallmann and Millock (2017), Dillon, Mueller, and Salau (2011), Drabo and Mbaye (2014), Gray and Mueller (2012), Gröger and Zylberberg (2016), Gutmann et al. (2016), Hornbeck (2012), Karadja and Prawitz (2019), Mahajan and Yang (2020), Mastrorillo et al. (2016), Mueller, Gray, and Kosec (2014), Murathanoğlu (2023), Reuveny and Moore (2009), and Thiede, Gray, and Mueller (2016).

[14] See, for instance, Beine and Parsons (2015), Cattaneo and Peri (2016), Gignoux and Menéndez (2016), Gröschl and Steinwachs (2017), Halliday (2006), Hunter, Murray, and Riosmena (2013), Paul (2005), Penning-Rowsell, Sultana, and Thompson (2013), Spitzer, Tortorici, and Zimran (2025), and Yang (2008b).

[15] See, for instance, Beine and Parsons (2017), Cattaneo and Peri (2016), Gröschl and Steinwachs (2017), Hirvonen (2016), Nawrotzki and DeWaard (2018), and Sichko (2024).

from moving. For instance, the destruction wrought by a disaster may lead to growth in demand for reconstruction labor after the shock, potentially raising local wages and reducing the gains to migration (Kirchberger 2017). A similar mechanism can be faced within the household rather than through the market—in the wake of the disaster, the marginal product of labor invested in reconstruction at home may increase, also reducing incentives for emigration (Halliday 2006). Migration might also be reduced in response to financial inflows to affected regions, which might come in the form of private or public reconstruction aid, remittances by prior migrants, or governmental relief (Bettin and Zazzaro 2018; David 2011; Mohapatra, Joseph, and Ratha 2009; Murathanoğlu 2023; Paul 2005; Yang 2008a). Such inflows can dampen the impact of the shock, eliminating or reducing the incentive to leave.

The same mechanisms determining the magnitude of the migration response to natural disasters also shape the composition of any such flows. For instance, liquidity constraints have been shown to induce positive selection into migration (e.g., Angelucci 2015; Belot and Hatton 2012; Chiquiar and Hanson 2005; McKenzie and Rapoport 2010; Orrenius and Zavodny 2005; Spitzer and Zimran 2018). If such constraints are exacerbated by a disaster, they might also drive positive selection into migration in response to natural disasters. Little is known, however, regarding the nature of selection into disaster-driven migration. Moreover, much of what is known is based on heterogeneity in migration responses in aggregate data—for instance, a greater migration response among better-off regions or countries is interpreted as evidence of liquidity constraints impeding migration (e.g., Nawrotzki and DeWaard 2018). Such results are, of course, subject to the ecological fallacy, but are necessary given the limited availability of individual-level data with which to study the impacts of natural disasters on the composition of migratory flows. Where such data are available (e.g., Sedova and Kalkuhl 2020; Sichko 2024), estimates of migrant selection are context dependent, and generally focus on either wealth or agricultural status.

Two issues in the literature on the response of the magnitude and composition of natural disasters to migration highlight the contribution of this paper. The first is the limited understanding of selection into disaster migration. Within this already limited literature, the differences between the response of majority and disadvantaged minority groups to natural disasters remains understudied

(c.f., Mastrorillo et al. 2016). Our study highlights and investigates these differences. The response of minority groups is particularly important to understand in light of concerns over trapped populations. Insofar as such populations are the product of economic disadvantage, the concern arises that disadvantaged minority groups might be more likely to be constrained in their migration, and thus might be less able to migrate to avoid the impacts of natural disasters.

Our unique setting of a substantial shock intersecting with complete-count individual-level data enables us to illuminate this aspect of the migration effects of natural disasters. Our focus on a setting of internal migration also sidesteps concerns that many existing studies' findings of the existence of trapped populations derive from modern settings in which substantial legal obstacles to migration might artificially limit the ability of some groups to migrate more than others.

The second issue underlying our contribution is that, although a number of potential mechanisms for the migration effects of natural disasters have been posited, the fact that each natural disaster is unique implies that a myriad of cases must be studied in order to better understand when and under what circumstances each mechanism applies. We add another case to this body of evidence, highlighting the roles of attachment to land and of government relief spending in shaping the composition of migration rather than simply its magnitude. We also show how these mechanisms can differ in their impacts across majority and minority groups.

2.2 Race, migration, and drought in the 1930s United States

The drought of the 1930s marked the most severe 10-year drought in US history (Heim 2017; Sichko 2021). Starting in 1930 in the southeast, the drought persisted with varying intensity across the country until 1939. The year 1934, distinguished as the worst drought year in the last millennium, marked a turning point, elevating the drought to levels unmatched by previous or subsequent droughts (Cook, Seager, and Smerdon 2014; Cook et al. 2007). From 1934 onward, the Great Plains, particularly the northern Plains, bore the brunt of the drought. Notably, 1938 stands out as the sole year without a significant portion of the Plains experiencing severe or worse drought conditions from 1934 to 1939. Despite the severity, extensive reach, and prolonged duration of the drought, research on its economic impact is remarkably scarce, partly because of the fact that detailed geographic

data on drought severity only became available in the last few decades.

There is a substantial body of research studying migration in response to this drought, though the disaster is operationalized in several different ways in this literature. The largest set of studies focuses on the Dust Bowl, which is a geographically smaller, though widely recognized, portion of the drought region. In particular, studies focus on either the core 20 southern Great Plains counties identified by the US Department of Agriculture's Soil Conservation Service (Joel 1937) as having been most affected by wind erosion and dust storms in the 1930s, or on a broader set of about 100 counties in the same area (e.g., Gregory 1991; Hurt 1981; Long and Siu 2018; Riney-Kehrberg 1994; Worster 1979 [2004]). Hornbeck (2012, 2023) instead focuses on erosion in a broader set of Great Plains counties. Finally, as we do, Gutmann et al. (2016) and Sichko (2021, 2024, 2025) focus on the drought itself. This focus benefits from the fact that soil erosion was the product of a combination of drought and farming practices, where the latter may have been endogenous to local characteristics.

The bulk of this literature focuses on the magnitude of the response of migration or of net population flows (e.g., Gutmann et al. 2016; Hornbeck 2012; Long and Siu 2018), finding evidence of outflows from the Great Plains and a decline of in-migration to the core Dust Bowl area. Studies of selection into migration in this context are rarer (Hornbeck 2023; Long and Siu 2018; Sichko 2024). Sichko (2024) finds that the probability of migration from drought was increasing in education. Hornbeck (2023) finds that the average migrant from wind-eroded places was negatively selected in terms of education. Long and Siu (2018) find neutral selection for migrants from the core Dust Bowl on either unobservables or on a broad set of observables.

What is lacking in the literature on migration and the 1930s drought is an understanding of the role of race. Prior research has included individuals of all races, but because the drought-affected areas were overwhelmingly white, the fact that this prior research has not studied differences in responses across races essentially entails a focus on the white population. This paper aims to shift the focus and to understand the extent to which a disadvantaged minority—black individuals—were able to follow the bulk of the population and use migration as an adjustment mechanism in the face of drought.

One of the main governmental responses to the drought and Dust Bowl came in the form of the Agricultural Adjustment Act (AAA).[16] AAA spending, which eventually totaled over $1.9 billion, or over 12 percent of all New Deal grants (Fishback, Kantor, and Wallis 2003), aided the drought-stricken agricultural communities of the Great Plains, with the greatest per-capita spending in the region of the traditional Dust Bowl.[17] In addition to providing relief payments to farmers, a goal of AAA spending was to raise agricultural prices by reducing surpluses, with goal reductions of 25 to 50 percent for targeted crops (Howlader 2024). To this end, payments were targeted to landowners and were conditional on the removal of land from production. While such payments would have reduced land-owning farmers' incentives to emigrate, others would not only have had to endure drought without aid, but would also have suffered from the reduction in labor demand due to land being removed from production. Fishback, Horrace, and Kantor (2006) find that AAA payments were associated with greater outmigration, indicating that the latter effect outweighed the former. This pattern differed from the effects of other New Deal public works spending, which was broadly targeted and attracted in-migration. The AAA also had effects beyond migration. In the South, where the bulk of the black population lived, it has been shown that the AAA had racially disparate effects as a result of different exposure to institutions such as share tenancy and sharecropping by race, with a greater reduction in tenancy and sharecropping among the black than the white population (Biles 1994; Depew, Fishback, and Rhode 2013).

The unique broader context of the 1930s also contributes to shaping the environment that we study. Most importantly, the drought came in the midst of the Great Depression. As is typically the case during economic downturns (e.g., Molloy, Smith, and Wozniak 2011; Saks and Wozniak 2011), internal migration rates in the 1930s had fallen substantially relative to their prior levels (Zimran 2024), though there were population flows away from areas particularly hard-hit by the downturn (Boone and Wilse-Samson 2023; Boustan, Fishback, and Kantor 2010). This was true for white individuals, for whom internal migration rates had previously been largely stable (Zimran 2024). It was also true for black individuals, for whom the 1930s marked a pause in the Great Migration—an

[16]This is not to say that drought relief was the primary goal of the AAA. But AAA spending was important in areas affected by the drought.

[17]See also Figure 5.

acceleration of internal migration that began around 1910 and would stretch to about 1970 (Collins 1997; Collins and Wanamaker 2015; Derenoncourt 2022). Despite this ongoing migration, most black individuals still lived in the South in 1935.[18] The South was characterized by widespread discrimination, including segregated schools that received less funding, resources, and opportunities compared to white schools (e.g., Baker 2019). Black communities, already vulnerable and facing poverty, were particularly affected by the Great Depression, with high unemployment rates and a disproportionate impact due to discriminatory employment practices (e.g., Sundstrom 1992).

3 Data

3.1 Sources and construction

Our main data source is the complete 1940 US Census (Ruggles et al. 2021, 2023), which provides extensive demographic information, such as age, race, gender, and education, for each person in the United States at this time, including 65 million adults (both men and women) aged 23–70 (i.e., aged 18–65 in 1935), who constitute our sample of interest. Most important for our purposes is that the census inquired about information at the time of the census, as well as about each individual's place of residence 5 years earlier, marking an important change relative to earlier censuses. Prior to this point, the only ways to study internal migration in the United States are to either use information on individuals' place of birth—which is informative only of the lifetime inter-state migration of natives—or to use linked census data (Zimran 2024), which are prone to error (Abramitzky et al. 2021; Bailey et al. 2020; Sasaki and Zimran 2025), and omit large fractions of the population. For the period 1935–1940, on the other hand, an individual's migration status is directly reported,[19]

[18] In 1930, the black population remained predominantly concentrated in the South, as depicted in Figure 2. While the drought of the late 1930s primarily impacted regions with a lower black population, there was also drought in the early 1930s that severely affected much of the South, with over half of the black population experiencing two or more drought years during this period. To our knowledge, no research has specifically examined the impact of drought on blacks in the 1930s. Although beyond the scope of this paper, this is an area that merits further investigation.

[19] A limitation of our use of the census data is that the precise timing of individuals' migration is unobserved; individuals who migrated over the period 1935 to 1940 might have done so at any point in this span, meaning that the drought exposure of their 1935 county of residence over the 1935–1939 period may not capture each individual's true drought exposure. For this to be a concern (i.e., for our results to be spurious), it would have to be the case that individuals systematically migrated away from drought counties for reasons other than drought before they experienced a drought.

enabling us to observe the inter-county migration of all adults over a known period of time with no error or exclusion.[20]

The main drawback to the use of the 1940 census is that we are limited in the extent of pre-migration data that we can observe. While the 1940 census reports socioeconomic information of interest such as occupation and income, these are all observed in 1940, after any migration had taken place, making this information endogenous to the migration decision that we study. However, by focusing on race, age, and gender, we can be sure that the characteristics that we observe are pre-determined. We also use the education data despite the fact that they were collected in 1940, relying on our focus on individuals at least 18 years old in 1935 to reduce the likelihood that individuals would have accrued additional education in the 1935–1940 period.[21]

As a secondary source, we also construct a dataset linking individuals between the 1930 and 1940 complete-count census records using the linkages from the Census Linking Project (Abramitzky et al. 2020). To reduce the risk of false linkages, we use the intersection of the two most conservative linkage methods from this source. As is standard in the use of linked data, we weight each individual observation according to the inverse of its linkage probability conditional on a broad set of observables. As mentioned above, using linked data brings with it several drawbacks. The most severe issues in our case are that linkage necessarily creates an unrepresentative sample, in part because some portions of the population generally cannot be linked (i.e., women are often excluded, as in our case),[22] and in part because of potentially selective linkage even among men (Abramitzky et al. 2021).[23] Moreover, using linked data requires us to sacrifice a substantial portion of our sample because most individuals cannot be linked between censuses. False matches in linkage would also tend to obscure any relationship between 1930 characteristics and 1935–1940 migration.[24] Because

[20]By this, we refer to error induced by our efforts to process the data. Errors and exclusions in reporting and transcription are, of course, an issue, as in all uses of census data.

[21]We also experimented with removing the youngest members of the sample, leaving only older individuals who were unlikely to have gained additional education between 1935 and 1940, and have found that the result are qualitatively unchanged.

[22]Most linked samples are systematically unable to offer insights into the behavior of women. More recently, certain linked samples have enabled the analysis of women's outcomes (e.g., Price et al. 2021), but women are still more difficult to follow than men (Withrow 2024).

[23]In most uses of linked data to study internal migration, a concern is that false matches result in false observations of migration (Sasaki and Zimran 2025; Zimran 2024). This is not a concern in this case, because even in the linked sample we use the 1935-1940 migration data from the 1940 census, which are not dependent on linkage.

[24]See Sasaki and Zimran 2025 for a more detailed explanation of the impacts of false matches on regression results

of these limitations, we do not use the linked sample for our main analysis. Instead, we prefer to focus on the information contained in the previous place of residence question of the 1940 census. But because the linked sample provides information on individuals' pre-migration characteristics, which we could otherwise not observe, it is useful in our analysis of the role of homeownership on migration, and in providing additional pre-migration controls to verify the robustness of our results.

Our drought data come from the US National Atmospheric and Oceanic Administration, which offers historical drought data through the Living Blended Drought Atlas (LBDA) (Cook et al. 2010). The LBDA is an updated version of the Palmer Drought Severity Index (Palmer 1965), which is widely used for measuring variations in drought severity across time and space. The LBDA data used in this study estimate yearly drought conditions based on meteorological factors and provide information on drought severity relative to the calibration period of 1928 to 1978; that is, the LBDA does not simply describe areas as particularly wet or dry, but captures deviations from the norm in each location. The continuous scale has cutoff values for specific levels of drought; for example, cutoffs of -4 and 4 denote extremely dry and wet conditions, respectively, relative to the local average.

The drought data provided by Cook et al. (2010) are annual and estimate drought for a grid of 11 thousand specific points across North America. The census data, however, are based on individuals' counties of residence in 1935 and 1940. We determine a county's annual drought severity according to a spatial interpolation method described by Sichko (2021, 2025), which estimates the average drought for each county in each year. We then aggregate each county's drought exposure over the period 1935–1939—that is, from when we first observe individuals' places of residence until the year before we observe whether they had moved—and assign to each individual the drought exposure of their 1935 county of residence. We use 1939 as the last year in computing our drought measure because the census was enumerated in April of 1940. In particular, we define the total drought exposure of county c, D_c, as

$$D_c = \sum_{t=1935}^{1939} \mathbb{1}\{d_{ct} < 0\} \times |d_{ct}|, \tag{1}$$

where d_{ct} is the drought severity of county c in year t. Thus, our drought measure in expression

where the outcome is not linkage dependent

(1) is the sum of the absolute values of the drought index in years in which a county experienced below-normal soil moisture. We then divide counties into two groups on the basis of their value of D_c: counties with $D_c < 5$ are categorized as experiencing no or mild drought over the period 1935–1939; counties with $D_c \geq 5$ are defined as experiencing drought. Thus, the threshold for the drought category corresponds to having experienced a mild drought in each of the five years of the period;[25] this is also the mean of the measure across all counties. We also verify that our results are robust to an alternate definition of drought exposure that uses a cutoff of $D_c = 6$ instead of $D_c = 5$.

Our study of the effects of AAA spending is based on data on spending on the AAA and other New Deal programs by county, provided by Fishback, Horrace, and Kantor (2005, 2006),[26] which also provide data on Great Depression severity.

3.2 Summary statistics

Figure 1 describes our main explanatory variable—an indicator for moderate or severe drought computed based on the drought severity experienced by each county over the period 1935–1939. Our control group—the area that we define as experiencing no or mild drought—is indicated in white. The treatment group—the area that we define as experiencing moderate or severe drought—is indicated in dark red. The treated area covers much of the Great Plains, as well as the northwestern United States, parts of New York, and an assortment of other small areas.

Figure 2 presents the 1935 distribution of population. Panels (a) and (b) show the complete distribution of the adult white and black populations, respectively, with darker colors indicating a greater share of total population. As expected, the white population is broadly distributed east of the 100th meridian, but is most concentrated in counties in the northeast and on the west coast. The black population is largely concentrated in the south, but, reflecting the first phase of the Great Migration (Collins and Wanamaker 2015), also shows concentration in northern cities.

Panels (c) and (d) of Figure 2 repeat panels (a) and (b), respectively, but limit attention to

[25] Equivalently, the minimum cutoff could be met by one year of extreme drought (-4) and one year of mild drought (-1).

[26] These spending numbers reflect a CPI base year of 1967 (Fishback, Horrace, and Kantor 2005).

individuals living in counties that experienced drought according to our definition above. These panels serve to highlight where the treated population of each race lived. On the whole, about 41.9 percent of the white population and about 13.1 percent of the black population lived in a drought county, as shown also in Table 1, which also presents summary statistics for other variables by the drought exposure of an individual's 1935 county of residence. The distribution of the treated white population roughly matches the geography of the treated area as presented in Figure 1. On the other hand, much of the drought area shows a negligible black population, consistent with the population of the Great Plains being almost completely white. Instead, the bulk of the black population in the drought area lived either in New York State or in eastern Oklahoma and northern Texas. Given the very different geographic distributions of the black and white treated populations, caution will be necessary in our analysis in making comparisons between the responses of blacks and whites to drought. In addition to geographic controls, we also present analyses in which we limit attention to portions of the drought-affected region with a relatively higher black population share.

Figure 3 presents basic statistics on our main outcome variable—the probability of making an inter-county move between 1935 and 1940. Panel (a) presents these probabilities divided by race, showing that about 12 percent of white individuals and 9 percent of black individuals made an inter-county move over this period. Panel (b) divides each race by drought category. For white individuals, the migration rate in counties experiencing drought was greater than in other counties. For black individuals, the reverse was true, though the difference is small. These differences, however, do not account for potential underlying differences between drought and non-drought areas.

Figure 4 presents education distributions by race, drought status, and migration status. Panels (a) and (b) focus on race, drought status, and education. The systematic disadvantage of black individuals in this period in terms of education (e.g., Baker 2019; Collins and Margo 2006) is readily apparent, with the plurality of white individuals having 8–11 years of education and the majority of black individuals with fewer than 8 years of education. Whereas the white education distribution is similar across drought and non-drought regions, black individuals in drought counties were somewhat more educated than black individuals in non-drought counties, likely reflecting the exclusion of the South and its particularly low levels of black education from the drought region.

Panel (c) presents migration probabilities by education status. Both races display a clear education gradient in migration, with more educated individuals more likely to have moved, and the gradient substantially stronger for white individuals than black.

Given our focus on relief policies directed to landowners, and because of Spitzer, Tortorici, and Zimran's (2025) findings that attachment to land can impede migration responses to natural disasters, the probability that individuals were homeowners is important to understanding migration responses to drought and their differences by race. Table 1 also presents information on homeownership by race and drought status in 1930 for the linked sample. There is a clear homeownership premium for white individuals in both drought and non-drought counties, as is to be expected (Collins and Margo 2011), with a somewhat larger premium, as well as higher rates overall, in non-drought counties than drought counties. These patterns indicate that black individuals were potentially less likely to be able to access AAA funds.

Ownership was especially important because AAA spending was directed to farm owners rather than laborers, tenants, or sharecroppers (Fishback, Horrace, and Kantor 2006). Panel (a) of Figure 5 presents the geographic distribution of AAA spending per capita. A clear relationship between AAA spending and the extent of drought is evident from this map. There was also substantial AAA spending outside of the drought region, however, with a concentration of spending in the South. In total the correlation between a county's D_c as defined in equation (1) and per-capita AAA spending was 0.55. Other New Deal spending, the distribution of which is depicted in panel (b) of Figure 5, does not show such a strong relationship with the severity of drought, with a correlation of about 0.11.

4 Empirical strategy

Our main estimating equation is the linear probability model

$$M_{ic} = \alpha + \beta_1 \text{drought}_c + \beta_2 \text{drought}_c \times \text{black}_i + \theta_1^r X_{i1935} + \theta_2^r X_{c1935} + \gamma_{s1935}^r + \gamma_a^r + \varepsilon_{ic}. \quad (2)$$

In this equation, M_{ic} is an indicator taking a value of one if individual i living in county c in 1935 made an inter-county move between 1935 and 1940; X_{i1935} is a vector of individual-level controls in 1935, including the number of children and indicator variables for whether the person was male, white, foreign born, in a city, and in their birth state;[27] X_{c1935} is a vector of controls at the level of the 1935 county of residence, including average age, fraction male, fraction white, fraction in a city, fraction in their birth state, average education in years, fraction foreign born, population, number of moderate or worse drought years from 1930 to 1934, and log change in per capita retail sales from 1929 to 1933 as a measure of Great Depression severity; γ^r_{s1935} are race-specific fixed effects for the 1935 state of residence to ensure that results are not driven by geographic differences in population distributions;[28] and γ^r_a are race-by-age fixed effects.[29] The coefficients θ^r_1 and θ^r_2 are permitted to vary by race. We cluster standard errors at the level of the 1935 state. With the treatment at the county level, such clustering has the effect of both ensuring that standard errors are clustered above the level of treatment and of capturing in a simple way the potential for spatial correlation in errors.

The coefficients of interest are β_1 and β_2, which are identified by the percentage-point migration premium for individuals living in counties of moderate or severe drought, and the additional premium for black individuals respectively, as compared to otherwise similar individuals living in otherwise similar counties in the same state experiencing no or mild drought. By limiting the comparison to observationally similar individuals and counties within the same state, including controlling for urban status and previous history of migration (as captured by a mismatch between birth state and state of residence), we aim to control for the possibility that drought counties and their residents were inherently different from non-drought counties and their residents, which, despite the random

[27] The indicator for being in one's birth state is intended to capture individuals' migration propensities. Table 1 lists the remaining controls.

[28] We permit the state fixed effects to differ by race in order to address the possibility that black men experiencing drought were systematically more likely to live in states where the black migration rate was higher for other reasons. Failing to permit this interaction would leave this potential concern open; permitting this interaction lets the data speak as to whether the state fixed effects should differ by race. More intuitively, given the very different experiences of the black and white populations in the 1930s United States, there is no reason to believe that the migration environment was similar between the two groups, and thus no reason to believe that cross-state differences would have been the same across races.

[29] These are fixed effects for each year of age for each race, thus providing a fully non-parametric control for age. The age controls are included in order to address the potential for different age distributions between races and between drought and non-drought counties, which would be potentially problematic because of the strong relationship between age and migration propensity.

nature of the drought, is possible as a result of the naturally geographically clustered nature of the treatment.[30] We also estimate a version of equation (2) to which we add county fixed effects. This has the effect of essentially converting the analysis to a difference-in-differences, in which the two differences are between drought and non-drought counties on the one hand and race on the other. Identification in this case derives solely from comparing the black-white migration rate difference across drought and non-drought counties; this specification does not permit us to identify the overall migration response to drought, since the treatment is at the county level—only the black-white difference in the drought migration premium can be identified.

5 Results

Table 2 presents our main results—estimates of the migration response to drought and of the black drought migration premium. Columns (1)–(3) focus on the complete urban and rural sample, and columns (4)–(6) limit the sample only to individuals living in rural areas in 1935.[31] In column (1), we control only for race-by-region fixed effects. We find that white individuals exposed to drought were 1.8 percentage points more likely to make an inter-county move relative to a base rate of 11.5 percent for individuals in non-drought counties (Table 1). For black individuals, the drought migration premium was 3.0 percentage points relative to a lower base migration rate of 8.7 percent (Table 1). The difference between the black and white drought migration premia is statistically significant. Column (2) presents our benchmark specification: controlling for state-by-race fixed effects yields similar results to those in column (1). Controlling additionally for county fixed effects in column (3) shows evidence of a smaller and statistically insignificant black drought migration premium, though the point estimate of a 0.6 percentage-point difference is non-negligible. The results for the rural sample in columns (4)–(6) are considerably stronger: for all specifications we

[30] Our measure of selection differs from that of Hornbeck (2023), who estimates an equation similar to our interaction version of equation (2). However, Hornbeck's (2023) estimation differs in that education is his outcome variable, and erosion, migration, and the interaction of erosion and migration are the explanatory variables. In practice, this means that Hornbeck estimates the difference between the average migrant and stayer from erosion rather than migration probability as we do.

[31] We define an individual's city residence in 1935 using the *migtype5* variable provided by Ruggles et al. (2021, 2023), which indicates whether an individual lived in a metropolitan area in 1935. Individuals living in metropolitan areas, city centers, or surrounding metro areas are treated as non-rural in 1935.

find a substantial and statistically significant difference in the black and white drought migration premia ranging from 2.4 to 3.5 percentage points, which is robust to the inclusion of county fixed effects.[32] In sum, Table 2 provides the following three results. First, consistent with a number of other studies of our setting (Gutmann et al. 2016; Sichko 2021, 2024), individuals responded to drought in the 1930s by migrating. Second, this response occurred not only for white individuals, as previous research has established, but also for black individuals. Finally, our results imply that black individuals were more responsive to drought than white individuals, in the sense that the increase in migration probability for those who experienced drought relative to those who did not was larger.

Our results in general, and in particular the racial differences that we document, are not the spurious consequence of our drought definition. Online Appendix Table A.1 repeats the analysis of Table 2 using a drought cutoff of $D_c = 6$ instead of our benchmark $D_c = 5$. The results are qualitatively similar, though the racial differences are larger in magnitude. Our results are also not the product of our choice to use a linear probability model; indeed, they are robust to the use of a logit specification, as shown in Online Appendix A.2.[33] Another potential concern is that, as shown in Figure 1, the geographic distribution of the white and black populations experiencing drought were quite different. While the many geographic controls included in Table 2 (fixed effects and geographic characteristics) should address this concern, Table 3 verifies that our results are robust to limiting the sample to various definitions of a "black-dense" region. In columns (1) and (2), the black-dense drought region is defined as states with moderate or worse drought and substantial black populations, as depicted in Figure 1. These states are Texas, Oklahoma, Missouri, Kansas, Colorado, Wyoming, Arkansas, Washington, Minnesota, Pennsylvania, New York, and Tennessee. Because the core of the drought impacted the Great Plains and other western regions, in columns (3) and (4) we define the black-dense western region as the same states as above but excluding Pennsylvania, New York, and Tennessee. For both the full sample and the rural sample, the existence of a black drought migration premium persists.

[32] The base migration rate for rural individuals not in drought counties was 13.8 percent for white individuals and 10.9 percent for black individuals.

[33] Because the coefficients in Online Appendix A.2 are from a logit specification, they are not directly comparable to those in Table 2, which are from a linear probability model.

Finally, Table 4 repeats the analysis of Table 2 but uses the sample of men linked between the 1930 and 1940 censuses instead of the full 1940 sample. Besides using a different sample, this analysis has the advantage of enabling us to control for a variety of individual characteristics in 1930, such as occupational category.[34] These characteristics could not be observed without linkage. The point estimates are quite similar to those in Table 2, though for the combined urban and rural sample (columns 1–3) the smaller sample sizes lead to a lack of precision that renders our estimates of the black drought migration premium statistically insignificant except in column (2).

The finding that black individuals' migration was more responsive to drought is surprising in light of the concerns in the disaster and environmental migration literatures regarding trapped populations. They are also surprising in light of Sichko's (2021, 2024) findings that migration in response to the 1930s drought was positively selected on the basis of education—a result that he attributes to liquidity constraints hampering potential migration responses, as feared by scholars documenting trapped populations. Given the substantial economic disadvantage of black individuals in the economy of the 1930s, it would be natural to expect that their migration responses to drought would be similarly constrained. The results of Table 5 reinforce this surprise. In this table, we estimate, separately for white individuals and black individuals, and for the combined urban and rural sample and the rural sample alone, a linear probability model of the form

$$M_{ic} = \alpha + \beta_1 \text{drought}_c + \beta_2 \text{drought}_c \times \text{8th–11th}_i + \beta_3 \text{drought}_c \times \text{12th or higher}_i + \theta_1 X_{i1935} + \theta_2 X_{c1935} + \gamma_{s1935} + \gamma_a + \varepsilon_{ic}.$$

The coefficients of interest are β_1, β_2, and β_3, which estimate the drought migration premium for individuals with less than a middle school education, and the additional premia for individuals with some high school or who completed high school, respectively. For white individuals, the non-interacted drought coefficients indicators are negative; for the complete sample the coefficient is statistically insignificant, whereas it is significant for the rural sample. These results indicate no or a negative migration response to drought by white individuals with less than 8 years of education.

[34] From the 1930 census, we also control for marital status, urban residence, home ownership, household head status, and farm status.

For black individuals, however, the non-interacted drought coefficient is positive and statistically significant for both the complete and the rural samples. For individuals of both races, we find evidence of an educational gradient in the migration response to drought. All of the interaction coefficients β_2 and β_3 are positive, and are statistically significant except for β_2 for the complete sample for both races. Moreover, the estimated β_3 is larger than the estimated β_2 for all specifications, indicating an increase in the migration response to drought with education for both races. These results are striking—despite the education gradient for both races, indicating positive selection into a migration response to drought in terms of disadvantage, the migration response to drought for black individuals was not only greater than that for white individuals, as shown above, but encompassed individuals of all levels of education. Thus, even in a situation in which disadvantage by one measure (education) limited migration, disadvantage along another dimension (race) promoted it. The migration response to natural disaster in this case is thus more complex than it would appear to be when studying a single dimension of selection.

6 AAA spending and migration responses to drought

The main governmental response to the economic harm wrought by the drought came in the form of spending under the AAA. Under this program, relief payments were made to landowners, who were in turn required to take land out of production, ultimately generating out migration (Fishback, Horrace, and Kantor 2006) and disproportionately driving black individuals out of sharecropping and tenancy in the South (Depew, Fishback, and Rhode 2013).[35] We add to these results by studying differential effects of AAA spending on migration by race and on the migration response to drought by race.

Table 6 investigates the role of AAA spending in driving migration and shaping migration responses to drought, with results again divided into those for the complete sample (columns 1–2) and the rural sector (columns 3–4). We first (columns 1 and 3) estimate a version of equation (2) with additional controls for AAA spending and AAA spending interacted with a black indicator.

[35]See also Alston (1981), who argues that AAA payments incentivized mechanization, which would have further reduced agricultural labor demand.

For both sample definitions, we find a positive coefficient on AAA spending and on the interaction of AAA spending and the black indicator. The positive overall impact of AAA spending on migration is consistent with Fishback, Horrace, and Kantor's (2006) findings. Our finding that the migration-inducing impact of AAA spending was larger for black individuals is novel: we find that, for black individuals, an additional $100 of AAA spending per capita was associated with approximately a 2.2-percentage-point increase in migration probability, and that the difference in the AAA migration response between black and white individuals was statistically significant.

Columns (2) and (4) investigate the role of AAA spending in shaping the migration response to drought. For both the complete and the rural sample, the coefficient on AAA × Drought is negative, albeit small; it is statistically significant for the rural sector and nearly so for the combined urban and rural sample. This indicates that AAA spending reduced migration probabilities for white individuals experiencing drought, providing a form of relief. But the triple interaction of AAA, Drought, and Black is positive, larger in magnitude, and either statistically significant (column 2) or similar in magnitude and more imprecisely estimated (column 4). Thus, for black individuals, AAA spending was associated with an *increase* in migration responses to drought. Put differently, black individuals were more likely to migrate in response to drought than were white individuals (Table 2), and this gap was larger where AAA spending was greater (Table 6). This finding is reinforced by the results of Online Appendix Table A.3, which repeats the analysis of Table 6 with the addition of county fixed effects and reveals the same role for AAA spending in increasing the black migration response to drought relative to the white.[36]

Notably, Online Appendix Table A.4 shows that the role of other government relief spending in shaping the migration response to drought was quite different. This table repeats the results of Table 6, but replaces the per-capita AAA spending variable with per-capita spending on other New Deal public works projects. Importantly, this spending was not directed primarily to landowners and did not require the removal of land from agricultural production. We find no relationship of public works spending with the migration response to drought in the rural sector (column 4), which is notable given that this was the sector in which the responsiveness of migration to drought was

[36]Notably, any impact of AAA spending on the drought migration premium is offset by the overall impact of AAA spending on migration (i.e., the AAA coefficient is larger than AAA × drought for both races).

particularly large, especially for black individuals. In the combined urban and rural sample (column 2), we find that greater public works spending was associated with a smaller migration response to drought for the white population (matching the role of AAA spending), but for the black population, this impact was even larger (the opposite of what we find for AAA spending).

These results provide important insights to the literature on migration responses to natural disasters. In other contexts (e.g., Paul 2005), it has been argued that increases in governmental aid inflows (as well as remittances from prior migrants), which increased in response to natural disasters,[37] offset the incentive to leave disaster-affected areas. This appears to have been true of AAA spending for white individuals but not for black individuals. Indeed, the results for black individuals, in combination with the general migration inducing effects of AAA spending, means that the case of AAA spending and the 1930s drought in the United States offers another perspective on the potential role of relief spending in determining emigration responses to natural disasters: as a result of the peculiar ownership-based structure of the relief in this case, relief spending appears to have had different effects on migration responses between majority and disadvantaged minority groups. Our findings thus speak to the potential for these distorting effects of government policy to vary by race despite being *de jure* race neutral, in this case as a result of differential eligibility for the relief.[38]

To strengthen the case that the allocation of AAA spending to land owners was responsible for the migration-inducing effects of AAA spending, Table 7 investigates the combined role of AAA spending and home ownership. Whereas AAA spending is a county-level variable, meaning that we can simply assign each individual to the appropriate value for their 1935 county (which we know from the 1940 census), home ownership is an individual-level variable, and is observed in the 1940 census only for 1940 (i.e., after any migration had taken place). To observe a pre-migration measure of homeownership, we turn to the sample of men linked between 1930 and 1940, for whom we can observe pre-migration homeownership (in 1930) directly. As above, the results are divided into the complete urban and rural sample (columns 1 and 2) and the rural sample alone (columns 3 and

[37] See also Bettin and Zazzaro (2018) on remittances, which can be considered to have a similar effect.

[38] On the racially disparate impacts of ostensibly race-neutral policy, see Muhammad, Sichko, and Olsson (2024), among others.

4). We first (columns 1 and 3) repeat our baseline estimation, with additional controls for AAA spending, home ownership, and the interaction of each of these with the black indicator. As in Table 6, we find evidence of AAA spending increasing emigration, and doing so to a greater extent among black men than white men. We also find that homeownership was associated with a reduction in overall migration probabilities, but to a lesser extent among black men than white.

Columns (2) and (4) add the interaction of AAA spending and home ownership, and the triple interaction with the black indicator. When we include this triple interaction, the coefficient on the AAA spending variable (that is, the main effect and the sum of the main effect and the interaction with the black indicator), indicating the impact of AAA spending for counties with average home ownership, remains positive and statistically significant. Moreover, consistent with ownership moderating the effect of AAA spending, the interaction with the ownership variable is negative and statistically significant for both races,[39] meaning that the migration-inducing effects of AAA spending were reduced in places with greater homeownership.

7 Conclusion

The Great American Drought of the 1930s offers a unique case in which a major natural disaster intersects with the availability of complete-count individual-level data on migration. In this setting, we focus on racial differences in migration responses to drought exposure. Our main result is that black individuals' migration was more responsive to drought exposure than was white individuals'. This result is surprising—black individuals were severely disadvantaged in the economy of the 1930s. Given the presence of constraints that led to positive selection into migration on the basis of education, it would be natural to expect that the migration of the relatively disadvantaged race would be constrained, resulting in selection into migration that led black individuals to be less likely to migrate than white individuals. But we find the reverse, indicating that selection along one dimension need not determine the nature of selection along another.

We also investigate the role in migration of the US government's main relief program for the

[39] That is, the interaction of AAA spending and ownership is negative, as is the sum of this interaction and the triple interaction of AAA spending, ownership, and the black indicator.

economic impact of the drought. The Agricultural Adjustment Administration (AAA) sought to provide relief by making payments to individuals in affected areas. But these payments were directed primarily to landowners and required them to take land out of production. This meant that individuals on other tiers of the agricultural labor force not only were far less likely to receive aid, but also saw demand for labor reduced by the reduced agricultural output. Given black individuals' lower likelihood of homeownership (which we take as evidence that they were also less likely to be landowners), this meant that governmental relief policy disproportionately reached white individuals rather than black individuals. Consistent with such a mechanism, we find that AAA spending increased migration rates, and did so to a greater extent among black individuals. Moreover, we find that AAA spending reduced the migration response to drought for white individuals but increased it for black individuals, thus widening the gulf between the migration responses to drought of each race. Thus, this ostensibly race-neutral policy had very different effects by race as a result of pre-existing differences between them.

Beyond helping to better understand this important setting in US history—one that remains important given the continued presence of racial differences in the modern US economy—this paper makes a number of important contributions to the literature on migration responses to natural disasters. First, a lack of individual-level data has constrained the ability to study migrant selection in response to natural disasters. A result of this has been that the degree to which disadvantaged groups may be disproportionately exposed to the impacts of natural disasters due to a different ability to respond through migration is not well understood. Our comparison of the different responses of black and white individuals is precisely such an analysis.

Our results also help to understand two mechanisms that govern whether and under what circumstances individuals respond to natural disasters through migration. The first regards attachment to land. While it has been shown in other cases that attachment to land can restrict individuals' ability to adjust to natural disaster shocks through migration, this setting demonstrates that this might be further reinforced by relief policy targeted towards landowners. Moreover, governmental relief policy has been cited as a factor helping to determine the degree to which individuals respond to disasters through migration. Such relief is generally thought of as a potential mechanism offsetting

the incentive to leave after a natural disaster, but our results show that relief can affect different groups differently, that the targeting of this relief is important, and that its targeting may even increase the incentive to migrate after disasters rather than mitigate it.

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Figures

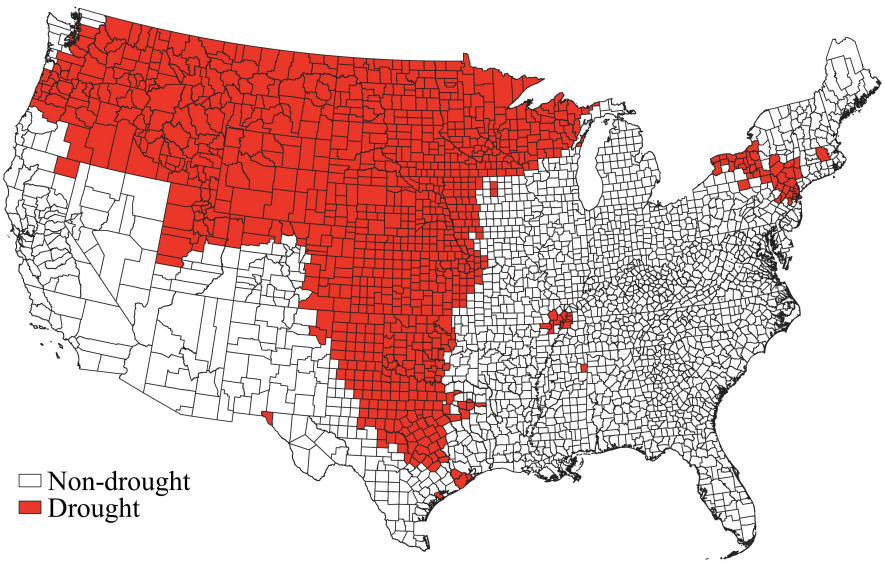


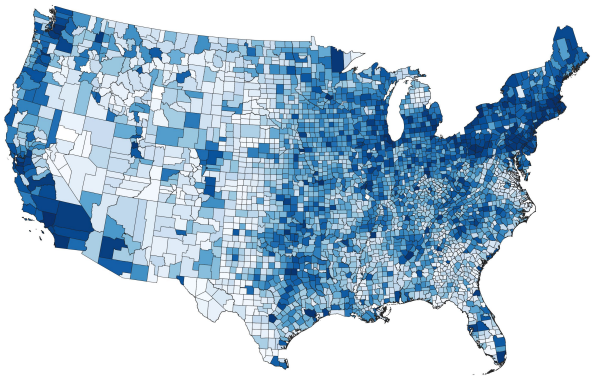
Figure 1: Drought severity 1935–1939

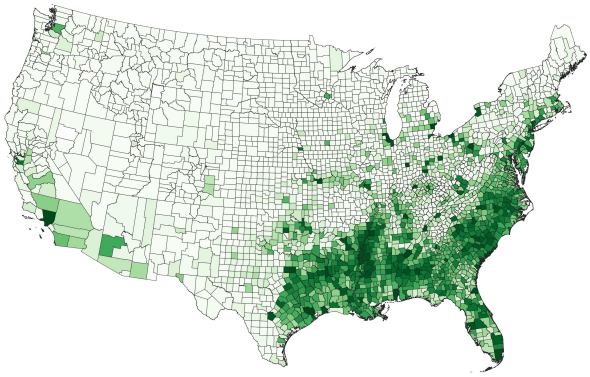
Note: This figure presents the geographic distribution of our main explanatory variable—an indicator for experiencing at least moderate drought (defined as $D_c \geq 5$) over the period 1935–1939.

Source: Cook et al. (2010) and Manson et al. (2019)

(a) White

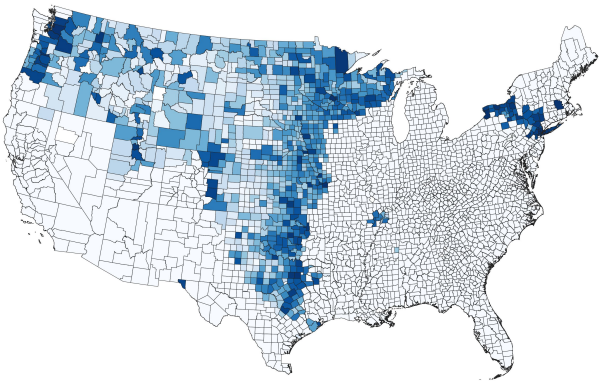
(b) Black





(c) White individuals in drought

(d) Black individuals in drought



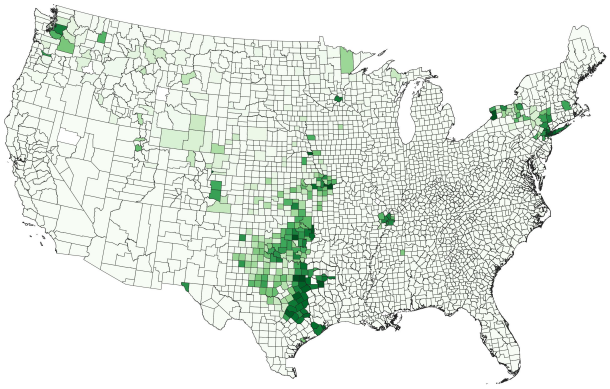


Figure 2: Population distributions by race in 1935

Note: Each figure shows the 1935 distribution of the population in question across US counties, with darker colors indicating a greater share of the total population indicated in the figure title. Panels (a) and (b) include all white adults and all black adults, respectively. Panels (c) and (d) limit attention to individuals living in counties that experienced at least moderate drought (defined as in Figure 1) over the period 1935–1939.

Source: Manson et al. (2019) and Ruggles et al. (2021, 2023)

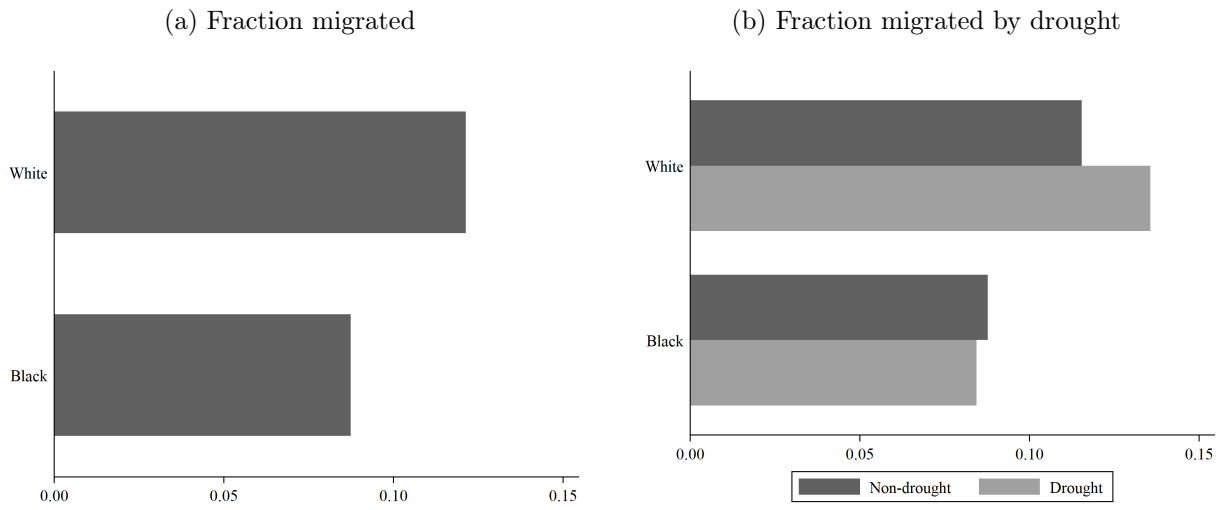


Figure 3: Migration rates

Note: This figure shows the fraction of individuals who migrated by race and drought status.

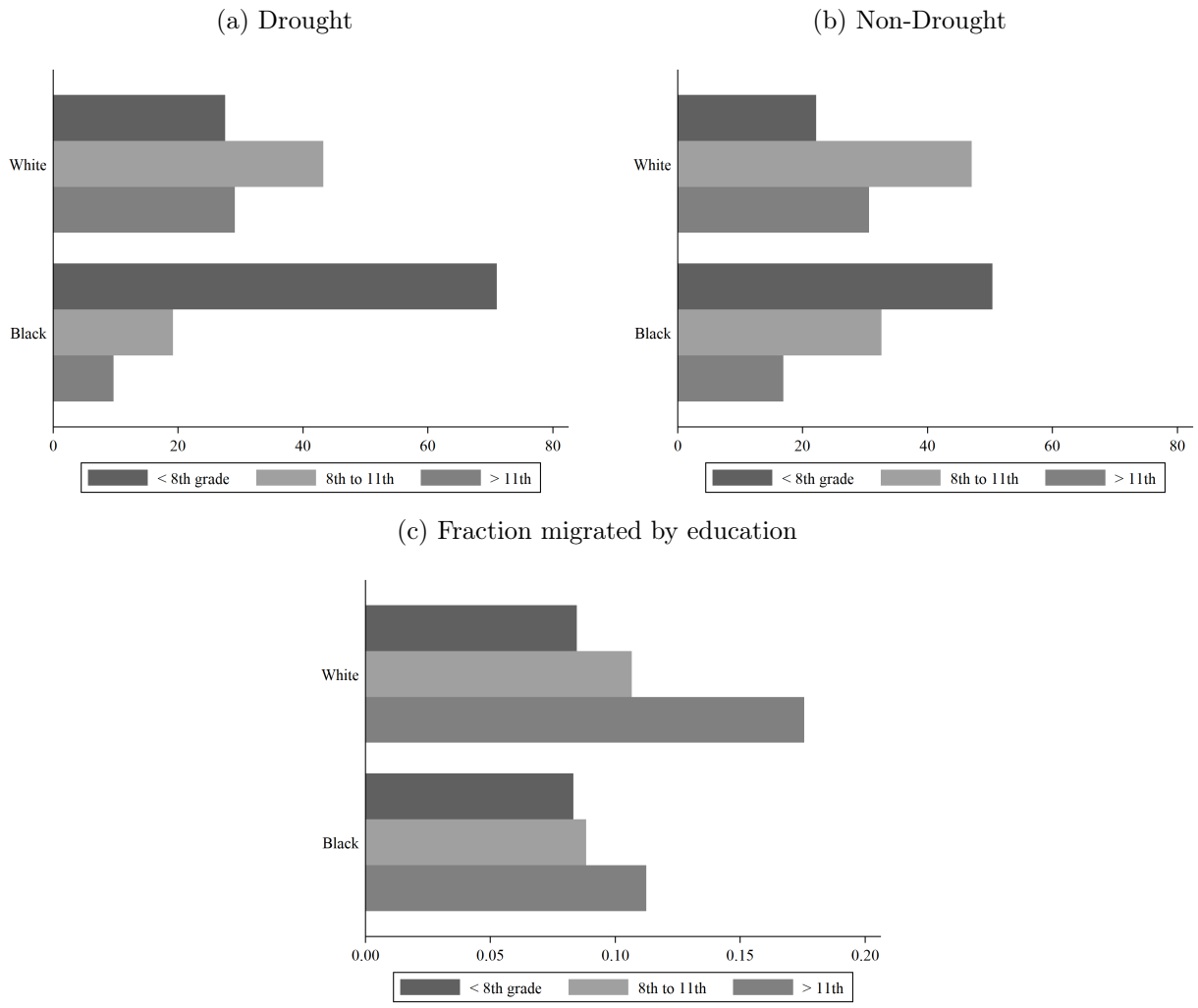
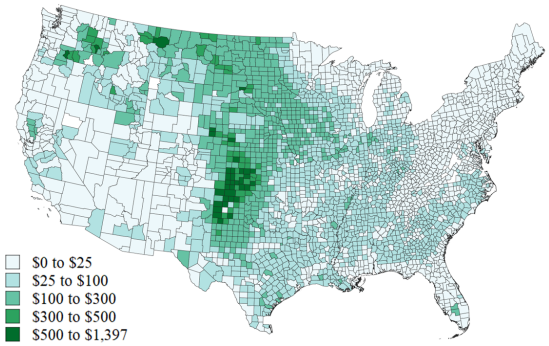


Figure 4: Education distributions by race, drought status, and migration status

(a) AAA Spending, 1933–1937



(b) Public Works Spending, 1933–1939

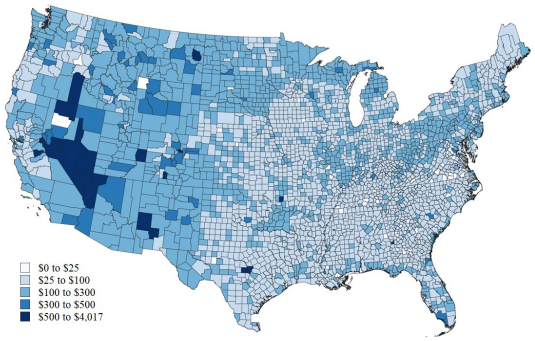


Figure 5: Per capita New Deal spending

Source: Fishback, Horrace, and Kantor (2005, 2006)

Tables

Table 1: Summary statistics

	(1) Non-drought	(2) Drought
Count white	46,000,736	18,835,156
Count black	5,537,547	742,612
Percent		
White migrated	11.5	13.6
Black migrated	8.7	8.5
1935 percent		
White	89.2	96.2
White male	50.3	50.6
Black male	48.7	47.6
White age	42.3	42.4
Black age	40.3	40.4
White in city	54.3	58.3
Black in city	42.4	73.9
White foreign born	12.6	19.7
Black foreign born	0.5	7.8
White in birth state	64.7	53.2
Black in birth state	68.4	40.2
White number of children	1.1	1.0
Black number of children	1.1	0.8
1930 percent (from linked sample)		
White homeowner	51.8	49.7
Black homeowner	30.1	27.8
1935 county average		
Percent white	90.0	97.8
Population	28,258	23,358
Age	38.6	39.1
Percent in city	8.3	5.9
Percent foreign born	3.7	7.4
Percent in birth state	79.3	59.9
Per capita public works and relief spending 1933 to 1939	$242	$304
Per capita AAA spending 1933 to 1937	$80	$326

This table displays average demographic variables based on the drought. The sample includes adults (18 to 65 in 1935).

Table 2: Drought migration premia by race

	Full Sample			Rural		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Drought	0.018***	0.014**		0.018***	0.017***	
	(0.006)	(0.007)		(0.006)	(0.004)	
Drought × Black	0.012**	0.012**	0.006	0.035***	0.024***	0.024***
	(0.006)	(0.005)	(0.005)	(0.008)	(0.003)	(0.007)
Region-by-race FE	Y	(Y)	(Y)	Y	(Y)	(Y)
State-by-race FE	N	Y	Y	N	Y	Y
County FE	N	N	Y	N	N	Y
Observations	70,662,847	70,662,847	70,662,847	32,264,940	32,264,940	32,264,940
R-squared	0.048	0.051	0.058	0.049	0.052	0.060

Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$)

Notes: Standard errors clustered at the state level in parentheses. Regressions use the complete 1940 census. Dependent variable is an indicator equal to one if an individual made an inter-county move between 1935 and 1940. All specifications include individual- and county-level controls interacted with race and race-by-age fixed effects.

Table 3: Alternate geographies

	Black-dense region		Black-dense western region	
	(1)	(2)	(3)	(4)
Variable	Full	Rural	Full	Rural
Drought	0.012	0.014	0.021***	0.020***
	(0.010)	(0.012)	(0.005)	(0.005)
Drought × Black	0.014***	0.013**	0.016***	0.018***
	(0.004)	(0.005)	(0.003)	(0.003)
Observations	26,702,690	19,709,941	11,059,148	8,681,671
R-squared	0.062	0.065	0.057	0.054

Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$)

Notes: Geographic coverage of each sample is explained in text. Standard errors clustered at the state level in parentheses. Regressions use the complete 1940 census. Dependent variable is an indicator equal to one if an individual made an inter-county move between 1935 and 1940. All specifications include state-by-race fixed effects, individual- and county-level controls interacted with race, and race-by-age fixed effects.

Table 4: Drought migration premia by race, linked sample

	Full Sample			Rural		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Drought	0.013**	0.011**		0.010*	0.011**	
	(0.005)	(0.005)		(0.005)	(0.004)	
Drought × Black	0.010	0.009*	0.006	0.034***	0.026***	0.026***
	(0.006)	(0.005)	(0.005)	(0.007)	(0.004)	(0.004)
Region-by-race FE	Y	(Y)	(Y)	Y	(Y)	(Y)
State-by-race FE	N	Y	Y	N	Y	Y
County FE	N	N	Y	N	N	Y
Observations	4,865,324	4,865,324	4,865,324	2,425,699	2,425,699	2,425,699
R-squared	0.044	0.047	0.057	0.051	0.053	0.064

Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$)
Notes: Standard errors clustered at the state level in parentheses. Regressions use the sample of men linked from the 1930 census to the 1940 census, reweighted to correct for selection into linkage on observables. Dependent variable is an indicator equal to one if an individual made an inter-county move between 1935 and 1940. All specifications include individual- and county-level controls interacted with race and race-by-age fixed effects. Individual-level controls include 1930 characteristics.

Table 5: Education and migration responses to drought

	Full Sample		Rural	
	(1)	(2)	(3)	(4)
Variable	White	Black	White	Black
Drought	−0.006	0.020***	−0.010**	0.028***
	(0.004)	(0.004)	(0.005)	(0.003)
Drought × 8th to 11th	0.007	0.006	0.013***	0.035***
	(0.005)	(0.008)	(0.002)	(0.005)
Drought × 12th or higher	0.057***	0.020**	0.075***	0.043***
	(0.010)	(0.008)	(0.005)	(0.016)
Observations	64,503,425	6,159,422	28,881,549	3,383,391
R-squared	0.053	0.032	0.056	0.030

Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$)
Notes: Standard errors clustered at the state level in parentheses. Regressions use the complete 1940 census. Dependent variable is an indicator equal to one if an individual made an inter-county move between 1935 and 1940. All specifications include state-by-race fixed effects, individual- and county-level controls interacted with race, and race-by-age fixed effects.

Table 6: AAA spending and migration responses to drought

	Full Sample		Rural	
Variable	(1)	(2)	(3)	(4)
Drought	0.010*	0.012	0.013***	0.019***
	(0.006)	(0.007)	(0.004)	(0.005)
Drought × Black	0.008	−0.000	0.015***	0.000
	(0.006)	(0.008)	(0.004)	(0.015)
AAA	0.008***	0.010***	0.005***	0.010***
	(0.001)	(0.002)	(0.001)	(0.002)
AAA × Black	0.014***	0.009*	0.016**	0.010
	(0.004)	(0.005)	(0.006)	(0.007)
AAA × Drought		−0.003		−0.006***
		(0.002)		(0.002)
AAA × Drought × Black		0.013**		0.011
		(0.005)		(0.009)
Observations	70,662,847	70,662,847	32,264,940	32,264,940
R-squared	0.051	0.051	0.052	0.052

Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$)

Notes: Standard errors clustered at the state level in parentheses. Regressions use the complete 1940 census. Dependent variable is an indicator equal to one if an individual made an inter-county move between 1935 and 1940. All specifications include state-by-race fixed effects, individual- and county-level controls interacted with race, and race-by-age fixed effects. AAA denotes per-capita AAA spending in hundreds of dollars.

Table 7: Home ownership, AAA spending, and migration responses to drought

	Full Sample		Rural	
Variable	(1)	(2)	(3)	(4)
Drought	0.007	0.007	0.007*	0.006*
	(0.005)	(0.005)	(0.004)	(0.004)
Drought × Black	0.006	0.006	0.019***	0.019***
	(0.006)	(0.006)	(0.005)	(0.005)
AAA	0.007***	0.013***	0.005***	0.009***
	(0.001)	(0.002)	(0.001)	(0.001)
AAA × Black	0.013***	0.014***	0.013**	0.014**
	(0.004)	(0.004)	(0.006)	(0.005)
Owner	−0.045***	−0.038***	−0.059***	−0.051***
	(0.003)	(0.003)	(0.003)	(0.003)
Owner × Black	0.017***	0.022***	0.021***	0.026***
	(0.003)	(0.003)	(0.003)	(0.004)
AAA × Owner		−0.010***		−0.006***
		(0.002)		(0.001)
AAA × Owner × Black		−0.011***		−0.008**
		(0.003)		(0.003)
Observations	4,865,324	4,865,324	2,425,699	2,425,699
R-squared	0.047	0.048	0.052	0.054

Significance levels: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.01$)

Notes: Standard errors clustered at the state level in parentheses. Regressions use the sample of men linked from the 1930 census to the 1940 census, reweighted to correct for selection into linkage on observables. Dependent variable is an indicator equal to one if an individual made an inter-county move between 1935 and 1940. All specifications include state-by-race fixed effects, individual- and county-level controls interacted with race, and race-by-age fixed effects. AAA denotes per-capita AAA spending in hundreds of dollars.