Published in final edited form as:

Popul Dev Rev. 2017 December ; 43(4): 599–623. doi:10.1111/padr.12095.

Frozen in Place: Net Migration in sub-National Areas of the United States in the Era of the Great Recession

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THE GREAT RECESSION represents the greatest economic displacement to affect the United States since the Great Depression (Eberts 2011). This recession and its aftermath have renewed longstanding concerns about economic change and population trends. The Great Depression of the 1930s had a substantial and enduring effect on demographic trends in the United States, including migration rates that were significantly lower than those observed during the decades preceding and following it (Boustan et al. 2008; Johnson 1985; Rosenbloom and Sundstrom 2004). These migratory shifts reverberated through the US demographic structure with long-term implications for national and sub-national population redistribution.

The Great Recession included a substantial decline in the stock market, falling housing prices, high mortgage foreclosure rates, and rising unemployment. It lasted from December 2007 to June 2009, making it the longest recession since World War II. However, the Business Cycle Review Committee of the National Bureau of Economic Research cautioned that their declaration that the recession was officially over should not be taken to imply that economic conditions had returned to normal by 2009 (National Bureau of Economic Research 2010). As we will demonstrate, these recessionary economic shocks profoundly influenced US demographic trends well beyond 2009. For example, fertility declined sharply during the recession and has yet to recover (Johnson 2014). Domestic migration (county-to-county flows) reached the lowest levels since record keeping began in the 1940s (Cooke 2011; Frey 2009). Immigration also slowed during the recession after more than a decade of unprecedented increases (Passel 2011; Rendall, Brownell, and Kups 2011). The conjoined economic contraction in the United States, economic improvements in Mexico, and tighter border security all contributed to this immigration slowdown.

Given what we know about the link between migration and economic conditions (Borjas 1987; Greenwood 1997; Foulkes and Schafft 2010; Gebremariam, Gebremedhim, and

Schaeffer 2011), our analysis focuses on patterns of net migration in the period of the Great Recession. In light of the waning economic effects of the recession (Han and Goetz 2015), we examine recent data to ascertain whether net migration trends are reverting to pre-recession patterns or whether the Great Recession ushered in a new era of migration in the United States.

What happened to US migration patterns during the Great Recession? To answer this question, we place the Great Recession and the migration patterns it engendered in context by examining net migration trends before, during, and after the recession in both rural and urban America. We also consider how underlying trends in out-migration and in-migration shaped broader net migration patterns during this turbulent economic period. We develop and test hypotheses about fundamental spatial and place-based dimensions of migration. We find systematic spatial differentiation in migration patterns that are consistent with the overarching narrative of people being “frozen in place” during and, in some cases, following the Great Recession. We find considerable spatial heterogeneity in the patterns of migration in rural and urban areas during both the recession and the recovery, with some places experiencing more loss and others more gains through migration than in years prior to the recession. Our conceptual and empirical approach focuses on the essential role of migration in changing the size, geographic distribution, and composition of the US population.

This study, based on recent data on net migration, provides a contemporary empirical benchmark of unfolding shifts in net migration during a period of economic turbulence. The research is national in scope, focusing on interconnected migration patterns across the rural/urban continuum. We demonstrate how interconnected patterns of net migration and gross migration have contributed to shifting growth patterns across counties. Finally, we offer an explicit spatial focus, with attention to migration trends in specific places, as well as to the interrelationship between migration trends in counties in spatial proximity to one another.

Migration in a period of economic turbulence

A large demographic literature shows that long-distance or inter-metropolitan migration decision-making processes are rooted in economic restructuring (Lu 1999; McHugh, Gober, and Reid 1990). Our conceptual approach recognizes that shifting patterns of net migration are influenced by changing economic conditions, which in turn drive local and regional migration (Beale 2000; Easterlin 1978, 1980; Lobao, Hooks, and Tickamyer 2007). For example, inter-regional and county-to-county patterns of net migration have been shaped historically by the uneven distribution of job growth (Greenwood 1997), unemployment (Foulkes and Schafft 2010; Gebremariam, Gebremedhin, and Schaeffer 2011), earnings (Borjas 1987), and poverty (Oropesa and Landale 2000).

Similarly, the influx of new immigrants into the United States and their geographic dispersion nationally have been shaped by periodic expansions and contractions in the economy and the uneven spatial distribution of job growth across different industrial and occupational sectors. The current dispersion of the Hispanic population from established gateways (in the Southwest and elsewhere) to new destinations in rural and suburban communities is a case in point (Massey 2008; Lichter and Johnson 2009). Yet immigration,

which is increasingly important to US migration, also slowed during the recessionary period (Lichter and Johnson 2009; Martin and Midgley 2010). Our analysis of net migration combines both domestic migrants and immigrants, allowing us to resolve some of the ambiguity regarding overall migration patterns in the recessionary and post-recession periods (Kritz, Gurak, and Lee 2011).

Migration has slowed in the United States over the past several decades, although the explanations for this slowdown remain unclear (Molloy, Smith, and Wozniak 2011, 2017). We do not dispute this conclusion; rather we focus on the shorter-term patterns of net migration in the period of the Great Recession. Conceptually, high unemployment rates, slow or stagnant job growth, and declining housing prices inform the economic calculus of migration and job mobility. Historically, economic pushes to migration have been substantial when economic restructuring fostered rising unemployment in some areas. In the face of economic hardships in one locality, workers traditionally migrated to other locales where opportunities were greater (Greenwood 2014). However, given the widespread effect of the Great Recession, there were fewer places to go as economic opportunities dried up across the country. Still, the Great Recession differentially affected particular economic sectors. Manufacturing, construction, and finance were severely affected, agriculture and energy less so (Kusmin 2009). Given the uneven spatial distribution of these sectors, it is unlikely that migration trends were uniform across localities.

Recent research suggests that migration during the Great Recession may have had lower economic payoff than during prior recessions (Yagan 2014). Additionally, the migration streams underlying net migration patterns appear to have been differentially influenced during the Great Recession; in-migration rates to distressed areas may have slowed, while out-migration rates from such areas remained stable (Monras 2015). There is also accumulating evidence that internal migration in the United States is pro-cyclical, accelerating during times of economic expansion and decreasing during periods of economic contraction (Molloy and Wozniak 2011). The housing market may be an important factor in this pro-cyclical trend. Karahan and Rhee (2013) found that the severe housing market decline associated with the Great Recession produced a significant decline in net migration. However, disagreement remains among economists about the overall influence of the Great Recession on migration (Molloy, Smith, and Wozniak 2011).

Nor are economic forces the only drivers of migration, especially in specific types of places. It is widely recognized that a matrix of factors influence the likelihood of migration, including life-cycle stage and family and community characteristics (Long 1988; Greenwood 2014; Clark and Mass 2015). Little is known about how the impact of these non-economic factors was influenced by the recession. For example, high-amenity recreational and retirement areas—largely concentrated at the rural end of the continuum—have experienced widespread migration gains over the last several decades (Johnson and Cromartie 2006; Partridge 2010; Johnson and Winkler 2015). Older migrants are prominent in these migration streams (Johnson and Winkler 2015; Johnson et.al. 2005). It is unclear how the recession influenced the propensity of older adults to migrate to amenity areas. Because they are less likely to be in the labor market, older Americans may be less sensitive to changing economic conditions. However, their retirement accounts and ability to sell their

homes to move to recreational areas may have been constrained by the recession (Johnson 2013). These considerations underscore the importance of examining the current migration regime with contemporary data.

In sum, while there is little question that economic shocks and migration are intertwined, the linkages between the two vary along a number of dimensions. Here we examine the association between the Great Recession and net migration across the entire rural/urban continuum and across the nation.

Research hypotheses

We test hypotheses about differential patterns of migration by documenting recent net migration processes before, during, and immediately after the Great Recession. This strategy is coupled with a spatial analysis of place-based factors associated with net migration during these three periods.

Our first hypothesis is that a portion of the country's population was frozen in place by the Great Recession. Residents faced widespread economic uncertainty; found themselves in houses they could not sell; saw the value of their real and financial assets fall; and faced a national job market that provided fewer incentives to move (Yagin 2014; Monras 2015; Karahan and Rhee 2013). Consequently, we anticipate that migration diminished. As a result, places that were pre-recession gainers should have gained fewer migrants or even lost migrants in the recessionary period (deceleration), whereas places that were pre-recession losers should have lost fewer migrants or even gained migrants during the recession (acceleration). To illustrate our expectations, consider the situation in areas with quite different migration trajectories in the pre-recession period. In Sun Belt counties in states such as Nevada, Arizona, and Florida, where growing economies and amenities had fueled substantial migration gains, we expect less net migration gain or net out-migration during the recession. In contrast, in Northeast and Midwest counties with histories of out-migration, we expect less migration loss or even positive net migration in the recession period. Our analysis extends to the immediate post-recession period to assess the temporal extent of the anticipated recessionary reversal in net migration trends. Should the migration trends of the recession persist into the post-recession period, it might suggest that the US has entered a new period of net migration trends. However, we recognize that economic conditions remained difficult even after the official end of the recession, so it may be that we are only capturing the early stages of the post-recession recovery.

Given the differential reach of the recession into various industrial sectors and the divergent pre-recession contexts (i.e., pre-recession gainers versus losers), we hypothesize that there will be systematic spatial heterogeneity in the patterns of net migration across the United States along the rural/urban continuum, even when controlling for region. Thus, places along the continuum that were fast-growing migrant destinations in the pre-recession period are expected to experience a reduction in net in-migration, and possibly negative net migration, whereas places that reported negative net migration in the pre-recession period are likely to experience less out-migration and possibly positive net migration. For example, large metro cores and non-metro places that are not adjacent to metro areas (i.e., the most rural and

isolated of places) are traditional net migration losers and are anticipated to report less loss or even net gains in the recessionary period. In contrast, traditional gainers, including large metro suburban, small metro, and non-metro counties adjacent to metro areas, should show lower gains or net loss in migration during the recession.

Of course, there are alternatives to these hypotheses. First, we might find no evidence of populations being frozen in place during the recession; pre-recession migration patterns might persist throughout the study period. Second, even if we find support for the frozen-in-place hypothesis, it could be that all places were affected in the same way; thus, there would be no differentiation across the rural/urban continuum. Finally, we might find evidence that people were frozen in place and differentiation in migration patterns, but that previous trends were exacerbated rather than reversed (i.e., traditional gainers gained even more during and immediately following the recession).

Data and measurement

The analyses are anchored by panel data covering the periods before, during, and after the Great Recession. We compared migration trends in three periods: 2004–2007, 2007–2010, and 2010–2014, representing the pre-recession, recession, and post-recession periods.¹ Throughout the study, we used the county as the unit of analysis (county equivalents in New England and independent cities in other states are treated as counties, following Census Bureau practice). Counties have historically stable political, economic, and socially meaningful boundaries and are a basic unit for reporting demographic data, including migration data. All 3,108 contiguous US counties and equivalents (excluding Alaska and Hawaii) were included in the analysis.²

We focus on net migration, which is calculated by subtracting natural increase from population change. Net migration includes both domestic migration (movement between US counties) and immigration. Most migration change is due to domestic migration, but immigration is important as well in some counties. Census Bureau estimates suggest that immigration diminished by 16 percent during the recession before increasing again in the post-recession period. Census Bureau estimates are made for immigration and domestic migration, but we are not confident that they are robust enough to support the detailed analysis of the short intercensal and post-censal periods we undertake at the county level. Thus, we focus on total net migration.³

¹Net migration was calculated using the Census Bureau's intercensal estimates for 2000–2010 released after the 2010 Census, and 2014 county postcensal estimates for 2010–2014. To obtain net migration, we subtracted natural increase from the population change for each year, then aggregated net migration for the periods 7/1/2004–7/1/2007, 7/1/2007–4/1/2010, and 4/1/2010–7/1/2014. Because these time periods vary in length, and to reduce error variability in single-year estimates, we calculated annualized values for 2004–2007 and 2007–2010 divided by the Bureau's respective population estimates for 2004 and 2007, and we divided the 2010–2014 values by the Bureau's Census 2010 estimate base. Specific year cut-points are based on dates identified in previous studies of the Great Recession (National Bureau of Economic Research 2010). We aggregate data to three time periods after reviewing annual migration data. Aggregating the Census Bureau annual estimates of migration and then annualizing them yielded more stable indicators of net migration than single-year data.

²We excluded Alaska and Hawaii because our spatial regression models assume that units of analysis are in spatial proximity to one another. This assumption is violated for Alaska and Hawaii since they are separated from the continental US. There are 41 independent cities in the United States: Baltimore, MD; Saint Louis, MO; Carson, NV; and 38 in Virginia. The Census Bureau has treated independent cities, which constitute primary divisions within their respective states, as county equivalents for decades. The largest independent city contains approximately 620,000 residents and the smallest contains 4,000; there are nearly 230 counties with populations smaller than 4,000.

Rural/urban classification was assigned by first designating counties as metropolitan or non-metropolitan using criteria developed by the US Office of Management and Budget. The 2013 metropolitan/non-metropolitan classifications were applied retrospectively to 2000 in order to remove any effect of reclassification that occurred after the 2010 Census. Next, we subdivided metropolitan counties into three categories—large metro core, large metro suburban, and small metro—and non-metropolitan counties into two categories—non-metro adjacent and non-metro non-adjacent. These five classifications represent population concentration along the rural-to-urban continuum and, additionally, offer insight on spatial proximity to concentrated populations (e.g., adjacency to metro areas). The terms rural and non-metropolitan are used interchangeably, as are the terms urban and metropolitan.

Large metro core counties include the major city (or twin cities) of metropolitan areas containing more than one million people in 2010. These 67 core counties had 97.5 million residents in 2014, representing 31 percent of the US population. Most contain both the central city and some of the older, inner suburbs. The remaining 365 large metropolitan non-core or suburban counties adjoin core counties containing the central city/ies. These large metro suburban counties contain 78.5 million residents, or 25 percent of the US population. They encompass newer suburban areas on the periphery of large metropolitan areas.

All 728 counties in metropolitan areas that had fewer than one million residents in 2010 are classified as small metro counties. They contain 95.0 million residents, making up 30 percent of the population. The bulk of the population in small metropolitan areas is concentrated in the counties containing the core city, and these counties generally contain both the city itself and much of the suburban portion of the metropolitan area. However, there are numerous suburban counties as well.

The remaining 1,948 counties, which together represent 72 percent of the land area, are outside metropolitan areas. These non-metropolitan counties are subdivided into non-metro adjacent counties that are contiguous to a metropolitan area and non-metro non-adjacent counties that do not share a boundary with a metropolitan area. There are 1,026 adjacent counties with a total population of 30.4 million (10 percent of the US population) and 922 non-adjacent counties with 15.3 million residents (5 percent).

To better understand the dynamics underlying net migration patterns, we examined gross migration in-flows and out-flows. The US Internal Revenue Service (IRS) produces annual aggregations of tax returns and exemptions (proxies of households and persons) that indicate whether the filer was in a different county from the prior year. To parallel the Census Bureau's net migration estimates, we aggregated for tax years 2004–2007, 2007–2010, and 2010–2014. The data for the third period were adjusted slightly because of improved coverage in the IRS's methods to provide better comparability to the prior two periods.⁴

³We focus on total net migration because of concerns about the robustness of the separate estimates of immigration and domestic migration at the county level. While the Census Bureau's estimation method of international migration is relatively robust at the national level, the allocation of these immigrants to the state and county levels is formulaic. In contrast, the symptomatic indicators of IRS tax returns and exemptions anchor the county-level estimates of domestic migration.

⁴IRS data do not cover the entire population, but the coverage is reasonably comprehensive. It includes individuals who have filed income tax forms in consecutive years and tends to underestimate migration among the wealthiest and poorest segments of the population. Even with these shortcomings, conclusions drawn from analysis of the IRS migration data are likely to be indicative of

Analytical strategy

We assess contemporary net migration patterns during three periods predating, during, and immediately following the Great Recession, with specific attention to differential patterns of migration across the rural/urban continuum. We divide our analysis into three parts. First, we examine net migration patterns for all counties in the contiguous US to assess whether a pattern consistent with the frozen-in-place hypothesis is evident; that is, whether traditional migration gainers gained less or registered negative net migration in the recessionary period and traditional migration losers lost less or reported positive net migration. We serially compare annual rates of net migration from the pre-recession period (2004–2007) to those during the recession (2007–2010) and then compare the recession period to the post-recession (2010–2014). In each of the two comparisons, migration acceleration is defined as: the rate of net migration loss diminished; loss was replaced by net migration gain; or the rate of net migration gain increased. Migration deceleration is defined as: the rate of migration gain slowed; gain was replaced by migration loss; or the rate of net migration loss increased.

Second, we examine gross migration streams to delineate the dynamics underlying the net migration patterns. We examine migration streams into and out of every contiguous US county to determine what combination of in-migration and out-migration produced the net migration change in each of the three periods of interest. For example, we expect that the net migration gains to traditionally fast-growing counties will diminish because the freezing in place of a share of the population will result in a smaller flow of migrants into these counties. In contrast, we expect smaller losses from traditional counties of net migration loss because of diminished migration out of those counties. It is plausible that the change in net migration patterns could be due to only one component of net migration—out-migration or in-migration—as opposed to change in both. Ultimately, we are better equipped to understand how parts of the American population were frozen in place by examining the dynamics of in- and out-migration that underlie net migration.

Third, we examine net migration along selected place-based dimensions to assess whether there is spatial differentiation in net migration patterns. We use a multivariate spatial regression analysis to buttress findings from the descriptive assessment of net migration trends and their differential patterns. The regression analysis simultaneously considers rural/urban and regional factors. We adopt a spatial regression approach given evidence of spatial autocorrelation in the residuals, and the spatial lag regression model in particular based on improved statistical fit compared with alternative specifications.⁵ Additionally, net migration

overall migration streams between counties. In 2012 the IRS changed its processing procedures of individuals' income tax returns. Previously, they prepared annual files for the Census Bureau, but these files covered only a partial year's returns. In 2012, the IRS expanded the process to cover all returns received in a calendar year and improved its year-to-year return matching procedures. The IRS estimates that these changes improved coverage by 4.7 percent. To try to maintain consistency with prior years, we reduced aggregated IRS migration by 4.7 percent in each county for 2012, 2013, and 2014. Caution should still be exercised in comparing these migration values to those in earlier years.

⁵The spatial lag regression can be represented as $y = \lambda W y + X\beta + e$, where $W y$ is the average of the response variable weighted (i.e., net migration) for neighboring locations (i.e., counties). The approach assumes a structured interaction among neighbors so that values of the response variable in one location are a direct function (λW) of values of the response variable among neighboring locations. $X\beta$ is an $n \times 1$ vector that represents the direct effects of the attribute values (i.e., region and rural/urban continuum), X , on y , and e is a vector of independently distributed errors. We used a queen first-order contiguity weights matrix, and results are robust against alternative specifications (e.g., rook first-order, queen second-order). Separate regression analyses are conducted for each time period and are therefore indicative of temporal changes.

patterns are conceptually aligned with a spatial lag process; migration within a particular county is similar to and informed by migration among nearby counties. We incorporate into the multivariate model the four census-defined regions in which the counties are located: the Midwest, Northeast, South, and West.

Results

Before the recession, spatial migration patterns were consistent with those common over the past several decades. Between 2004 and 2007, net migration gains were greatest in large non-core areas of the West and Southeast, in the suburban counties of many large metropolitan areas, and in scattered recreational areas of New England, the Upper Great Lakes, and the Mountain West (Figure 1). In contrast, migration losses were greatest in rural areas of the Great Plains and the Corn Belt, in much of the industrial belt of the Great Lakes and the East, in the Mississippi Delta, and in the urban cores of large metropolitan areas in the East and Midwest.

The onset of the Great Recession produced widespread reversals of long-standing migration trends. Consistent with our expectations, places losing migrants before the recession lost fewer or gained migrants in the recession period, whereas places that gained migrants before the recession gained fewer or lost migrants. Immediately prior to the recession, 1,576 counties in the contiguous United States experienced migration losses (Figure 2). Net migration losses diminished, or shifted from loss to gain, in 67 percent of these counties during the recession and post-recession periods (accelerate-decelerate (38 percent) or accelerate-accelerate (29 percent)). In contrast, only 33 percent of the counties that lost migrants during the pre-recession period experienced larger migration losses during the recession (decelerate-decelerate (7 percent) or decelerate-accelerate (26 percent)).

This reversal of migration trends continued for many of these counties in the post-recession period. Between 2010 and 2014, 55 percent of the counties that lost migrants prior to the recession experienced diminished migration losses or net migration gains during the post-recession period compared to the recessionary period (decelerate-accelerate (26 percent), accelerate-accelerate (29 percent)). The remaining 45 percent experienced greater migration losses or smaller gains during the post-recession period than during the recession (decelerate-decelerate (7 percent), accelerate-decelerate (38 percent)). Among the counties that had migration losses prior to the recession, only 7 percent saw their migration losses decelerate during each period.

The contrast between the Great Recession experiences of counties that lost migrants prior to the recession and those that gained migrants during the pre-recession period is striking. Some 82 percent of the 1,532 counties that gained migrants prior to the recession either experienced smaller migration gains or migration loss during the recession (decelerate-decelerate (51 percent), decelerate-accelerate (31 percent)). Migration gains accelerated in only 18 percent of those counties with migration gains prior to the recession (accelerate-accelerate (3 percent) and accelerate-decelerate (15 percent)). In the post-recession period, only 34 percent of the pre-recession gainers experienced migration acceleration (accelerate-accelerate (3 percent), decelerate-accelerate (31 percent)), whereas 66 percent saw their

migration gains decelerate compared to their experience during the recessionary period (decelerate-decelerate (51 percent), accelerate-decelerate (15 percent)). In 51 percent of the counties with migration gain before the recession, migration decelerated during the recession and further decelerated in the post-recession period (decelerate-decelerate).

There is clear geographic variation in the patterns of migration change before, during, and after the recession. As noted above, among counties with losses before the recession, most show migration acceleration during the recessionary and post-recession periods (Figure 3). The patterns are most distinct in the Northern Great Plains, where the impact of the energy boom on migration in the Dakotas is clearly reflected. However, diminished migration losses are widespread in the Great Plains, along the Mississippi River, and in the Northern industrial belt, with the exception of Michigan. These areas have traditionally lost more migrants than they have gained.

Among counties that were gaining migrants pre-recession, the deceleration of migration during the recession is also clear. Migration deceleration is evident in most traditionally fast-growing areas in the West and South (Figure 4). Florida counties, for example, which had nearly universal migration gains pre-recession, experienced widespread migration deceleration during the recession. Much of North Carolina and Virginia also experienced migration deceleration during the recession.

In sum, results are consistent with our expectations that patterns of migration shifted during and following the recession in a way that benefited counties that lost migrants prior to the recession. The vast majority of counties that experienced migration losses before the recession experienced migration acceleration during the recession, whereas those gaining migrants pre-recession experienced deceleration. Net migration patterns suggest that part of the population was frozen in place during the recessionary period and in the years immediately following it. Moreover, the pattern is evident nationwide.

Migration trends along the rural/urban continuum

Analysis of migration along the rural/urban continuum sheds further light on the differential effect of the Great Recession on net migration. We find additional support for our hypothesis that traditional net migration losers (i.e., large metro cores and non-metro counties that are not adjacent to metro areas) should experience less loss or net gains in the recessionary period, whereas traditional net migration gainers (i.e., large metro suburban, small metro, and non-metro counties adjacent to metro areas) should show lower gains or net loss in migration during the recession. Indeed, traditional losers lost less or experienced gains, while traditional gainers gained less or lost migrants.

During the pre-recession period, the core counties of metropolitan areas with more than one million residents had a minimal annual average migration gain of 0.04 percent (Figure 5). This is consistent with historical trends, which generally reflect small, if any, net migration gain in large urban cores. However, with the onset of the recession, this migration gain increased to 0.22 percent annually. In the post-recession period, the annual gain was even

greater at 0.44 percent. Results show a clear reversal of traditional net migration patterns during and immediately following the recession.

Historically, the suburbs of large metropolitan areas have seen substantial net migration gains, often at the expense of their urban cores. Such counties had an average annual migration gain of 0.68 percent pre-recession, 17 times as great as that in the large urban cores. Yet, there was a decline in their net migration gains during both the recessionary and post-recession periods. During the recession, the average annual change fell to 0.51 percent for these counties, and the ratio of the suburban-to-core migration gain sharply diminished. This decline persisted in the post-recession period. Thus, migration trends in large metropolitan areas during the recession contrast sharply with pre-recession and historical trends. Similarly, pre-recession migration gains in smaller metropolitan areas were also relatively high, but diminished during the recession, and there was no evidence of a migration rebound in the post-recession period.⁶

In non-metropolitan America, the contrast between historical migration trends and trends during the recessionary and post-recession period is also striking. Traditionally, migration gains were always larger in non-metropolitan counties adjacent to metropolitan areas as compared to their non-adjacent counterparts. Residents of these proximate non-metropolitan counties have easier access to the metropolitan labor markets and to the economic, social, and health services that are generally urban based. In addition, as metropolitan areas sprawled outward, migration spilled over into these adjacent non-metropolitan counties. In contrast, non-adjacent non-metropolitan counties historically experienced much more modest net migration gains or net out-migration (Johnson 2014; Johnson and Cromartie 2006). These traditional patterns are evident during the pre-recession period when the net migration gain in adjacent counties was 0.14 percent compared to a migration loss of 0.09 percent in the non-adjacent counties. As expected, the situation changed during the recessionary and post-recession periods, when adjacent counties saw a significant deceleration in migration and shifted from net migration gain to net loss. In contrast, net migration rates remained stable in the non-adjacent counties during the recession. Nor is there evidence of a recovery in net migration rates in non-metropolitan areas in the post-recession period: migration losses actually increased in both adjacent and non-adjacent counties in the years immediately following the recession. In fact, the more remote rural counties experienced a smaller migration loss than did the adjacent counties after the recession. This is an occurrence without historical precedent in rural America. Adjacent rural counties have consistently had larger migration gains, or smaller losses, than their non-adjacent counterparts.

Gross migration and its implications for net migration

Net migration patterns are the result of an interplay between flows of migrants into and out of an area. Here we examine the dynamics of these migration streams during the period of

⁶The core and suburban counties of the smaller metropolitan areas were combined in this analysis because much more of the suburban population resides in the core counties of small metro areas. In contrast, in large metropolitan areas the urban core counties include only the central cities and the oldest suburbs. Most of the suburban population resides in the suburban counties of large metropolitan areas. When we analyzed the smaller core and suburban counties separately, the results were similar to those reported here.

the Great Recession. A key point is that the volume of gross migration to and from any place always dwarfs net migration change. For example, the annual domestic gross migration into and out of large metro cores averaged almost 7.6 million between 2010 and 2014 (Table 1). Yet, net annual migration change during this period was approximately -145,000, or 1.9 percent of the gross change. Thus, small changes in the relative volume of in- and out-migration can have a significant effect on net migration.

Examination of domestic migration flows into and out of counties using IRS data reflects this interplay of in- and out-migration. Overall, migration slowed during the Great Recession. In every migration stream, the number of migrants during the recession is smaller than in the pre-recession period. For example, in large urban cores the number of outmigrants declined during the Great Recession by around 250,000 annually, while the number of in-migrants stayed about the same. As a result, net migration loss among the large urban cores was cut nearly in half. During the post-recession, both migration streams increased again, but the in-migration increase exceeded the growing loss from out-migration, resulting in an even smaller net migration loss than during the recession.

In suburban counties of large metro areas, both in-flows and out-flows diminished during the recession, but the reduction in out-migrants was less than that of in-migrants, so the net suburban gain diminished. During the post-recession, the volume of in-migration and out-migration increased at roughly the same pace; consequently, the net migration gain remained stable.

In small metro areas, a significantly larger reduction in the volume of in-migrants than out-migrants produced a substantial reduction in net migration during the recession. After the recession, the in-flow of migrants increased less than the out-flow, thus the net migration gain diminished again.

In the traditional faster-growing non-metropolitan counties adjacent to metro areas, the pattern was similar to that in suburban and small metro areas. Here the number of in-migrants diminished, while the number of out-migrants remained about the same. As a result, there was a shift from net migration gain to loss. This net loss increased in size during the post-recession period because the incremental increase in in-migration was smaller than the growing volume of out-migration. In contrast, in remote rural counties the in-flow and out-flow of migrants diminished only marginally during the recession, so there was little change in net migration. However, in the post-recession period, the volume of out-migration increased more than that of in-migration, which produced a greater net migration loss.

Spatial regression results

We use spatial regression to assess the relationship between migration and key locational attributes. When examining spatially referenced data, we must consider the possibility of spatial autocorrelation that might bias estimates and/or statistical inference if left untreated (Cliff and Ord 1973). Spatial autocorrelation is evident in our data, with statistically significant and positive Moran's *I* values (Moran 1950) in each period, indicating that net migration rates are more similar among neighboring counties than among more distant

counties. In the pre- and post-recession periods, the Moran's I values are comparable at 0.44 and 0.40, respectively (Table 2). However, the value is 0.29 during the recession, demonstrating a comparatively weaker spatial pattern in net migration; net migration rates were less similar among neighboring counties during the recession compared to the periods predating and following the recession.

Given evidence of spatial autocorrelation and informed by spatial diagnostics (i.e., robust Lagrange Multiplier estimates), we use spatial lag regression to analyze net migration and its covariates in each of the three study periods. Results from the spatial lag regression analysis buttress our descriptive findings and suggest changes over time in migration trends for counties along the rural/urban continuum. We report the AIC as a measure of model fit relative to a standard OLS to demonstrate that the spatial lag model is a better fit for these data, and we control for the influence of county region.⁷ We also present the Moran's I value on the residuals to demonstrate that spatial autocorrelation has been accounted for (reduced to nearly zero) by our modeling strategy. Negative coefficients indicate net loss, positive coefficients net gains.

Migration trends are related to the rural/urban continuum. As expected, in the pre-recession period (2004–07) both the suburban counties of large metropolitan areas and small metro counties had significant net migration gains, controlling for region. In contrast, net migration in large core and non-metro adjacent counties was no different from that in non-metro non-adjacent counties.

Net migration gains became less widespread during the recession (2007–10). Large metro core counties, the suburban counties of large metro areas, and small metro counties experienced net gains that were significantly different from the experience of non-metro non-adjacent counties. The net migration loss evident in large metro cores prior to the recession did not occur during the recession. This is a departure not just from the pre-recession trend, but also from historical trends.

In the post-recession period, migration trends in large core counties continue to be more positive than those in non-metro non-adjacent counties. There was also a statistically significant net loss among non-metro adjacent counties. The fact that adjacent non-metropolitan counties experienced larger migration losses than their more remote non-adjacent counterparts underscores the substantial effect of the Great Recession on US migration trends. This is extremely unusual compared to historical trends, which consistently show larger migration gains in adjacent non-metropolitan counties than in more remote counties.

The differences in migration along the rural/urban continuum are evident even though we control for region. In the pre-recession period, net migration gains in the South and West

⁷We conducted a sensitivity analysis in which non-metropolitan counties were further classified using a typology developed by the Economic Research Service of the US Department of Agriculture, which identifies non-metropolitan counties along economic and policy dimensions (Parker 2015). Results are unchanged with only two exceptions. First, large metro core counties are not statistically different from non-metro non-adjacent counties in the recession and post-recession periods when accounting for the potential influence of the 2004 economic typology. Second, these counties are statistically different from one another in the pre-recession period when using the 2004 and 2015 typologies. Results available from authors upon request.

exceeded those in the Northeast and Midwest. This is consistent with trends over the past several decades. Even with the slowdown in net migration during the recession, these regional trends are sustained. However, in the post-recession period, little regional variation remains. This further underscores our finding that the recession and its aftermath disrupted traditional migration patterns.

Overall, results demonstrate that migration trends among the traditional gainers—large metro suburban counties and small metro counties—differed from patterns found in counties considered traditional migration losers in the recession and post-recession periods. However, migration trends in large core counties differed sharply between the pre-recession and the recession and post-recession periods, as did trends in non-metro adjacent counties. Thus, our spatial analysis supports our descriptive findings, suggesting that net migration trends during this period of economic turbulence were systematic and spatially patterned and differed from historical trends.

Discussion

We provide a timely analysis of evolving changes in America's net migration patterns before, during, and after the Great Recession. In analyzing what has happened to net migration across the national landscape during this period, we emphasize how the patterns have emerged through interconnected trends in net migration and gross migration. There is little question that the economic shock of the Great Recession was associated with striking changes in net migration patterns among US counties. Many counties experiencing net migration losses or minimal migration gains prior to the recession bore smaller losses or greater migration gains during the recession. In contrast, counties with histories of significant migration gain prior to the recession generally experienced smaller gains or lost migrants during the recession. We find support for our central thesis that a portion of the American population became frozen in place during this period of economic upheaval. These findings lend support to recent research suggesting that US internal migration trends are pro-cyclical and that the collapse of the housing market significantly slowed migration (Molloy and Wozniak 2011; Karahan and Rhee 2013).

Additionally, we find systematic spatial heterogeneity in patterns of net migration across the US along place-based dimensions. Counties in regions that were growing in the pre-recession period—chiefly the South—experienced diminished growth in the recessionary period as in-migration fell. In contrast, counties in regions that have traditionally lost migrants registered slowed loss during the Great Recession. For example, net loss in the Northeast was cut nearly in half between the pre-recession and recession periods.

Our findings also extend to the rural/urban continuum. For example, in the large urban cores with histories of small net migration gains or net migration losses prior to the Great Recession, migration gains during the recession exceeded pre-recession gains. And in remote rural counties, migration losses were similar during the recession and pre-recession period. In contrast, migration gains diminished substantially during the recession among the suburban counties of large metropolitan areas, places that have long experienced substantial net migration gains. A similar pattern of reduced gains is evident in the non-metropolitan

counties just beyond the metropolitan edge that have long gained migrants at a faster pace than their more remote rural counterparts. Adjacent counties shifted from net migration gain to migration loss with the onset of the Great Recession. Generally, these net patterns were due to changes in (less) in-migration, although changes in (diminished) out-migration drove the net patterns in large metro core and non-metro non-adjacent counties. This is precisely what would be expected if people were frozen in place. The large metro core and non-metro non-adjacent counties experienced smaller losses than usual because fewer migrants were leaving. In contrast, the large metro suburban, small metro, and non-metro adjacent counties that typically experienced net migration gains grew less because fewer people moved to them.

What will happen to net migration now that the economic impact of the recession is waning? Will it revert to pre-recession patterns, or did the Great Recession usher in a new era of migration? Our research ended in 2014, when the influence of the Great Recession had not entirely faded. Thus, our ability to comment on the long-run migration effects of the recession is limited. What is clear is that the temporal reach of the recession differs across the place-based dimensions of region and rural/urban status, with considerable implications for specific types of places. If net domestic migration is, in fact, pro-cyclical, then some areas face considerable future risks. For example, remote non-metropolitan counties generally benefited from lower migration losses during the recession consistent with the procyclical model. However, the model also predicts the higher migration losses that ensued in these areas in the post-recession period, as out-migration outpaced gains in in-migration. Thus, these counties were left with net losses that were over twice as large as those reported before the recession. If such migration trends continue, parts of rural America are positioned to experience even more loss. At the other end of the rural/urban continuum, large metro cores continued to experience migration gains considerably larger than in the pre-recession period through 2014, and there is little evidence of an uptick in migration in the large suburban counties. These trends are inconsistent with the idea of a pro-cyclical trend. However, it is likely that the adverse impact of the recession on demographic trends had not fully run its course by 2014. Recent migration data suggest the re-emergence of pre-recession migration patterns with dramatic slowdowns in net migration to large urban cores, whereas migration gains accelerated in suburban areas (Frey 2017).

Research should continue to monitor contemporary data as they are released to fully delineate the implications of future migration trends for overall population redistribution. A key question is whether the pro-cyclical migration trends predicted by recent research (Molloy and Wozniak 2011) will emerge. While beyond the scope of the current study, other forces, including international migration and spatial heterogeneity in patterns associated with (new) destination selection, are also fruitful avenues for exploration. Nor was the demographic effects of the Great Recession limited to America's borders, so future research might incorporate the economic conditions within dominant sending countries to further explain changes in the pattern of net migration within the United States. Finally, migration is only one component of population change; fertility was certainly altered by the Great Recession (Johnson 2014), and mortality may have been influenced as well. Future studies need to assess all of the demographic components of change to delineate the implications of the Great Recession for population redistribution.

Acknowledgments

Kenneth Johnson's research was supported by an Andrew Carnegie Fellowship from the Carnegie Corporation of New York; the New Hampshire Agricultural Experiment Station; sabbatical support from the College of Liberal Arts and Carsey School of Public Policy at the University of New Hampshire; and the University of Wisconsin-Madison Applied Population Laboratory, Department of Community and Environmental Sociology and Center for Demography and Ecology. Katherine Curtis's research was funded by the Wisconsin Agricultural Experiment Station. Barbara Cook of the Carsey School of Public Policy provided GIS support. The content is solely the responsibility of the authors and does not necessarily represent the official views of the agencies supporting their research.

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FIGURE 1. Net migration between 2004 and 2007
SOURCE: Census Bureau population estimates.

Accelerate = migration gain was greater or loss was smaller than in previous period.
 Decelerate = migration loss was greater or gain was smaller than in previous period.

FIGURE 2. Migration experience in 2007–2010 and 2010–2014 in counties with migration loss or gain in 2004–2007

SOURCE: Census Bureau population estimates.

FIGURE 3. Migration experience in 2007–2010 and 2010–2014 in counties with migration losses in 2004–2007

SOURCE: Census Bureau population estimates.

FIGURE 4. Migration experience in 2007–2010 and 2010–2014 in counties with migration gains in 2004–2007
 SOURCE: Census Bureau population estimates.

FIGURE 5. Annualized net migration rates by county type, 2004–2014

SOURCE: Census Bureau population estimates.

TABLE 1

Annualized in-migration, out-migration, and net migration by rural/urban continuum, 2004–2014

County type	Years	In-migration	Out-migration	Net migration
Large metro core	2004–2007	3,393,018	3,890,664	–497,646
	2007–2010	3,387,528	3,639,641	–252,114
	2010–2014	3,712,744	3,858,058	–145,314
Large metro suburban	2004–2007	3,932,421	3,704,144	228,277
	2007–2010	3,655,138	3,466,222	188,917
	2010–2014	3,838,874	3,666,751	172,123
Small metro	2004–2007	4,186,926	3,942,445	244,481
	2007–2010	3,996,870	3,914,899	81,971
	2010–2014	4,139,857	4,111,834	28,023
Non-metro adjacent	2004–2007	1,325,928	1,286,888	39,040
	2007–2010	1,269,995	1,280,300	–10,305
	2010–2014	1,296,074	1,325,207	–29,133
Non-metro non-adjacent	2004–2007	671,586	678,950	–7,364
	2007–2010	670,098	674,172	–4,074
	2010–2014	673,709	689,058	–15,350

TABLE 2

Spatial lag regression analysis of net migration rates by period, with tests for model fit and residual spatial autocorrelation

	2004–07			2007–10			2010–14		
	β		SE	β		SE	β		SE
Metro code									
Large metro core	–0.0024	ns	0.0014	0.0028	**	0.0010	0.0031		0.0009
Large metro suburban	0.0089		0.0007	0.0061		0.0005	0.0033		0.0004
Small metro	0.0045		0.0005	0.0032		0.0004	0.0024		0.0003
Non-metro adjacent	0.0005	ns	0.0005	–0.0003	ns	0.0004	–0.0009	**	0.0003
Region									
Midwest	0.0003	ns	0.0008	–0.0001	ns	0.0006	0.0008	ns	0.0005
South	0.0027		0.0008	0.0024		0.0006	0.0012	*	0.0005
West	0.0039		0.0009	0.0038		0.0007	0.0010	ns	0.0006
Intercept	–0.0035		0.0008	–0.0031		0.0006	–0.0020		0.0005
Rho	0.6049			0.4064			0.6026	**	
AIC (vs. OLS)	–19,093		(–18,281)	–21,084		(–20,808)	–21,932		(–21,091)
Moran's <i>I</i>									
Original	0.44			0.29			0.40		
Residuals	–0.02	*		–0.02	ns		–0.03	**	

NOTE: Reference categories are non-metro non-adjacent metro code and Northeast region.

All coefficients significant at $p < .001$, except as indicated:

**
p < .01,

*
p < .05, ns = not significant.