# How The American Civil War Impacted Migration Patterns

Kelvin Liu[1]; Maryam Torkashvand[2]; Caglar Koylu, PhD[2]

Choate Rosemary Hall, Wallingford CT[1]; Department of Geographical and Sustainability Sciences, University of Iowa[2]

## Introduction

- Disruptive events substantially alter spatial and social interactions of humans.
- Although existing studies have thoroughly examined the volumetric, temporal, and spatial impact of disruptive events on human activities, the changes in structural patterns of human movement remain relatively unexplored.
- The American Civil War drastically changes the way people lived, worked, and interacted with one another, and had immediate and long-lasting impacts on the structure and functioning of social and spatial networks.
- Migration regions are groups of spatial units with a high degree of connection internally but low interaction with other subsystems.

## Objective

- Investigate the American Civil War's impact on human migration.
- Understand how to utilize the Louvain method.

## Methods

- Utilized Known Node-Correspondence (KNC) to examine the changes in community structures in pre- and post-war networks.
- Employed Louvain algorithm to identify migration network regions across the continental United States. Used these regions within the US to examine the structural changes in spatial migration networks between pre- and post-war periods.
- Used a series of quantitative comparisons to quantify the similarity of regions between partitions of pre- and post-periods of each network including Adjusted Rand Index, z-Rand coefficient, Rand coefficient, and Jaccard coefficient.

## Results

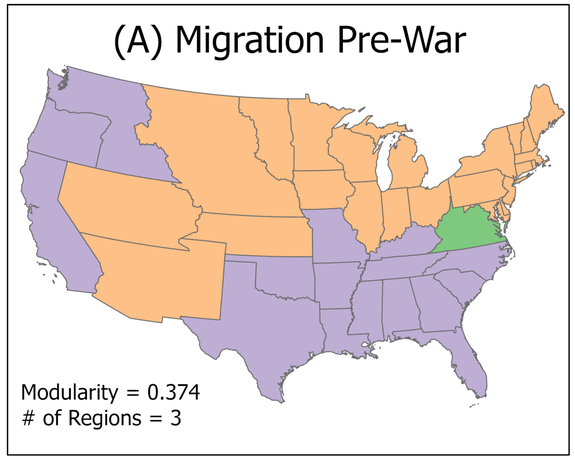


**Figure 1** Migration Regions in (A) Pre- and (B) Post-War Periods

| Network | Pre-Period | Post-Period | z-Rand | Rand | Adj. Rand | Jaccard |
|---|---|---|---|---|---|---|
| Family Tree | 1840-1861 | 1865-1900 | 2.65 | 0.56 | 0.06 | 0.20 |

**Table 1** Partition quantified data of pre- and post-war migration network

- Regions increased from 3 to 4 in the post-period, with significant changes. All 4 regions in the post-period were substantial in size. Notably, Region 2, which originally consisted of the Virginias, expanded northwards.
- Modularity shifted from 0.374 in pre-war to 0.349 in post-war period. While similar modularity values suggest similar connectedness in migration networks, the post-war modularity indicates that states in that period were less densely connected in terms of migration flows, possibly due to the Settlement of the West and longer-distance moves.
- The z-Rand score of 2.65 is significant when compared with the z-Rand scores of 18.11 (for 1850-60 and 1860-70) and 13.85 (1860-70 and 1870-80) found in Koylu et al. (In Review), indicating dissimilarity between the pre- and post-war regions.
- The Jaccard coefficient of 0.20 indicates a significant overlap between the two partitions.

## Conclusion

- This study demonstrates that the American Civil War led to a notable reduction in migration connections within regions while increasing long-distance migration flows between regions in the post-war period. Regardless of these differences, regions derived from migration flows generated a significantly similar regional structure in the US.
- The data used in this study accurately represents the native-born white population, but not others such as Blacks, Native-Americans, or Mexicans.

## References

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### Selected References

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