

Estimating and Mapping of Net Migration in the Midlands (United Kingdom) Between the Period of 1911-1921

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ABSTRACT

The spatial distribution of population in both national and international perspectives play a significant role in determining demographic and economic situations in all countries of the world. Therefore, net migration has a more complex set of features involving the redistribution of a different component of the population with different reasons for migration. This study uses data collected from the Office for National Statistics (ONS) United Kingdom to demonstrate the method of areal interpolation by using polygon as a tool of Geographical Information Systems (GIS), to estimate net migration in the Midlands between 1911 and 1921. By considering the male population aged between 18 and 25 years. The results revealed that certain types of employment which include agriculture has the highest correlation value ($r = 0.08$), light industry ($r = 0.16$), staple industry ($r = 0.15$), and service industry ($r = 0.16$), these types of employment tend to attract more people to either coming into or going out of a population of an area, hence, its results to the movement of people from one place to another.

Keywords: *Net migration, Spatial, Areal interpolation, Polygon, Midlands.*

1.0 INTRODUCTION

Most spatial analysis of population is limited by the scale of data from a geographic, demographic or a temporal perspective. Migration data are more limited in geographic, temporal, and demographic resolution than other forms of population data [1]. Migration is the movement of an individual or a group of people from their birth place to new environment that is attracted by numerous factors to spend all or a part of their future life [10]. Net migration in Britain arises as a result of the combination of complex processes involving the redistribution of different segments of the population with different sets of motivations for migration. These processes, which include regionalisation, may be balanced by centralisation or moves into the major cities on the other and process usually take place at different spatial scales [9]. The responses to push and pull factors can be attributed to both places of birth and the new environment respectively. It is universally accepted that selective age is a factor. Nevertheless, the male migrant is about two years older than the female migrant [8]. There has been growing interest in both Britain and other western developed industrial countries where natural change is relatively slight. It could also be attributed to the growing interest in the geographical migration of labour imbalances of demand and supply [3].

The changing nature of British population has become the characterised in rapid growth and segregation of few ethnic populations with accompanying White [2]. Human movement can take many forms both in time and space on the motivations involved. Movement can include temporal scale from hours to years, involved spatial boundaries crossing from international to residential and it can be as a result of job opportunities, voluntary recreational and under duress in the times of war [4]. The method of

determining population distribution is through areal interpolation. Areal interpolation refers to interpolation of an area using polygons [7]. Areal interpolation is the transfer of data from source units to target units of overlying, non-hierarchical area units [5].

However, the objectives of this study is (i) To calculate the net migration rates in the West Midlands for the period 1911-1921 for male aged 18 to 25 in 1911 and (ii) To compare these results with employment data to see what types of employment sectors which are causing young men to migrate into and out of certain areas.

2.0 METHODS

2.1 Estimating the Net migration Values

To calculate the net migration the census and mortality data is calculated for ten years period t to $t + 10$ as given below:

$$NM_{t,t+10} = P_{t+10} - P_t - B_{t,t+10} + D_{t,t+10}$$

Where:

- NM_{t,t+10} = Net migration rates;
- P_{t,+10} = is the population at the end of the decade;
- P_t = is the population of an area at the start of the decade;
- B_{t,t+10} = is the number of births over the decade;
- D_{t,t+10} = is the number of deaths over the decade.

GIS is an instrument to use with population analysis. One of the fundamental strength of GIS is the capability to integrate data from one incompatible spatial zone to another spatial zone and then to carry out analysis on them [7]. The technique applied to integrate employment data (points) with the target districts was to keep the data as points, The reason for this choice is because it is simple and straightforward, that involved making the same data as the point to overly with the target zones. The 1911 was selected and used as the target districts for it has the larger boundaries. Because of the difference in the number of districts, the data were first processed to make some spatial units and their boundaries for both 1911 and 1921 censuses. The 1921 values were aggregated to the 1911 then spatial unit using the dissolve function in ArcGIS melds together spatial units that have the same attribute then spatial join was performed to determined within which 1911 district the 1921 centroid is located. Finally, a table join was performed to merged the table attributes for the final layer, and this is to get both the population data and employment details in the same place in other to calculate the sum, net migration and percentage change.

This might be better for both edge and sensitivy of results to the shape of a region would be to examine a large number of random drawings of sizes and shapes of regions within an area and to produce statistics on every such region to provide an experimental distribution for the test of significance.

3.0 RESULTS AND DISCUSSION

This study compares two population districts, 1911 as the target district and 1921 as the source zones. Simple areal weighting average population counts within a zone. The source zones were interpolated onto the target zones to calculate the net migration. This has been achieved using areal interpolation to re-district data from all dates onto a single set of registration districts; that is the two boundaries were interpolated to become one. After that Simple areal weighting is mapped in the form of choropleth map. Choropleth map often displays the percentage change in the net migration; each change is graded with different colours so as to show in-migration and out-migration of people from one place to another (Figure:1).

The movement of people from one place to another is influenced by some population factors, in this case, the net migration of the male age 18-25 is related to the different types of employment which include agriculture, light industry, staple industry and service industry as highlighted by [9]. The different colours depicted on the choropleth map (Figure 1) revealed the net migration and percentage change patterns. The positive net migration indicates increase in number of people to an area Bromsgrove, for example, has the highest rate which is above five hundred indicated by red colour on the choropleth map, while on the other hand negative net migration indicates decrease in population. Aston has the lowest number that is many people (male) moved out of the area to different places within that period of time, it is also indicated in dark green colour.

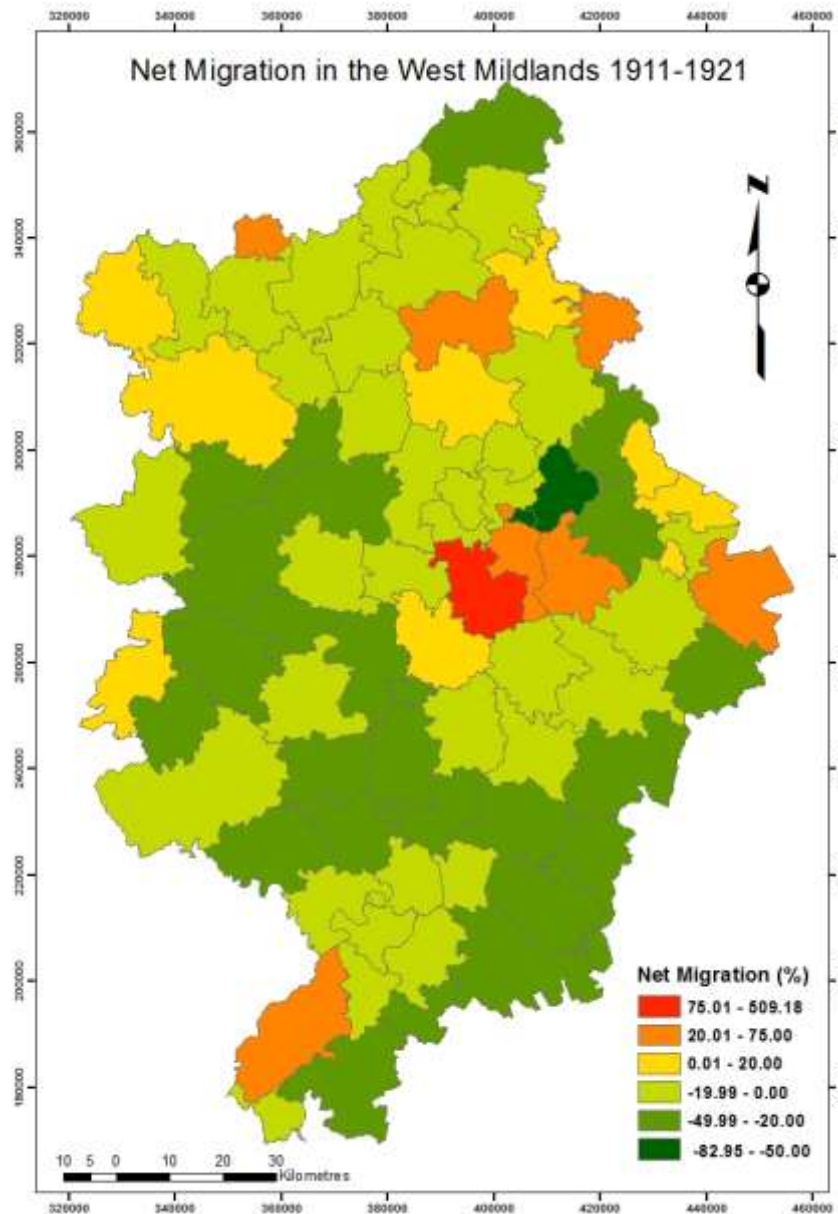


Figure 1: Spatial distribution of Male Net migration rates, 1911-1921. A negative rate indicates net out-migration and a positive rate indicates net in-migration.

The scatterplots displayed the relationships that existed between the types of employment and net migration. However, all the scatterplots show negative value which simply means there is a decrease in population (out-migration), on the other hand, outliers are randomly distributed, and that might affect the relationships.

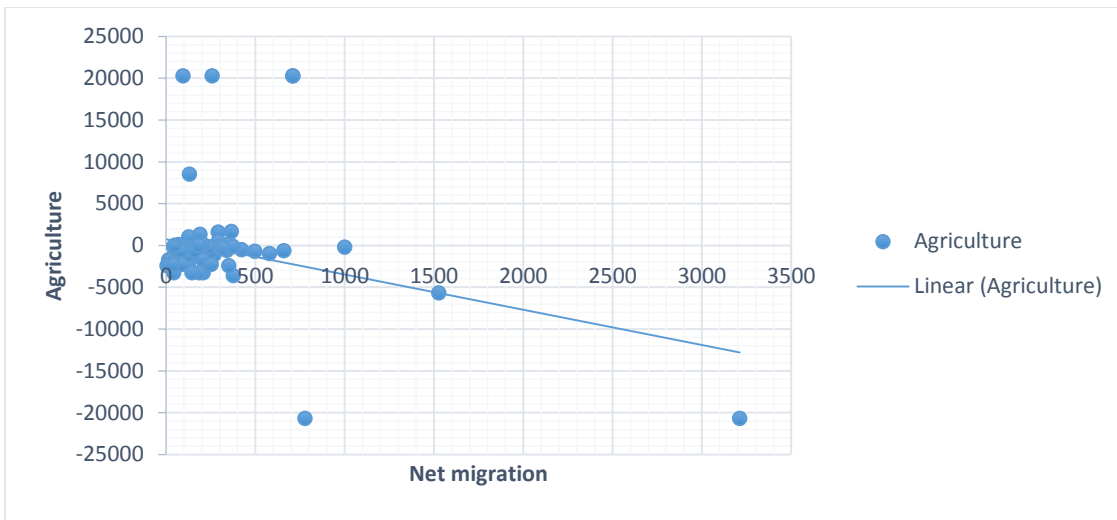


Figure 2: Showing relationship between male Net migration and Agriculture.

From figure 2 agriculture illustrated higher correlation, $r = 0.08$, that means many young male migrated from one location to another as a result agricultural activities within that period.

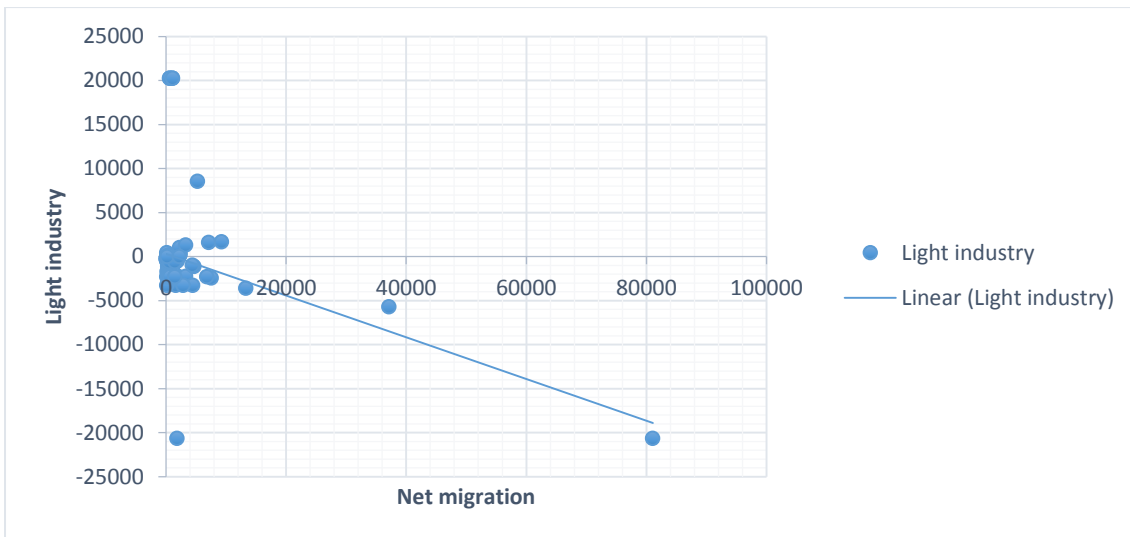


Figure 3: The relationship between net migration and light industry.

The relationship between net migration and light industry has correlation $r = 0.16$.

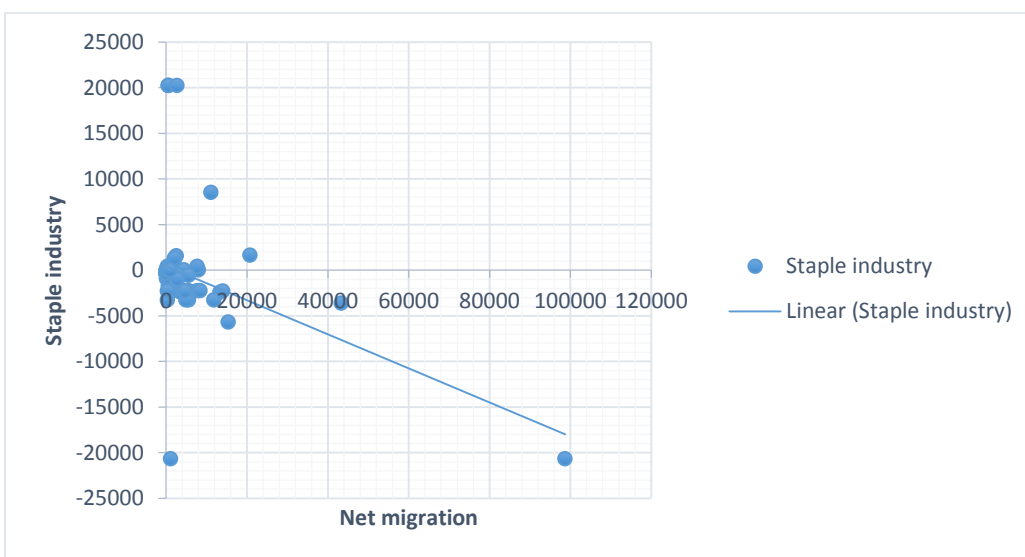


Figure 4: Relationship between Net migration and staple industry.

The correlation between net migration and staple industry $r = 0.15$.

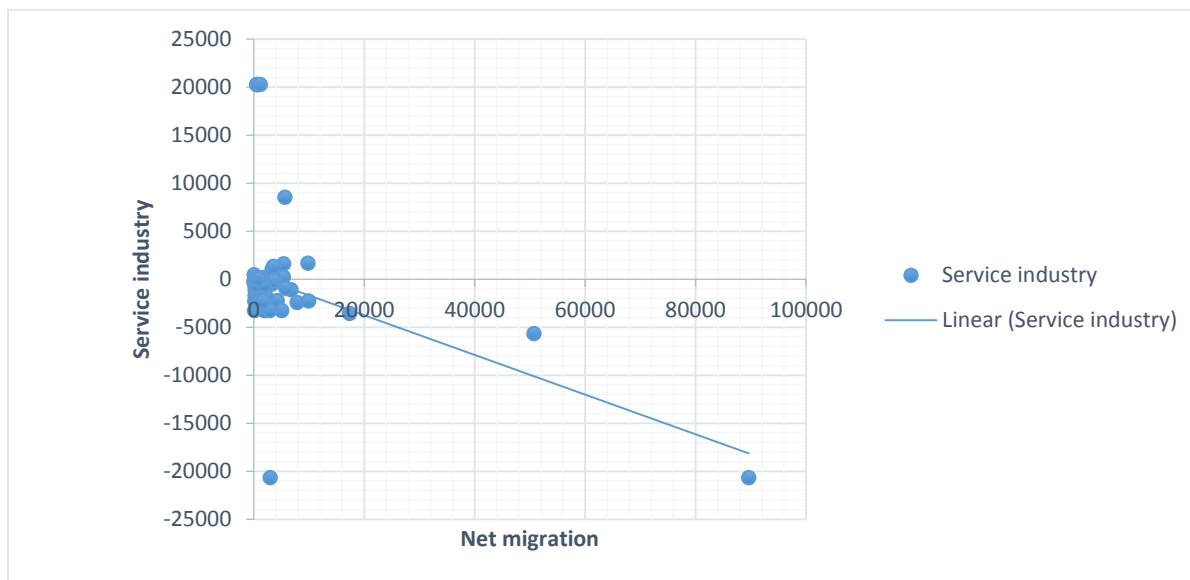


Figure 5: Relationship between Net migration and service industry.

The correlation between net migration and service industry $r = 0.16$.

For all the relationships that took place between net migration and types of employments revealed some negative values and this happened because there is an increase or decrease in population from one place to another due to in or out migration. Nevertheless, agricultural activities tend to attract more young people to an area than any other type of employment and the reason for this is that, may be agriculture activities is one of the lucrative jobs as observed by [4].

4.0 CONCLUSION

Areal weighting is the technique that was used to determine the population distribution by using the polygon, mean while dasymetric interpolation has been shown more accurately redistribute population than simple areal interpolation and Dasymetric interpolation is a method of interpolation that utilises ancillary data [7]. Although dasymtric does not represent data more closely to actual population density, rather estimates net migration among the population characteristics. However, the study revealed that certain types of employment tend to attract male population from eighteen to twenty five years to migrate form one place to another, these includes: agriculture, light industry, staple industry and service industry.

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