# Impact of Subnational Migration Flows on Population Distribution in Kenya: Analysis Using Census Data

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In Kenya, internal migration continues to impact population redistribution, although few studies have considered subnational variations of the intensities and their overall impact on this process. This study sought to analyze subnational migration flows and their impact on population redistribution in Kenya. The study used 1999 and 2009 census micro data to generate migration intensities for each county and to map these using ARCGIS software, to show the distributional effects of migration on the population for the period of investigation. The findings confirm a shift in the migration patterns in the country over the ten-year period, and also on the effect on population redistribution in the country. There are wide county variations with net gainers, net losers, and an emergence of inactive migration zones. Migrants are concentrated in counties with large, urbanized areas, although suburbanization is emerging, as secondary cities and urban areas attract migrants. Results from the spatial analysis show that migration intensities are clustered in ways that reveal similar intensities in neighboring regions. Consequently, two hotspots are visible – high-high hotspots in Nairobi and Vihiga – and clustering of low intensities in Mombasa and adjacent counties is evident. The study concludes that while internal migration effectively contributes to population redistribution, the effect is waning, as more regions become urbanized.

Keywords: impact, intensity, migration, subnational migration, county, Kenya

## INTRODUCTION

Migration affects the spatial distribution of the population and changes the age and sex structure of receiving and sending populations. There has been significant research on how international migration affects population distribution in sending and receiving areas, with little focus on the role that internal migration plays. Migration leads to suburbanization in national contexts, where migrants move from the metropolitan areas to smaller urban and rural areas. Understanding the patterns of flows and counter flows reveals the impact that migration has on the redistribution of the population over time. Scholars have used measures such as intensity of migration, in addition to rate and volume of migrants, to understand how the subnational dynamics play out. Owing to the paucity of migration data, particularly on the African continent, most countries rely on census data to conduct analyses of migration, focusing on national or regional averages. However, national averages tend to mask subnational variations of migration.

Studies have outlined the importance of internal migration to population redistribution, including the contribution of migration to urbanization processes. Global comparisons have been made with regard to internal migration trends and indicators, acknowledging the challenges of comparability of the data sets (Bell et al., 2002). To mitigate these challenges, researchers established a global repository for internal migration generated from census microdata through the IMAGE project (Bell et al., 2002; Bell and Muhidin, 2009; Bell et al., 2015). Several studies have used the IMAGE database to study migration intensities and their impacts worldwide (Bell et al., 2002; Bell et al., 2015; Rees et al., 2017).

Patterns and impacts of migration flows within national boundaries indicate not only where people move to, but also, the impact that such moves have on the overall residential population in receiving and sending areas. In Africa, internal migration is more predominant than international migration; therefore, scholarly interest has shifted to understanding the dynamics and impacts of internal migration flows (Adepoju, 1995; Okyerefo and Setrana, 2018). The common trend is that internal migration flows mirror the national development patterns; hence, migrants move to the more developed parts of the country and shun the least developed ones (Oucho and Gould,1993; Oucho, 1998). While this is a global trend, it is particularly common in Africa and is responsible for some of the urbanization challenges the continent faces (Turok, 2012; Mberu et al., 2017).

Studies on subnational migration patterns in Kenya are few, with the majority limited to a regional analysis based on previous provincial data. Such studies show wide regional variations in migration patterns and flows within the provinces, which are the old administrative units, resulting in the conclusions that Nairobi, Rift Valley and Coast provinces are the main recipients of migrants, while Western, Nyanza and Eastern provinces are the net losers. Little is said about the North Eastern and Central provinces (Wakajummah, 1986; Odipo, 1994; Oucho, 1996, 1998, 2000). Successive studies revealed little change in these patterns, prompting the conclusion that the factors determining internal migration in the country are not changing (RoK, 2010, 2012). To determine if this conclusion is true, this study used recent census data to explore migration trends at the subnational levels. This was prompted by a study showing wide differentials in county migration rates (Adieri, 2012), which led to the conclusion that national averages mask these subnational variations.

This study had a twofold objective, of (a) mapping out the subnational patterns of internal migration in Kenya to determine if any changes happened during the 1999–2009 period; and (b) visualizing the spatial effects of these migration flows in the counties. To do this, the study generated measures of migration intensity and undertook spatial analysis using ARCGIS software to map out the patterns and impacts of migration on population redistribution in the subnational units. While the 1999–2009 data used districts as the subnational units, this study reconstructed the districts to counties using a matching process, so that the findings were more relevant for the current administrative structure.

The study is timely, as county governments are currently fully functional administrative units in Kenya, hence migration dynamics within the county level become important for planning and development processes in these counties. While the analysis relied on census data, the availability of geospatial analysis tools helped with the visualization of the spatial effects of migration over time.

## LITERATURE REVIEW

The net effect of migration on population redistribution has been captured in several studies globally, although the majority of these studies are based on international migration data. In the recent past, there has been a growing interest in understanding internal migration through comparative global studies, although this has been plagued by numerous problems, including data sources, measurement, and definitional concepts, resulting in comparative studies of internal migration being largely absent from the main literature (Bell et al., 2002, Bell et al., 2015). In response to these challenges, the work of Bell et al. (2002) on the Comparing Internal Migration Across the Globe (IMAGE) project resulted in the development of a global repository of internal migration for global research. By 2013, the contributions of 179 of the 193 United Nations Member States were captured in the repository (Bell et al., 2015). The IMAGE project has revolutionized the discourse on internal migration, enabling global comparisons of migration intensities across the world (Bell et al., 2015).

Several measures of migration intensity have been used in subnational analysis. Bell et al. (2002) propose the use of two measures of the impact of migration, namely the migration effectiveness index (MEI) which extends the migration effectiveness ratio; and the aggregate net migration rate (ANMR). The MEI compares the proportion of total inflow minus outflow into a given geographical area as a proportion of total migrations recorded in the area, as captured by the sum of the total inflows and outflows to the geographical area. The MEI values range between 0 and 100, with high values showing that migration is effectively redistributing the population in the given area. The ANMR only measures how the net and gross migration flows compare for a given region. Another measure is the crude migration intensity, calculated as the number of levels of spatial disaggregation and computed as the total number of internal migrations at any given time as a percentage of the population at risk (Rees et al., 2000). A newer index of measuring migration intensity, the Index of Net Migration Impact (INMI), which has been proposed by Rees et al. (2017), compares the spatial patterns of migration between migration and population density. The use of migration intensities removes the focus from the rural-urban dichotomy, which complicates comparative analysis of migration data. As Lucas (2015: 6) observes, comparative studies resort to measuring migration rates by the propensities to cross some internal administrative boundaries such as regions, provinces, or districts.

Several studies have used the IMAGE dataset to document the impacts of internal migration across the globe (Bell et al., 2002; Bell et al., 2015; Rees et al., 2017). While this is progressive, there is still low representation of countries in Africa owing to data challenges, as documented by many researchers (see for example, Oucho and Gould, 1993; Oucho, 1998). Several efforts have been made to improve the migration statistics for migration analysis in Africa, including census data, surveys, as well as the limited use of specialist migration surveys in a number of countries, including Egypt and Ethiopia (Muyonga et al., 2020). Using data from the IMAGE dataset, Rees et al. (2017) observe that there are wide regional variations of intensities in Africa – although data is sparse – with low levels of migration impact noted in Egypt, Mali, and Ghana, but more substantial redistribution in Guinea, Senegal, Tunisia, Uganda, and Cameroon. Comparatively, in Kenya, there is a high redistribution effect based on recent migration data (Rees et al., 2017).

Elsewhere, several studies identified the impact that migration has on national population distribution, for example, in China (Fan, 2005; Shi et al., 2020), India (Bhagat and Keshri, 2020), and Latin America (Rodríguez-Vignoli and Rowe, 2018). Migration influences not only urbanization but also reflects the temporal effects of historical events, including migration policy outcomes for Asian countries (Charles-Edwards et al., 2019). In Britain, a study on the ethnic migration patterns reveals the heavy concentration of immigrants in the metropolitan areas in England, while the White population moved to regions with higher concentration to areas with a high share of the white population (Stillwell and Duke-Williams, 2005). In a review of internal migration impacts in 12 European countries, there is evidence of increased urbanization as well as counter-urbanization, specifically in Western European countries such as the UK, the Netherlands and France (Rees et al., 2017).

In Africa, subnational analysis of internal migration and the impact on population redistribution have been conducted widely, with the majority of studies focusing on regional population flows. Oucho and Gould (1993) observe that internal migration contributes to urban growth in Africa, although this effect has been declining over time. The regional studies show that internal migration is largely responsible for urbanization and growth of metropolitan cities, with increased population numbers in urban settlements due to the influx of migrants, while rural areas report net losses. The fast pace of urban growth in major cities of Africa has also been partly attributed to internal migration and the related challenges of the proliferation of slums (Mberu et al., 2017). While the majority of studies focus on movements from rural to urban areas, Lucas (1997) cautions that the bulk of internal migration flows in least developed countries are mainly between rural areas and not from rural to urban areas. Oucho (1998) agrees, observing that increased internal migration flows within countries is resulting in the blurring of the urban-rural dichotomy. In South Africa, findings show that metropolitan areas remain the greatest attraction to rural migrants, leading to net gains in the urban areas and losses in rural areas (Ginsburg et al., 2016). High internal migration is associated with low development, pushing out rural migrants to urbanized spaces. In Delta State, Nigeria, Onokerhoraye (2013) observes that unequal development, resulting in poor investments in rural infrastructure in the region, is the main push factor for migrants out of the region to the more developed parts of the country.

*Previous studies in Kenya*

Studies on internal migration in Kenya have largely focused on identifying the typology of flows and determinants of flows, with only a few studies considering the impact of migration on population redistribution. The internal migration flows confirm the colonial legacy of the country, where unequal development resulted in migration flows from poorly-developed areas to the metropolitan areas (Soja, 1968; Gupta, 1979; Oucho, 2007). The seminal works by Ominde (1969, as reviewed by Morgan, 1970) and Oucho (1988) show that migration flows are from rural to urban areas, rural to other rural areas, urban to other urban areas, and urban to rural areas – also known as return migration. However, while such studies focused on the urban-rural dichotomy in the flows of migrants within the country, Oucho (1998) observes that this is largely diminishing as urbanization levels rise in the country.

Wakajummah (1986) offers a different typology of internal migration flows in the country, identifying five major streams: (a) to metropolitan areas, largely representing patterns observed in Nairobi and Mombasa; (b) to settlement areas, in regions where land is available (Laikipia, Trans Nzoia, Uasin Gishu, West Pokot, Kajiado, Nakuru, Lamu, and Tana River districts); (c) to nomadic areas, largely found in the northern part of the country (Mandera, Wajir, Garissa, Marsabit, Samburu, Turkana); (d) to border areas (Busia, West Pokot, Kajiado, Narok, Garissa, Wajir, Marsabit); and (e) the patterns in Western, Nyanza, and Eastern regions. He notes that a limitation of such earlier studies is that they did not show the inter-regional flows (Wakajummah, 1986: 134).

Several other studies concentrated on the determinants of internal migration in Kenya, although most focused on explaining the patterns of labor migration flows, arguing that the migrants move in search of employment opportunities or better wages (Todaro, 1969; Rempel, 1971,1974; Knowles and Anker, 1977; House and Rempel, 1981). Todaro's study shows that migrants make the decision to move based on the perceived income in urban areas compared to rural areas. In case they do not find the wage differentials beneficial, they are likely to return to their origin areas. Soja (1968) notes that migrants may move to areas with better economic development. However, the distance between districts and destination factors determine how far migrants are prepared to move (Barber and Milne, 1988). Oucho (1996) describes the 'urban bias' of rural migrants who prefer to move to urbanized parts of the country, adding that internal migrants maintain urban-rural linkages with their origin areas through exchange of goods and services, visitation, and remittances. Despite the bias for rural areas, several studies argue that migration patterns mirror the economic disparities between regions (Oucho, 1981, 2000, 2007, 2016). A different perspective is offered by Wakajummah (1986), who notes that migration is motivated by land inequality in the origin areas, resulting in male out-migration to other parts of the country where there is land. In a related study, Ovyat and Mwangi wa Githinji (2017) add that land inequality causes migrants to move initially to smaller urban areas, before eventually reaching the larger urban cities like Nairobi. In addition, the study shows that land inequality affected more males than female migrants.

Internal migration studies in Kenya have relied on regional estimates of migration rates to show the population redistribution in the regions – previously named Provinces – concluding that the net gainers are Nairobi, Rift Valley, and Coast regions, and net losers include Western, Nyanza, and Eastern provinces. The high numbers of outmigrants from the Western region resulted in the region becoming known as Kenya's human capital reservoir (Oucho, 2002; Oucho et al., 2014). Such studies are however, based on a regional analysis of migration patterns based on national averages, which may mask subnational variations, as confirmed in more recent studies (for example, Adieri, 2012). In his analysis of intercensal migration during the period 1999 to 2009 using census data, Adieri (2012) observes that there are wide variations in the county-level migration rates, which were previously masked using regional aggregate measures of migration. His study, that used intercensal migration rates, shows that movements to Nairobi and Mombasa exhibit similar age-sex specific patterns. However, the study did not consider the contingency flows between counties.

The review of the relevant literature confirms that there are regional variations in migration patterns and rates in the country, although none of the studies compared the impact of migration on the spatial distribution of the population. This study sought to fill this gap in knowledge, showing how migration intensities are spread in the 47 counties, and highlighting the impact on spatial distribution of the population in the receiving counties. This study differs from the previous ones in two key ways. First, it focused on county-level analysis using 1999 and 2009 census data. While studies such as Adieri (2012) conducted county-level analysis, the focus was on the migration rates in the intercensal period, showing the age-sex specific rates per county. Previous studies relied on regional analysis that focused on Provinces, which are currently redundant, following the creation of counties in the country's new constitution (RoK, 2010). Second, the study employed spatial analysis and spatial mapping techniques that visualize the spatial changes to the population in counties for the two respective census years.

The next sections present the study methodology, key findings and a discussion of their implications, followed by the conclusion with some recommendations for policy-makers and future studies.

## METHODOLOGY

The analysis required county-level data on migration intensities. The county was the study's unit of analysis, and although data was available for sub-county migration, did not conduct the sub-county migration intensity analysis owing to data limitations and constraints. While the 1999 and 2009 censuses were conducted using the district as the subnational unit, the researchers obtained county-level data by matching the relevant districts to the present-day county. Table 1 shows the district data for 1999 and 2009 with the corresponding county as per the new constitution. The matching process was guided by the data processing team of the Kenya National Bureau of Statistics – the custodian of official statistics in Kenya. The number of districts had increased from 69 in the 1999 census, to 159 by 2009 (RoK, 2001; Odhiambo and Ndilinge, 2007). The creation of administrative units in the pre-devolution period, was largely political with the head of state deciding on the number and location of districts to be created. The new constitution altered the process of creating administrative units in the country and established 47 counties, which have been gazetted. As a result of these changes, the 2009 census, while originally conducted before the promulgation of the constitution in 2010, had the analytical reports prepared with the county as the unit of analysis (RoK, 2010, 2012).

Table 1: Districts to Counties matching

| **Region (previously Province)** | **County (previously District)** |
|---|---|
| Nairobi | Nairobi |
| Central | Nyandarua, Nyeri, Kirinyaga, Muranga, Kiambu |
| Coast | Mombasa, Kwale, Kilifi, Tana River, Lamu, Taita Taveta |
| Eastern | Marsabit, Isiolo, Meru, Tharaka Nithi, Embu, Kitui, Machakos, Makueni |
| North Eastern | Garissa, Wajir, Mandera |
| Nyanza | Siaya, Kisumu, Homa Bay, Migori, Kisii, Nyamira |
| Rift Valley | Turkana, West Pokot, Samburu, Trans Nzoia, Uasin Gishu, Nandi, Baringo, Laikipia, Nakuru, Narok, Kajiado, Kericho, Bomet |
| Western | Kakamega, Vihiga, Bungoma, Busia |

The map of counties is presented in Figure 1.

Figure 1: Map of Kenyan Counties (KNBS, 2019)


Source: Authors' own work

Researchers derived census micro data from the 1999 and 2009 Kenya Population and Housing census data obtained from the Kenya National Bureau of Statistics (KNBS). The 1999 data included information on the district of birth, district of residence a year before the census and duration of residence. The 2009 census, by comparison, collected data on place of birth, previous residence, duration of residence and place of enumeration. While the 2019 census had been completed, the data sets were not used in this analysis, as the study commenced before the completion of the census. Moreover, the 2019 census is yet to undergo the detailed analysis of population dynamics, but it included questions on reasons for migrating (RoK, 2019: 250).

The key data for this analysis was lifetime migration data, derived by cross-tabulating the place of birth by the place of current residence from the census. Residents whose place of birth was different from their place of residence, were categorized as lifetime migrants. Depending on whether they had moved into or away from their place of birth, they were labeled as 'lifetime in-migrants' or 'lifetime out-migrants'. Lifetime data was used to compute migration intensities, thus giving insights on the extent to which individuals living in Kenya had moved away from their place of birth. However, this is limiting, as it does not factor duration of residence and may lead to under- or over counts of migration in the long term (UNDESA, 1970).

*Method*

To determine the net effect of migration on population redistribution, the study used the Revised Weighted Net Migration Rate (RNM*i*) and the Revised Weighted Gross Migration Rate (RGM*i*). These two measures showed how the population had been redistributed through migration. The RGM*i* and RNM*i* values provided different outputs of the impact of migration on subnational population distribution. The RGM*i* presented the proportion of migrants in each county, that is, 1 in X number of the population in a given county was 'in-migrant population', while RNM*i* gave an indication of the overall intensity of migrants in the county compared to the rest of the country, hence, the proportion of net migrants in a given county, in relation to the entire migrant population in the country. Thus, the RNM*i* value weights the individual county migration intensities to the overall national intensity.

The measures are derived from the net migration and gross migration rates, which consider only the difference between in-migrants and out-migrants as a proportion of the total population. The RNM*i* considers the proportion of migrants in the total population and the total migrants, therefore taking care of undercounts or overcounts that would otherwise occur due to huge differences in the total population (Shi et al., 2020; Liu et al., 2011).

The RNM*i* is computed by weighting the net migration rates by the share of migrants in the total population. When the number of in-migrants is larger than the number of out-migrants, the net migration rate gives a positive result, whereas a negative migration rate implies that more people are moving out of an area than coming in. The RNM*i* is computed as:

$$RNMi = ((I_i\text{-}0_i/P_i) * (I_i/\Sigma I_n)) * N$$

Where I*i* is the number of in-migrants in County *i*, O*i* is the number of out-migrants in County *i*, P*i* is the resident population in County *i*, and N is the total number of counties – in this study's case it is 47. To visualize the changes in population redistribution, this study used ARCGIS 10.5 software to map out the revised weighted migration rates using shapefiles for the 47 counties.

*Revised Gross Migration Rate ($RGM_i$)*

This is derived from the gross migration rate, which measures the total flows of migrants, adding in-migrants and out-migrants. Thus, the RGM*i* weights the gross migration rate by the share of total migrants in the total population. Therefore, the RGM*i* is derived by multiplying the gross migration rate by the summation of the total migration in the county, weighted by the total number of counties. The RGM*i* was used in this study to show the overall effect of migration on the total county population. Thus, for a given county, the RGM*i* will show what proportion of the county population is comprised of the migrant population.

$$GMR = (I_i + O_i)/P_i,$$

where GMR is the gross migration rate, I is the number of in-migrants, while O is the number of out-migrants.

Therefore, the RGM*i* is derived as follows:

$$RGMi = ((Ii + Oi)/Pi) *(\Sigma I_n + \Sigma O_n)) *N$$

where I*i* is the number of in-migrants in County *i*, O*i* is the number of out-migrants in County *i*, and P*i* is the resident population in County*i* and N is the total number of counties.

*Spatial analysis*

The researchers conducted a spatial analysis of the migration intensities executed by Spatial Statistics Tools extension found in the Arc Toolbox section in the ARCGIS software. The spatial analysis involved testing if the migration intensities for the counties are randomly distributed or not, and if they are dependent on spatial factors. To do this, the researchers conducted the Moran's I test of spatial autocorrelation of the migration intensities, captured using the RNMis. The Moran's I test of spatial autocorrelation confirms if the values of migration intensity in the country are randomly distributed, or if they have spatial associations. The values of Moran's I test range from -1 to 1, with -1, where the value 1 means there is perfect clustering of similar values, while 0 means there is no autocorrelation, hence, any clusters arising are of dissimilar values. Thus, a positive value of Moran's I indicates that the values being analyzed tend to cluster spatially, either as high values clustering together, or low values clustering together. A negative index implies that high values repel each other and tend to be near low values. The results of spatial autocorrelation analysis using Moran's I present five outputs: the Moran's Index, Expected Index, Variance, *z*-score, and *p*-value. The Moran's Index value ranges from -1 to 1, confirming if the variables – in the case of this study, migration intensity – are either clustered or randomly distributed. A Moran's I value of 1, indicates that the migration intensities are clustered with similar values together, such as high values in the neighborhood of other high values, or low values together with other low values. When the Moran's I value is close to 0, it shows that the values are not clustered. If the Moran's I value is negative, it indicates that high values are located close to low values. The Moran's Index also generates a *p*-value and a *z*-score that capture the statistical significance of the outputs. The spatial autocorrelation report presents a second output – the Expected Index. This index shows the distribution of migration intensities in case there is no clustering. The p-values and the *z*-scores of the Expected Index are also generated.

To determine if the migration intensities are random or clustered, the *p*-values and the *z*-scores of the Moran's I and the Expected Index are compared. The *p*-values present a probability that the spatial pattern observed is a random process. If p is of low value, then the observed clustering is not a random event, hence, the null hypothesis is rejected. The *z*-scores present the standard deviations, and these tend to vary, based on the distribution. In a normal distribution, the z-values can be extremely high or extremely low with small *p*-values. Thus, to determine the spatial association and the significance of such association the *p*-values and the *z*-scores of the two indexes are compared. Once the Moran's Index is computed, the Expected Index is also computed, and the two values are then compared using the *p*-values and the *z*-scores to determine if the difference is statistically significant. The output of the spatial autocorrelation analysis generates maps of the residuals which reveal the spatial changes to population distribution.

## RESULTS

### *Migration activity: 1999–2009*

Table 2 shows the trends in migration activity using the revised net migration and revised gross migration rates.

Table 2: Trends in Migration activity 1999-2009

| RNM*i*_1 per 1000 | | | | RGM*i* per 100 | | | |
|---|---|---|---|---|---|---|---|
| **County** | **2009** | **County** | **1999** | **County** | **2009** | **County** | **1999** |
| Vihiga | 547.46 | Nairobi | 6740.35 | Nairobi | 1298 | Nairobi | 496 |
| Nyandarua | 54.06 | Mombasa | 1302.35 | Mombasa | 448 | Nakuru | 147 |
| Bungoma | 34.13 | Nakuru | 1011.54 | Nakuru | 202 | Kiambu | 125 |
| Kiambu | 18.15 | Uasin Gishu | 501.39 | Kiambu | 153 | Mombasa | 125 |
| Samburu | 0.06 | Laikipia | 397.81 | Uasin Gishu | 121 | Kisumu | 103 |
| Mandera | 0.00 | Trans Nzoia | 303.83 | Kajiado | 90 | Siaya | 91 |
| Nyamira | 0.00 | Kajiado | 235.74 | Machakos | 87 | Kakamega | 83 |
| West Pokot | 0.00 | Nyandarua | 165.72 | Kilifi | 85 | Muranga | 80 |
| Kisii | 0.00 | Narok | 78.92 | Meru | 80 | Nyeri | 75 |
| Baringo | 0.00 | Kiambu | 53.38 | Busia | 77 | Uasin Gishu | 72 |
| Garissa | 0.00 | Kericho | 48.02 | Nyandarua | 70 | Vihiga | 72 |
| Laikipia | 0.00 | Migori | 21.94 | Trans Nzoia | 68 | Machakos | 59 |
| Homa Bay | 0.00 | Nandi | 16.69 | Laikipia | 59 | Homa Bay | 57 |
| Bomet | 0.00 | Lamu | 10.52 | Kisumu | 58 | Trans Nzoia | 55 |
| Narok | 0.00 | Tana River | 8.96 | Kwale | 56 | Nyandarua | 55 |
| Kericho | 0.00 | Isiolo | 2.30 | Lamu | 53 | Laikipia | 50 |
| Siaya | -0.01 | West Pokot | -1.84 | Makueni | 50 | Kericho | 38 |
| Migori | -0.01 | Mandera | -2.20 | Tharaka Nithi | 48 | Nandi | 32 |
| Kisumu | -0.02 | Wajir | -2.43 | Embu | 47 | Bungoma | 31 |
| Kajiado | -0.03 | Garissa | -6.06 | Bomet | 40 | Busia | 26 |
| Nandi | -0.04 | Marsabit | -6.94 | Vihiga | 38 | Migori | 24 |
| Trans Nzoia | -0.05 | Turkana | -8.15 | Nyamira | 38 | Kajiado | 23 |
| Uasin Gishu | -0.06 | Kilifi | -8.95 | Muranga | 34 | Kisii | 22 |
| Kirinyaga | -0.06 | Samburu | -9.08 | Taita Taveta | 25 | Kitui | 20 |
| Nakuru | -0.07 | Meru | -10.19 | Kakamega | 24 | Makueni | 20 |
| Nyeri | -0.09 | Tharaka Nithi | -10.58 | Narok | 23 | Nyamira | 18 |
| Kakamega | -0.18 | Kwale | -10.81 | Isiolo | 20 | Bomet | 17 |
| Turkana | -0.40 | Embu | -15.97 | Tana River | 20 | Taita Taveta | 17 |
| ElgeyoMarakwet | -0.60 | Kirinyaga | -19.07 | Homa Bay | 19 | Narok | 16 |
| Nairobi | -0.90 | Baringo | -22.04 | Nandi | 19 | Embu | 12 |
| Wajir | -4.52 | ElgeyoMarakwet | -24.82 | Migori | 17 | Kilifi | 11 |
| Marsabit | -33.75 | Taita Taveta | -29.92 | Nyeri | 16 | ElgeyoMarakwet | 10 |
| Kitui | -35.63 | Bomet | -39.87 | Bungoma | 16 | Kirinyaga | 10 |
| Tana River | -57.82 | Kitui | -40.67 | Marsabit | 15 | Baringo | 10 |
| Isiolo | -62.14 | Nyamira | -43.58 | Siaya | 14 | Kwale | 9 |
| Taita Taveta | -75.30 | Makueni | -49.30 | Kitui | 14 | Isiolo | 7 |
| Tharaka Nithi | -77.02 | Kisii | -51.70 | Kericho | 12 | Lamu | 7 |
| Muranga | -77.90 | Busia | -60.72 | Kirinyaga | 5 | Meru | 5 |
| Embu | -119.86 | Bungoma | -70.41 | Kisii | 3 | Tharaka Nithi | 4 |
| Makueni | -145.13 | Kisumu | -71.52 | ElgeyoMarakwet | 2 | Samburu | 4 |
| Kwale | -145.83 | Homa Bay | -104.63 | Baringo | 2 | Tana River | 4 |
| Lamu | -156.79 | Vihiga | -104.99 | Wajir | 2 | Turkana | 4 |
| Meru | -173.33 | Machakos | -144.56 | Garissa | 1 | Marsabit | 3 |
| Busia | -236.25 | Muranga | -157.55 | Samburu | 1 | Garissa | 3 |
| Kilifi | -236.77 | Nyeri | -182.60 | West Pokot | 0 | West Pokot | 2 |
| Machakos | -266.78 | Kakamega | -198.03 | Turkana | 0 | Wajir | 1 |
| Mombasa | -1282.82 | Siaya | -227.30 | Mandera | 0 | Mandera | 1 |

*Shifts in the net in-migration zones*

In Table 2, panel one has columns 1–4 capturing net in-migration rates. The positive values indicate where in-migration rates were higher than out-migration rates while the negative values represent counties where out-migration was higher than in-migration. The indicators have been weighted by the share of in-migrants (in-migrants in the county divided by total migrants in the county). The key result from the table is the reversal in the pattern of the county net in-migration rate over the 10-year period.

In 1999, the top counties with high in-migration rates represent three typologies of counties: (a) the urban counties of Nairobi and Mombasa, which attract high rural-urban migrants; (b) counties with agricultural potential, including Nakuru, Naivasha, and Uasin Gishu counties; and (c) counties that have large settlement areas, such as Trans Nzoia and Laikipia counties. In 2009, there was a huge reversal, with the top three counties of high in-migration rates being largely rural counties. Vihiga county, with the highest in-migration rate in 2009 could reflect return migration, as it had a high out-migration in 1999. This may be partly attributed to the 2007/2008 post-election violence in Kenya, with return migration – probably from the neighboring Nandi and Uasin Gishu counties – having had a high out-migration rate in 1999. Bungoma county also gained high in-migration, possibly due to return migration as well as resettlement. Nyandarua, a traditional settlement, could also have gained in migrants from the Uasin Gishu and Nandi counties, which experienced internal displaced of the population following the post-election violence.

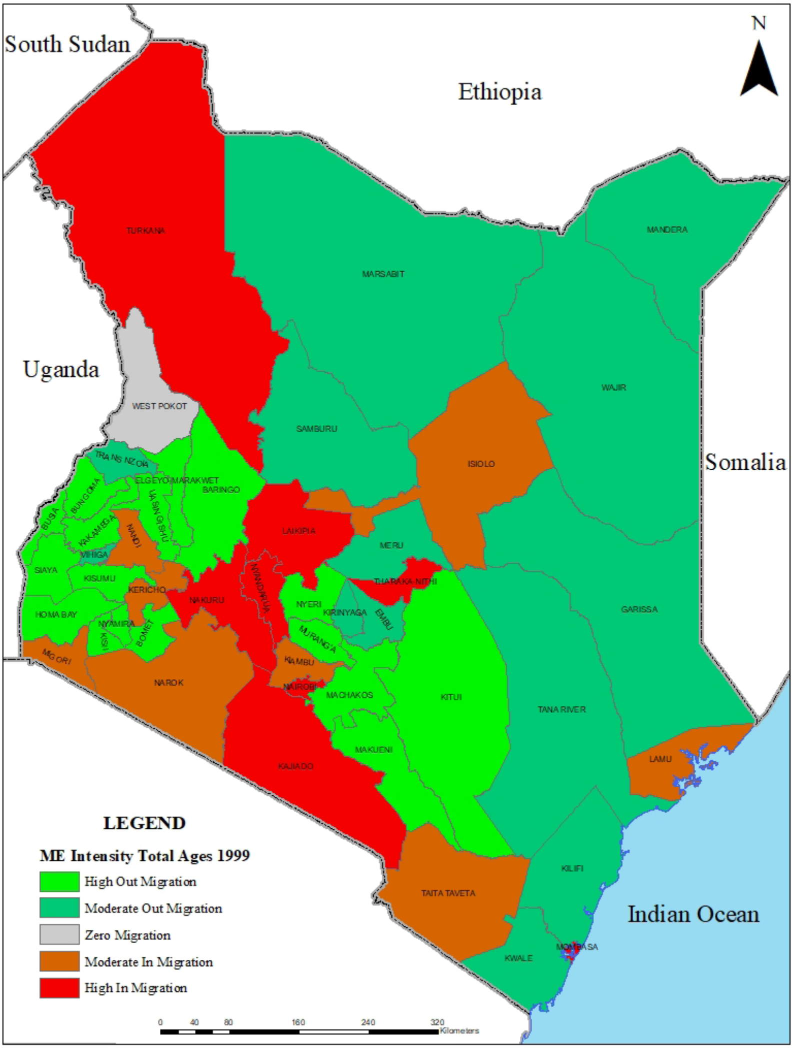
*Shifts in the net out-migration zones*

The negative values of panel one show counties where out-migration was higher than in-migration. Data for 1999 shows high out-migration rates in the counties of Western Kenya including Siaya and Kakamega counties, and Central Kenya (Nyeri and Muranga) that date to the pre-independence period. The patterns seen here arise from the regions with higher education due to early colonial administration and missionary settlement, hence, residents' decision to move, seeking employment, especially in while collar jobs in businesses in urban areas and plantation establishments. A reversal in the 2009 data is evident, with high out-migration from Mombasa, Machakos, Kilifi and Meru counties, although the patterns are mixed. The highest out-migration observed in Mombasa may yet again be attributed to the post-election violence of 2007/08, the decline in the tourism sector that created employment in the hotels along the beach, and a decline in formal employment creation. The decline in tourism could also explain the high out-migration from Kilifi. However, Machakos and Meru County scenarios are still difficult to explain. For Busia County, the net losses could be attributed to reduced informal cross-border trade as the revamping of the East African Community (EAC) formalized border control processes for the exchange of trade between Kenya and Uganda.

The results of the migration intensities, measured using RNMi were mapped using ARCGIS and the results are shown in Figure 2 and Figure 3. Figure 2 presents the outcome of the analysis using 1999 census data. The counties are categorized into five key regions – regions of high in-migration are indicated in red, while those with high in-migration are in green. The counties where migration is inactive are indicated in grey. The results show that net gainers of migrants are counties with metropolitan areas, including Nairobi, Uasin Gishu, Mombasa, Nakuru, and Kajiado counties – all indicated in red. The data shows a pattern of net gainers for counties along the international borders, including Turkana County in the north of the country, bordering Ethiopia, Sudan, and Uganda; and Kajiado county in the southern part of the country bordering Tanzania.

The lighter green colour denotes counties that are net out-migration zones. There are two distinct regions manifesting this trend. The first is the block of counties in the western part of the country around the Lake Victoria basin, in the Nyanza and Western regions, and parts of the Upper Rift Valley region including Uasin Gishu and Baringo counties. A second block of net out-migration counties is found in the eastern part of the country, especially Kitui, Machakos, and Makueni counties in the Eastern region, and Nyeri County in the Central region.

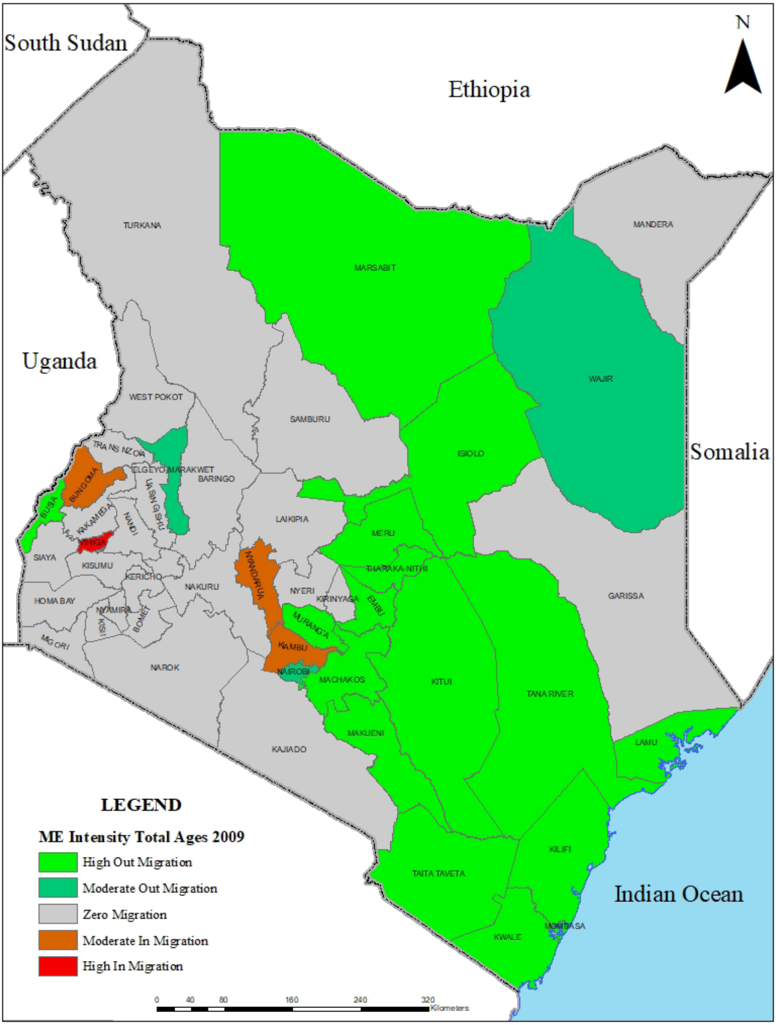
Figure 2: Weighted migration rates for counties, 1999




Source: Authors' own work

Figure 3 presents the spatial maps generated from revised weighted migration rates from the 2009 data. The map captures those spatial changes in the migration patterns over the ten-year period between the two censuses. The map captures the different impacts of migration, with red indicating high in-migration areas, grey indicating inactive migration zones and light green indicating counties with high out-migration. At a first glance, the map is predominantly green, implying that there is increased mobility in the country, although there are many counties where migration is inactive, as indicated in the grey zones. It is only in Vihiga county where high out-migration was evident, followed by Bungoma county and parts of Central Kenya.

Figure 3: Weighted migration rates for counties, 2009




Source: Authors' own work

A comparison of data on the two maps, revealed a higher increase in inactive migration zones from the 2009 data, as captured in Figure 3, implying that there was little population redistribution due to migration. There have been shifts in intensities and impacts in some counties. Vihiga county in the western part of the country remains the county with high in-migration, according to the 2009 data, with a few other counties recording moderate in-migration, as noted in Busia, Nyandarua and Kiambu counties. The Eastern region remained an active net out-migration region in 2009, while Mombasa County shifted from being a net out-migration zone to becoming an in-migration zone. Nyandarua, Kiambu, and Kericho counties, which were net out-migration zones in 1999, became net in-migration zones in 2009.

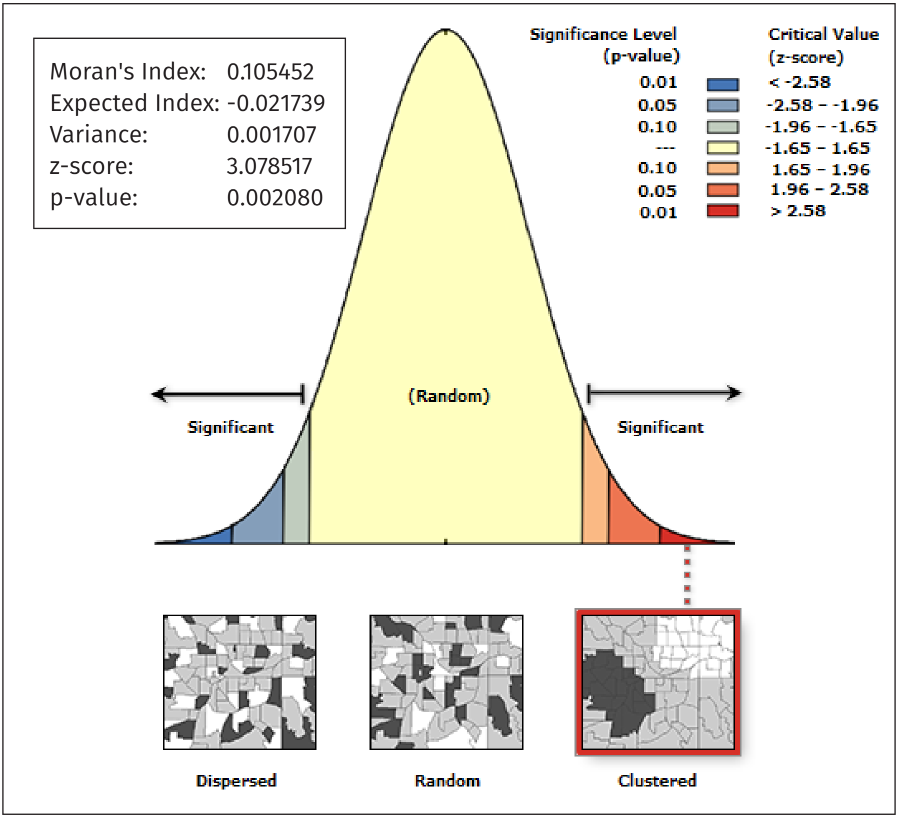
Using the revised weighted gross migration rate, the findings show a higher proportion of migrant population in each county, with those having urbanized settlements recording a higher intensity of migrants. In 1999, a higher influx and concentration of migrants was noted in Nairobi, Nakuru, Kiambu, Mombasa, and Kisumu counties. All these counties host major urban areas in Kenya. The 2009 data shows that the major concentration of migrants is found in Nairobi, Mombasa, Nakuru, Kiambu and Uasin Gishu counties. The data further shows that internal migrants are mainly concentrated in regions with the large, urbanized counties in Kenya, with the major cities, especially Nairobi, being the destination of choice of migrants. Conversely, there is little effect of migration in the overall populations in the counties in the northern frontier of the country, located in the arid and semi-arid areas, as noted in West Pokot, Turkana, and Mandera counties in the data for 2009.

When the data is observed for the proportion of migrants in counties, there is an indication of the importance of secondary urban areas and cities in the absorption of migrants. In 2009, when major urban areas were considered, the next destinations of migrants were Kajiado, Machakos, Kilifi, Meru, and Busia counties. The first four of these counties are those contiguous to major urban areas; they are thus receiving an outflow of the migrant population. For Busia county, the data may contain migrants crossing the national borders from the neighboring countries, as it is located at the border of Kenya and Uganda. Comparing the data for 1999 and 2009 shows a shift in the major destinations for migrants, as the rural-based counties of Siaya, Kakamega, Muranga, and Nyeri which attracted migrants, have a lesser concentration of migrants during the 2009 period. The results of the gross weighted migration rate for the two periods show a migration transition in the country.

*Spatial analysis of migration intensities*

The study applied spatial analysis using Moran's I to determine if the migration intensities were random or if there was clustering. The results included the Moran's Index as well as a cold-to-hot rendered map of standardized residuals, as shown in Figure 4. The map shows hot and cold spots of migration intensities clustering.

Figure 4: Spatial autocorrelation results

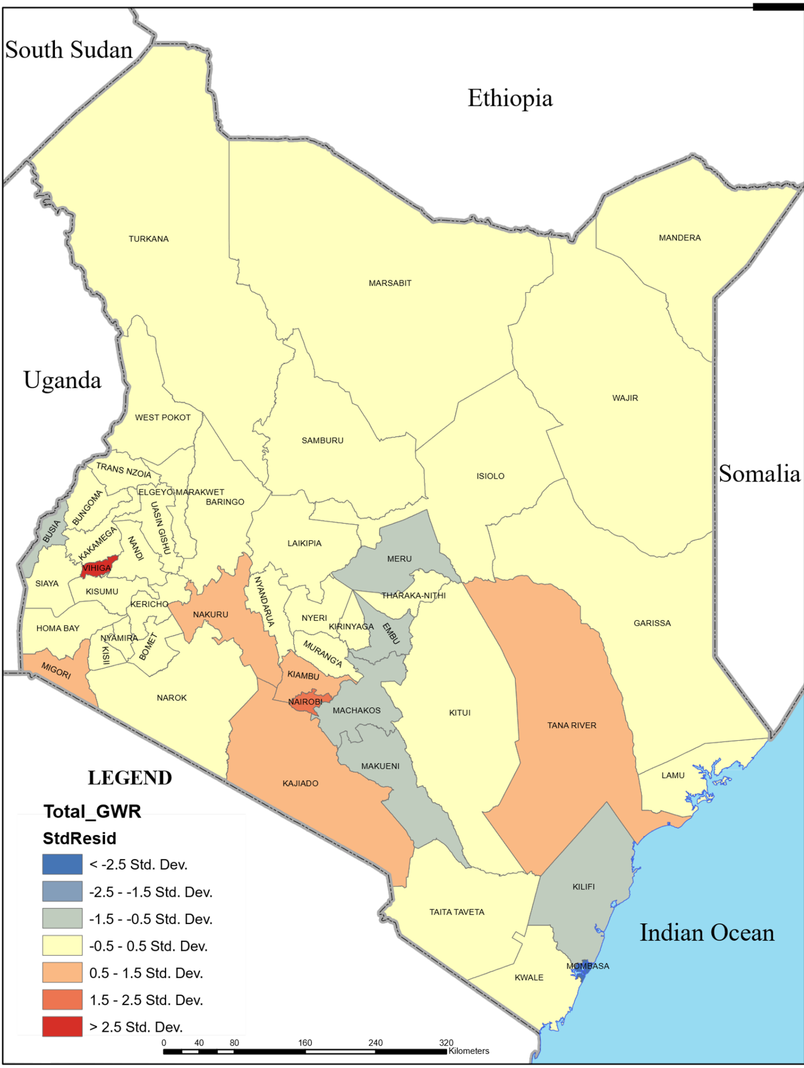



Source: Authors' own work

The output of the analysis, in the top left corner of Figure 4 presents the Moran's Index as 0.105452, the *z*-score is 3.078, while *p*-value is 0.002, implying that the data is spatially clustered and not randomly distributed. The positive value of Moran's I indicates that while the values are spatially clustered, positive values are clustered together and negative values are clustered together. This leads to the conclusion that migration intensity is spatially clustered, with neighboring regions recording similar values.

The residuals of the analysis of migration intensities by county using ARCGIS, are presented in Figure 5. The results confirm the clustering of migration intensities around the country. Nairobi has remarkably high migration intensity and is surrounded by regions with similarly high migration intensities, leading to a clustering of high-high migration. This may be because of the spillover effects of migration to Nairobi, hence migrants move to the next contiguous counties, as demonstrated by high intensities in Kajiado, Kiambu, and Nakuru counties. There is a clustering of low migration intensities in Makueni, Machakos, Embu, and Meru counties. In the Western part of the country, there is a cluster of high migration in Vihiga county and evidence of high migration in Migori county at the Kenya-Tanzania border. Comparatively, the coastal region shows evidence of low migration clustering in Mombasa and Kilifi counties.

Figure 5: Results of the spatial analysis of migration intensities




Source: Authors' own work

## DISCUSSION

This study considered county migration patterns and their impact on spatial distribution in Kenya, using data from successive censuses. The study used two measures of migration intensity to consider the impact of migration on population redistribution, namely, the revised weighted net migration rate and the revised weighted gross migration rate. Each of the measures helps to clarify the effect of migration on the population redistribution in the country. The revised weighted net migration rates show a shift of migration intensity in 2009 compared to 1999. There was high in-migration into several regions in the country, particularly in Busia and Kajiado counties, located on the international borders, and in the central region, in such counties as Laikipia, Nyandarua, and Nakuru, in addition to Nairobi County. Comparatively, the 2009 data shows that there have been higher levels of migration within all the counties, but with a concentration of in-migrants in Vihiga county as well as moderate flows into Nyandarua, Nakuru, and Busia counties. The findings suggest that the effect of migration on population redistribution is waning and implies that other factors such as natural increase may be contributing to the spatial redistribution of the population in the country. The data for Vihiga county warrants further research as it seems to be the main in-migration hub for the Lake Victoria basin, which is a shift from Kisumu and Kericho, identified in earlier studies (see for example, Oucho, 1988).

The data from the revised weighted gross migration rates shows that most migrants are moving into the more urbanized ones, most of these being part of administrative centers in the colonial period and presently have higher economic potential. This corroborates findings of previous studies, especially those conducted during the colonial and pre-independence period (Rempel, 1974; Knowles and Anker, 1977; Oucho and Gould, 1993; Oucho, 2007). The urbanized areas – though districts at the time – are still the same in the present-day counties. The urbanized counties have well-developed infrastructure including schools, health facilities, and public transport systems. Nairobi, the capital city, receives the lion's share of migrants in each successive census owing to the enormous opportunities available in both the formal and informal sectors. The high influx of migrants could strain the existing infrastructure and the provision of social services in the counties, including the proliferation of slum dwellings in the counties, as migrants seek cheap accommodation. This has already been observed in the recent periods, with problems such as waste disposal, traffic congestion, and the proliferation of slums increasingly evident in counties other than Nairobi, Kisumu, Mombasa, and Nakuru, which were the previously urbanized counties.

The findings show that the top counties remain the same, save for the dominance as either an in-migration or an out-migration county. The 1999 census data identified Nairobi as having the highest population gains, dominated by the influx of in-migrants. This is also happening in Nakuru and Mombasa counties (high RGMi, high RNMi). Kiambu has a moderate RNMi but still ranks higher. Meanwhile, Kisumu and Siaya are dominated by out-migrants (low RNMi), with Siaya reporting the highest out-migration rate in the country. The pattern for 2009 showed Nairobi as having high internal migration activity but with balanced in- and out-migration. Mombasa recorded a high out-migration rate, while Kiambu had a high positive migration rate, while the rest of the counties reported more balanced in- and out-migration. The spatial analysis confirms that migration intensities in the country are not randomized as they are clustered.

## CONCLUSION AND RECOMMENDATIONS

This study sought to establish the impact of internal migration on the population redistribution in the country. Using several indicators of measuring migration intensity and spatial analysis, the results show that migration has affected the population redistribution in the country with migrants concentrated in counties with urbanized areas, such as Nairobi, Nakuru, and Uasin Gishu. However, much of the concentration of migrants in urban areas, has led to an increase of migrants in the populations in the receiving counties, as confirmed by this study's data from the gross migration rate. These observations lead the researchers to conclude that while migration initially led to faster urban growth in the country, there is evidence of a declining net effect of migration on the population redistribution in the country. There is evidence of suburbanization, as more migrants move to secondary urban areas in the country. The flows and counterflows of migration in the country are clustered with high-high hotspots emerging in the western and central parts of the country, with low-low clustering in the coastal region.

The findings confirm that the migration in the country is concentrated in the more developed regions owing to the colonial legacy, as observed in previous studies. However, shifts in this pattern are emerging, as evidenced from the 2009 census data, with secondary cities gaining importance in attracting migrants. Part of the scenario observed from the 2009 data, confirms the effect of the 2007/2008 post-election violence in the country that resulted in internal displacement of some people, but that also led to return migration from the conflict hotspot regions that were mostly in the Central and Rift Valley regions.

The findings bear evidence that the regional variations in migration rates in the country were masking subnational intensities. The data has shown that urbanized counties are the main receptors of migrants, while non-urbanized counties remain largely sending areas. In the Rift Valley region for example, only a handful of counties are responsible for the high mobility that was previously observed in the region. This confirms the importance of analyzing the migration data to the subnational level.

The findings from this study form the basis of several policy recommendations for county governments, presented here. The researchers maintain that devolution will result in faster growth of urban areas in the country as new counties set up their administrative infrastructure, and this may affect the nature of internal migration flows. The researchers anticipate increased mobility within and across counties as devolution sets in, and each county is required to set up its administrative infrastructure. Migrants need to be factored into the existing social and development agenda of the counties. This means that information on migration intensities need to be factored in the county planning processes. County statistics departments need to collect migration data to inform the planning and service delivery agenda, including the provision of housing and social amenities for the youthful migrants relocating to the urban centers in search of opportunities. There is also an anticipation of an outflow of the return migrants – usually older people who are retirees – to settle back in their rural places of origin. Adequate planning for this elderly population will be important.

There are several limitations of this study. A discrepancy in census figures was observed in the North Eastern region in the 2009 data; therefore, results from the region needed to be interpreted with caution. The study used Moran's I index to determine spatial clustering in the migration intensities, but the index is limited as it only identifies hotpots within their vicinities, and this may have missed other levels of association between counties that are far apart.

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