Measuring the Impact of Internal Migration on Population Redistribution in Europe

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Introduction

Migration has become the leading agent of demographic change in European countries, shaping patterns of human settlement both between and within countries. Internal migration underpins the efficient functioning of the economy by bringing knowledge and skills to the locations where they are needed, and is essential to social well-being by enabling individuals to pursue their goals and aspirations. Together with cross-border flows, internal migration is therefore the primary agent driving population redistribution within countries. Despite its acknowledged significance, contemporary understanding of the way migration impacts on settlement patterns remains remarkably crude, constrained primarily by reliance on coarse dichotomies into urban and rural, inadequacies in data collection and the perennial obstacles presented by the modifiable areal unit problem and the challenge of spatial scale. These difficulties are seriously compounded when seeking to make comparisons between countries or to trace the changing effect of migration on settlement patterns over time.

This paper applies recent methodological advances developed through the Internal Migration Around the GlobE (IMAGE) project to a global repository of internal migration data (Bell *et al.* 2015a), to compare the impact of internal migration on patterns of human settlement across 30 European countries. Our analysis proceeds in a series of stages. We begin by comparing the overall impact of internal migration on population redistribution using the Index of Net Migration Impact (INMI), a single system-wide index which transcends national differences in the zonal systems on which migration is recorded (Rees *et al.* 2016). We compare the level of redistribution in European countries to the world average and examine how cross-national differences are driven by the differential effects of migration intensity and migration effectiveness. We then examine how these system-wide differences play out to alter the pattern of human settlement at the local and regional level, moving beyond conventional measures based on the urban hierarchy to identify trends in concentration and deconcentration within countries. To that end, we set net migration rates against population densities across entire national zonal systems and compare the slope of population-weighted regressions for our sample of countries. We explore the relationships at a range of spatial scales to establish the effect of the modifiable areal unit problem (MAUP) and examine trends over time in context of the conceptual model proposed by Rees *et al*. (2016) which anticipates a range of trajectories among economically advanced countries.

Our results underline the importance of simple yet robust indices in the analysis of spatial demographic processes, identify the effects of zonation and spatial scale on key indicators and show chart contemporary variations and temporal trends in population concentration arising from internal migration in the countries of Europe.

Internal Migration Data

Comparability between countries is complicated by the fact that migration can be measured in various ways. All European countries collect migration data but they differ in regards to the type of data collected, the interval over which migration is measured and the spatial framework employed (Bell et al. 2014). A third of countries in Europe collect data through one or two of these sources: population censuses, registers or/and surveys (Bell et al. 2014). The main distinction is between data derived from population registers, capturing migration events, and data on migration transitions derived from censuses, comparing place of residence at two points in time. Events count migrations, while transitions count migrants. Over short intervals, event and transition data tend to reveal the same migration patterns, with the number of migrants closely matching the number of migrations (Rees 1985). Differences in these numbers are negligible when migration is measured over a single year. We thus draw on data from both sources, population registers and censuses in order to maximise geographical coverage, measuring migration over a single year interval, which is the predominant interval at which data are captured in Europe (Bell *et al.* 2014). Our sample includes 30 countries, accounting for 67% of all UN members.

Even where countries collect the same type of data over equivalent observation intervals, comparisons are made difficult by differences in the number and arrangement of spatial units into which countries are divided. In Portugal, for example, data on migration between 22 districts are collected, whereas in Belgium migration between 589 municipalities is captured. Variations in the spatial scale at which migration is measured affect most measures of migration. Bell *et al*. (2015b) and Rees *et al*. (2016) explored and assessed the effects of the MAUP in order to compare migration intensities and migration impact between countries respectively, by harnessing the IMAGE Studio, a suite of analytical software designed to create multiple random aggregations of spatial units at a range of geographical scales (Stillwell *et al.* 2014). They showed that the crude migration intensity, to capture migration intensity, and the migration effectiveness index and aggregate net migration rate, which is used measure migration impact, are both dependent on spatial scale and so cannot be used to make cross-national comparisons. To circumvent this problem, Rees *et al*. (2016) proposed a new Index of Net Migration Impact (INMI), which permits robust comparison with respect to the overall redistributive impact of migration. In this paper, we make use of this indicator.

While this measure represents a summary indicator of migration impact, it does not provide information on its spatial form, so we examine the spatial patterns of net internal migration. Particularly we focus on the scale and intensity of rural–urban, given the importance of migration in the process of urbanisation. Cross-national differences in the definition of urban and rural areas significantly prejudice such comparisons and only a handful of countries classify both the origin and destination of migrants by rural and urban areas. In any case, urban and rural areas are coarse spatial categories; therefore, following Rees and Kupiszewski (1999), we use the more detailed geographies of migration available in each country to examine the relationship between net migration and population density

The Net Impact of Migration

This section explores how the net impact of migration on population redistribution varies within Europe using the INMI. We first describe this indicator and then report the estimated values for each country alongside the global average to provide a point of reference against which to interpret the results.

Migration is inherently a spatial process which transforms the settlement system by redistributing the population between regions, either increasing or reducing the degree of population concentration in particular areas. While analysts have commonly focused on rural to urban migration, definitions of urban vary widely, and simple measures of urbanisation fail to capture more subtle transformations of the settlement pattern. Bell et al. (2002) proposed the aggregate net migration rate (ANMR) as a more comprehensive system-wide measure of the impact of net migration on the pattern of settlement within a country, defined as half the sum of the absolute net changes across all regions, divided by the population at risk P:

$$ANMR = 100 * 0.5 \sum_I |D_i - o_i| / P \quad (1)$$

where D_i and O_i are in- and out-flows from region i. The ANMR identifies the net shift of population between regions per 100 residents in the country and is a product of the Crude Migration Intensity (CMI) and the Migration Index (MEI) such that:

$$ANMR = CMI * MEI/100 \quad (2)$$

where

$$CMI = 100M/P \quad (3)$$

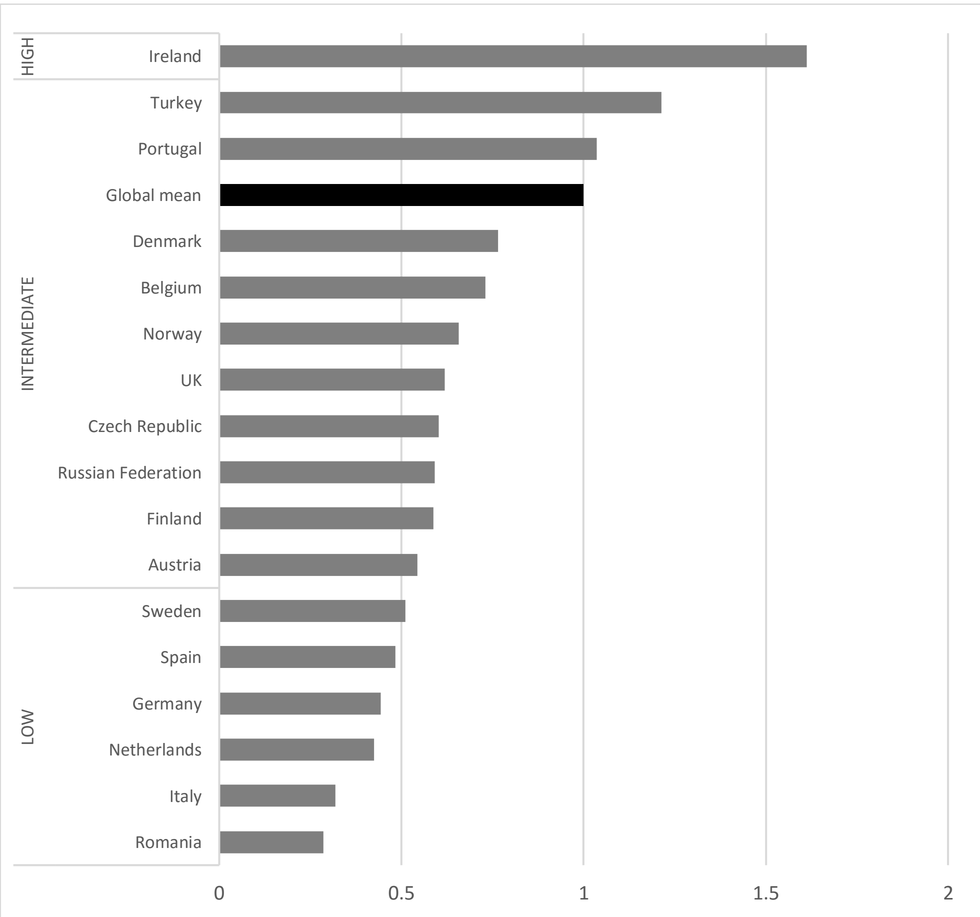
$$MEI = 100 * 0.5 \sum_I |D_i - o_i| / M \quad (4)$$

While the CMI measures the overall incidence of migration, the MEI captures its effectiveness as a mechanism for redistributing population by comparing net migration to migration turnover. It quantifies the spatial imbalance between migration flows and counter-flows, with low values indicating closely balanced flows and counter-flows while high values indicate greater asymmetry, with some regions gaining population at the expense of others. Because the ANMR is a product of the CMI, its value increases with the number of spatial units, and it therefore cannot be used to make cross-national comparisons directly. However, Rees *et al.* (2016) showed that both the CMI and the MEI are linear functions of the number of zones into which the territory is divided: while the CMI rises steadily as the zones count increases, the MEI is stable and largely scale independent above a threshold of 20 zones. Rees *et al.* (2016) then demonstrated algebraically that the slope of the ANMR is a product of the slope of the CMI and the average level of the MEI, which provides a robust basis for making comparisons of migration impact between countries, irrespective of the number of regions used to measure migration. To facilitate comparisons, Rees *et al.* (2016) recommended adopting the mean across a sample of countries as a point of reference and define the proposed new measure as the Index of Net Migration Impact (INMI), computed as:

$$INMI = \frac{CMI\ slope\ for\ a\ country}{Average\ CMI\ slope\ for\ all\ countries} * \frac{Mean\ MEI for\ a\ country}{Average\ MEI\ for\ all\ countries} \quad (5)$$

As well as facilitating robust comparisons with respect to the overall redistributive effect of internal migration, the particular advantage of the INMI lies in distinguishing between the relative contributions of migration intensity and migration effectiveness.

In this paper, we compute the INMI for 17 European countries against the global sample of 71 countries encompassing all world regions as reported by Rees et al. (2016). Figure 1 ranks countries with respect to the aggregate INMI, and Figure 2 plots the same values distinguishing its constituent components. Values above unity indicate that the effect of migration in redistributing population is greater than the global average, and vice versa. The results show that the impact of migration in redistributing population is relatively low in Europe. Of the 17 countries, 14 display migration impacts below the global mean, migration impacts are lowest in Romania, Italy, the Netherlands, Germany and Spain where the INMI is less than half the global mean. Conversely Ireland stands out with the highest level of population redistribution, 1.5 times the global average.

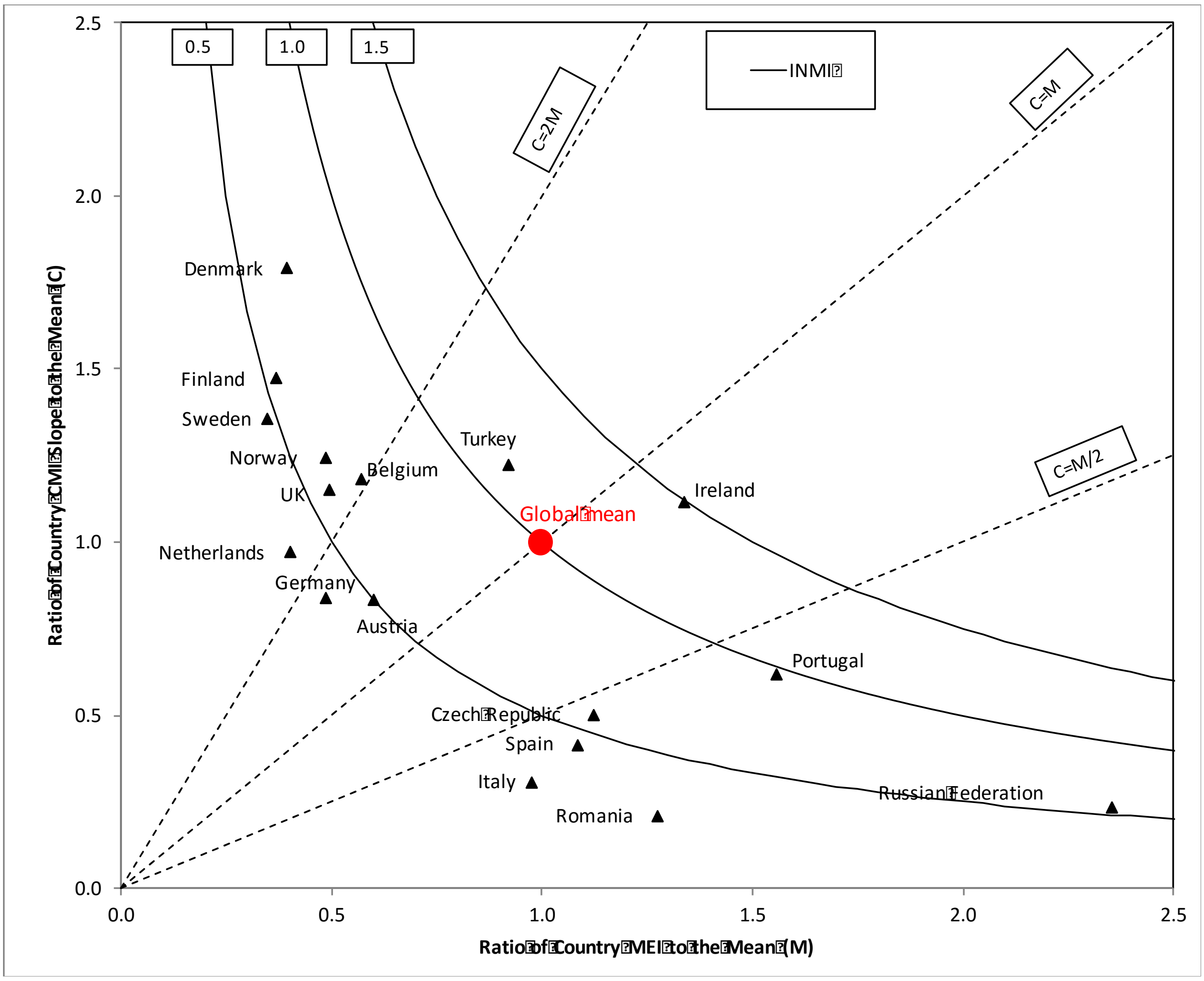


Source: IMAGE Repository, global mean across a sample of 71 countries from Rees et al. (2016).

Note: INMIs greater than or equal to 0.5 standard deviation above the global mean are classified as high, INMIs 0.5 standard deviation above or below are classified as intermediate, and INMIs lower than or equal to 0.5 standard deviation below the global mean are classified as low.

Figure 1. Index of Net Migration Impact

To distinguish the relative contributions of migration intensity and migration effectiveness to the INMI, Figure 2 displays the ratio of the CMI slope to the mean against the ratio of the MEI to the mean. The surface plot represents the INMI and the contour lines link points of equal impact. The results underline the complex interaction between intensity and effectiveness in driving population redistribution. In Ireland, it is clear that the very high level of population redistribution is driven equally by above average levels of migration intensity and migration effectiveness. For both Turkey and Portugal, the impact of migration in redistribution populations is lower, just a little above the global mean, but the underlying drivers are different. In Turkey, population redistribution is due to high migration intensity, whereas in Portugal low migration intensity is compensated by very high migration effectiveness. At lower levels of population redistribution, differences are more pronounced with high levels migration intensity being offset by low levels of migration intensity in Denmark, whereas the reverse pattern is observed in Russia. Close inspection of Figure 2 suggests that four distinct regional groups can be identified: (1) countries where low effectiveness offsets high intensities, as in Nordic countries (Denmark, Finland, Sweden and Norway), the United Kingdom, Belgium and the Netherlands, (2) a cluster of countries displaying equally contributions on both drivers, as in Germany and Australia, generating below average INMI, (3) a group of countries (Czech Republic, Spain, Italy, Romania and Russia) where low intensities strongly constrain the redistributive effect of migration, this is particularly pronounced in Russia, and (4) countries, such as Turkey, Ireland and Portugal, with high INMI but showing diverging patterns of contribution of migration intensity and impact. Comparing these results to evidence reported by Rees et al. (2016), unlike other regions of the world, the predominant trend in Europe is a tendency for low migration effectiveness to be offset by high migration intensity. A reduced number of countries display the reverse pattern of low effectiveness to be offset by high intensity (Czech Republic, Spain, Italy, Romania and Russia).



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