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OD Maps for Studying Historical Internal Migration in Ireland

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ABSTRACT

We study internal migration in Ireland, an aspect of migration that is little-studied. OD Maps have enabled us to characterise aspects of spatial patterns in county to county migration more effectively than with other techniques. We found that internal migration is relatively local, but relatively national for Dublin. Although migration increased between 1851 and 1911, there was a decrease in more local migration. This work explores the origins of trends that would continue for over a century and had a profound effect on the population geography of the island.

1 INTRODUCTION

Internal migration patterns in nineteenth century Ireland have received limited attention from geographers and population historians. Emigration has been the dominant force in Irish population history and consequently, the main focus of research has been on the movement of people out of Ireland [3]. The lack of work on internal migration has resulted in the view that those who did not emigrate, stayed at home [1]. However, migration trends that were to have a profound effect on the population geography of the island of Ireland in the following century, began in this period of Irish history. Here we use OD maps [6] to study patterns of internal migration in 1851 and 1911 during this formative period in the population history and geography of the island. In doing so, we address an absence in the existing literature and explore the origins of trends that would continue for over a century to follow.

2 RELATED WORK

Visualising spatial patterns in migration is surprisingly difficult. The classic OD matrix [2] shows origins and destinations as the rows and columns of a matrix, where cells are coloured to indicate magnitude of flow or connection. However, geographical aspects of flow are lost. Ordering origins and destinations by latitude or longitude can help, but gives an incomplete geographical picture. Flow maps are common means of showing spatial flow patterns (e.g. [4]), but occlusion from crossing lines often obscures, and arbitrary line crossings often produce artefacts that may suggest patterns that do not exist. Filtering by origin, destination and distance can help reduce these problems, at the expense of data content. Small multiples for different origins can be effective, but comparison may become difficult, particularly with many origins. We use OD Maps [6] which address these problems by depicting flows as non-occluding cells, whilst maintaining their geographical arrangement. They are essentially OD matrices with 2D geographical ordering.

3 OD MAPS

OD Maps [6] rely on a square base-map comprising all the discrete locations (origins/destinations), spatially-arranged into a tessellated grid of squares (Fig. 1, bottom left). Where origins and destinations are already based on the regular gridding of geographical space, this is easy to construct. This is not the case for counties (Fig. 1, top left), so we added 4 'dummy nodes' to produce a square number of counties ($6 \times 6 = 36$) and geographically tessellated these using an algorithm [5], but this can be done by hand. Once the square base-map has been established, mini versions of it are simply embedded to represent destinations within the origins. The result is a set of cells which are exactly the same as those in an OD Matrix, but geographically arranged. OD Maps can also be considered as geographically-arranged small-multiples of destination maps. Our OD Maps were generated in HiDE (http://gicentre.org/hide/) and are demonstrated in our video (http://vimeo.com/45078794).

Figure 1: Constructing an OD Map. *Top left:* The 32 counties of Ireland as squares in their true geographical positions. *Bottom left:* Counties moved such that they tessellate into a grid, with approximate geographical positioning. *Right:* OD Map, where original squares represent origins, into which we have nested a mini map of destinations with exactly the same layout. Each cell represents an origin-destination pair. Colour indicates county. This is also illustrated in our video at http://vimeo.com/45078794.

OD Maps constructed in this way, emphasise spatial patterns at the *destinations*. Reversing origin and destinations is useful and has been done on the right of Figs. 2, 3 and 4.

OD Maps work relatively well for Ireland, because the island is relatively square and counties relatively evenly spaced. Nevertheless, county positions in the OD Maps are displaced relative to their geographical locations. This is inevitable. Understanding the extent to which this is the case is essential when interpreting such maps (see Fig. 1).

4 INTERNAL MIGRATION PATTERNS

Fig. 2 shows origin-destination (left) and destination-origin maps of county-county migration in 1851, using absolute numbers of migrants on a logarithmic scale. Migration was relatively localised, but migration in and out of Dublin was to and from all parts of the country. Although there was some symmetry in internal migration, there was also asymmetry. Dublin and Antrim (in the north-east) have higher inward migration than outward migration. Logarithmic

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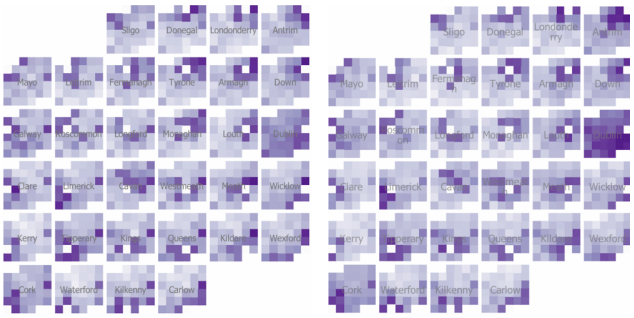

Figure 2: 1851 Maps. *Left:* OD Map showing flow densities from origins (large squares) to destinations (small squares) on a logarithmic scale (the large Dublin square shows where *Dublin people went*). *Right:* Origins and destinations have been reversed (the large Dublin square shows where people who *arrived in Dublin came from*). White squares (that are not dummy nodes) are where both origin and destination are the same. Labels are faint to help reduce occlusion – see Fig. 1 for help identifying places.

Figure 3: 1851 OD Maps coloured by migration as percentage of all county migration, on a linear colour scale. Darker colours indicate destinations of higher preference. Left and right images are origin-destination maps and destination-origin maps, see Fig. 2's caption.

colour scales show variation across the different magnitudes of migration, but it is important to note that it does this by exaggerating low numbers of migrants more than high numbers. It is also important to remember that *in detail*, adjacencies and distances do not necessary represent true geographical configuration but *in general*, these hold.

Fig. 2 shows absolute numbers of migrants. Since some counties have higher populations, we would expect these to have more migrants. We tried numerous options for normalising these numbers. One of these is shown in Fig. 3 where the proportion of migrants to destinations (left) and from origins (right) are shown with colour on a linear scale. Dublin dominates as the destination of choice for migrants from Wicklow, Meath and Kildare. Antrim is the destination of choice from Down, Londonderry and Donegal. Yet migrants from Monaghan, Tipperary and others go to multiple destinations. It is clear from the destination-origin maps (right) that the dominance of Dublin and Antrim as destinations drops off with distance.

To compare migration data between 1851 and 1911, we found that differences were too small to visually discern when juxtaposed OD maps from these two years. In Fig. 4, we plotted migration differences between these two years, normalised by the county population in each year. Red indicates fewer migrants than we would expect based on 1851 migration, as a proportion of county population. Blue indicates that there more migration than we expected. Note that Fig. 4 uses a logarithmic colour scale.

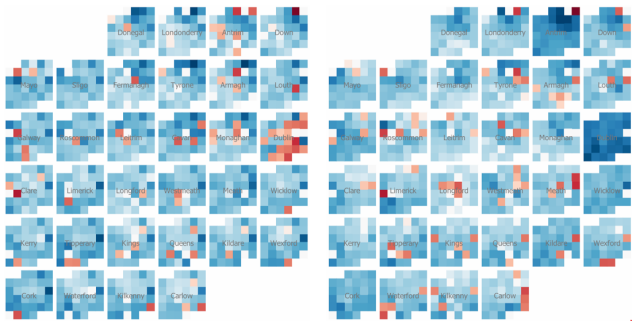

Figure 4: Percentage differences in number of migrants between 1851 and 1911, normalised by population, on a logarithmic scale, where red indicates that there were proportionally fewer migrants in 1911 and blue indicates more. Left and right images are origin-destination maps and destination-origin maps.

This map shows a number of interesting changes in internal migration. There was less migration *out of* Dublin but much more migration *into* Dublin in 1911 compared to 1851. This might suggest that Dublin increased in economic importance between 1851 and 1911. There is a severe drop in *local* migration for Antrim and Londonderry, but Londonderry has much more *inward* migration in 1911. Overall, there was more internal migration in 1911 (more blue cells), but there is a *decrease* in *local* migration, with fewer people migrating to neighbouring counties. While some of the changes in migration may be relatively small, Irish people were generally becoming more internally mobile between 1851 and 1911.

5 Conclusion

OD Maps have been effective for studying and depicting spatial patterns of Irish internal migration, including how popular and unique destinations are for origins and *vice versa*, how localised migration is in different regions of the country and key differences in migration between the two years for which we have data. The geography of Ireland suits its depiction as OD Maps and the technique is worth exploiting further for data from other years and for other aspects of migrations, such as migration by gender, age and occupation.

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