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Balancing visibility and distortion: Remapping the results of the 2015 UK General Election

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A perennial problem when mapping demographic, social and other area-based data is that rural areas usually are of greater physical size than their urban counterparts. The consequence is that the places with fewest people dominate the map space, whereas those with the most are rendered small and illegible. A classic example is what happens if the results of the UK election are mapped, in this case for the 2015 election. As the left side of Figure 1 reveals, the outcomes for London visually are unintelligible.

A popular solution is to use a cartogram, changing the size of each area no longer to be proportional to its physical extent but instead increasing with the size of some scaling variable such as the number of people who live there. This resolves the problem of the areas with highest population density being most 'invisible' on the map but it does so at a price. Most cartograms create a high level of geographical distortion, changing both the shape and locations of the areas on the map, potentially reversing the problem they are trying to solve: the areas of lowest population density become the smallest on the map and, worse, their illegibility is compounded by the distortion of their shape. A compromise, popular in newspaper presentations of elections, is to use a tile map (essentially an equal area cartogram), giving each area equal space on the map, representing it as a hexagon for example (see, for example, http://www.telegraph.co.uk/news/general-election-2015/11592743/General-Election-2015-The-final-result.html (accessed 1 March 2016)). This is a logical way of presenting the results, where each area is a voting constituency, and each constituency returns one Member of Parliament under the UK's 'first past the post system'. Unfortunately, tile maps also entail quite a high degree of geographical abstraction and will

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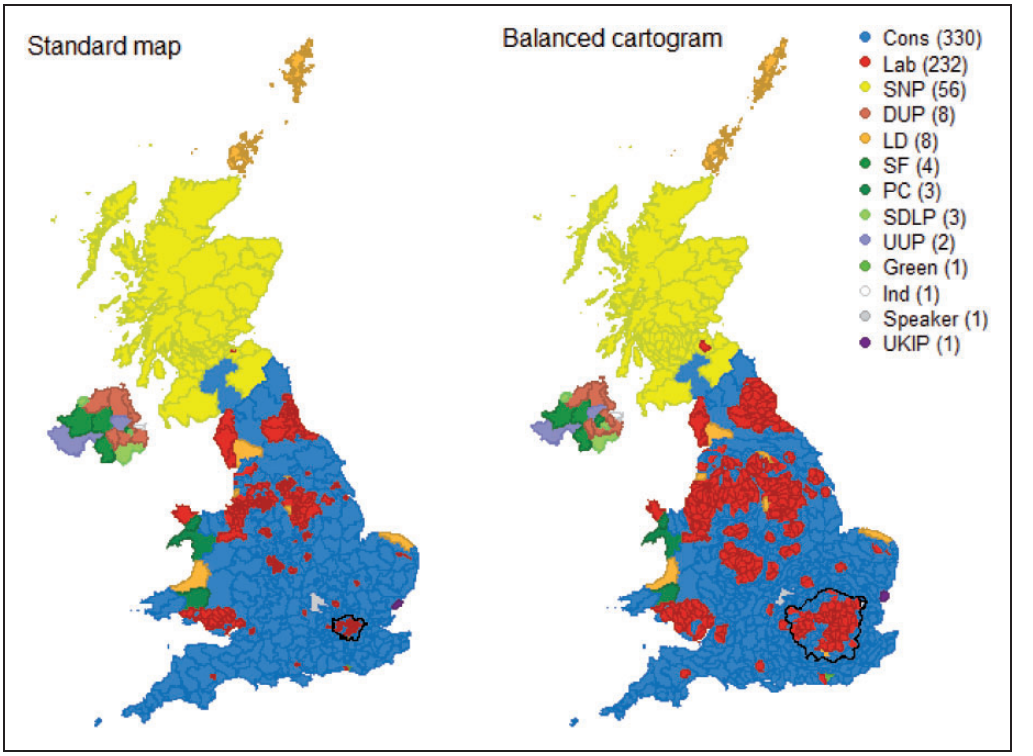

Figure 1. Mapping the results of the 2015 UK General Election (left) on a standard map (right) balancing visibility and distortion with a smallest interpretable unit. [In colour online].

Cons: Conservative; DUP: Democratic Unionist Party; Green: Green Party; Ind: Independent; Lab: Labour; LD: Liberal Democrats; PC: Plaid Cymru; SDLP: Social Democratic and Labour Party; SF: Sinn Féin; SNP: Scottish National Party; Speaker: Speaker of the House; UKIP: United Kingdom Independence Party; UUP: Ulster Unionist Party.

break the topological relationships between places (i.e. which is a neighbour of which others). The geographical locations of the constituencies again are distorted.

However, cartograms are agnostic to the choice of scaling variable – it is up to the user to decide. We propose a balance between visibility and distortion, here based on a simple heuristic: define the smallest interpretable unit for the map (here it is $2\,mm^2$) and then set the scaling variable for the cartogram so that all places are scaled in accordance to their physical size except any place that would fall below the interpretability threshold, which are then set to it. The result, on the right of Figure 1, is a map that, with less distortion, better displays the true geography of the election results. It shows the results for London, including the Liberal Democrat's sole remaining win in the capital, where Labour gained seven MPs from the 2010 to 2015 elections. Nationally, Labour lost 48 MPs, of which 40 were to the Scottish National Party. Labour's only win in Scotland is now more visible. The results for other urban areas such as the Midlands and parts of the North West and North East of England also are clearer, revealing Labour's more traditional industrial heartlands as well as Conservative dominance in rural locations.

To conclude, our argument is as follows: if the purpose of a map is to convey both the what and the where of geographical information, then a prudent selection of a scaling variable can lead to more effective visual results and improved graphical communication.

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