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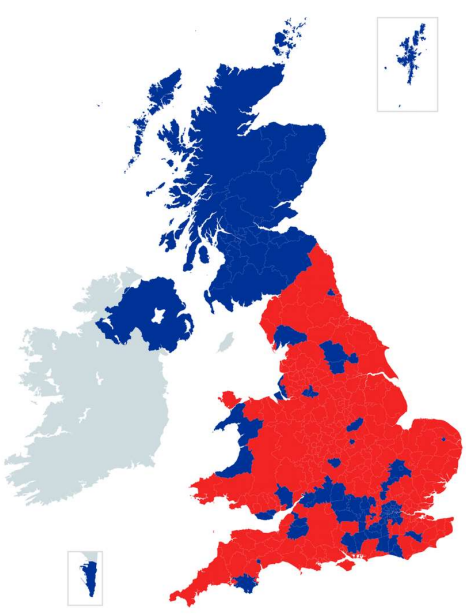
Brexit — a story in maps

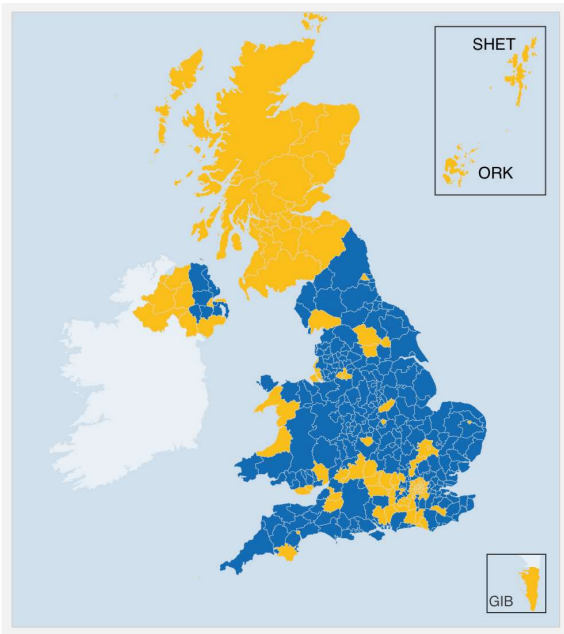
 Bob Taylor Aug 11, 2016 · 7 min read

They say a picture is worth a thousand words. And maybe they're right. Your brain can process an image in a fraction of the time it would take to read the same information.

But what if that picture *isn't the whole picture?*

After the Brexit referendum, I saw many variations on one particular map. You know the one, it looks like this….





Images: Telegraph, BBC News, Herald Scotland and EU Parliament TV

Which areas voted Leave? Did London vote for Remain? These graphics answer such questions instantly. But showing the results in this black and white way — **IN** or **OUT**

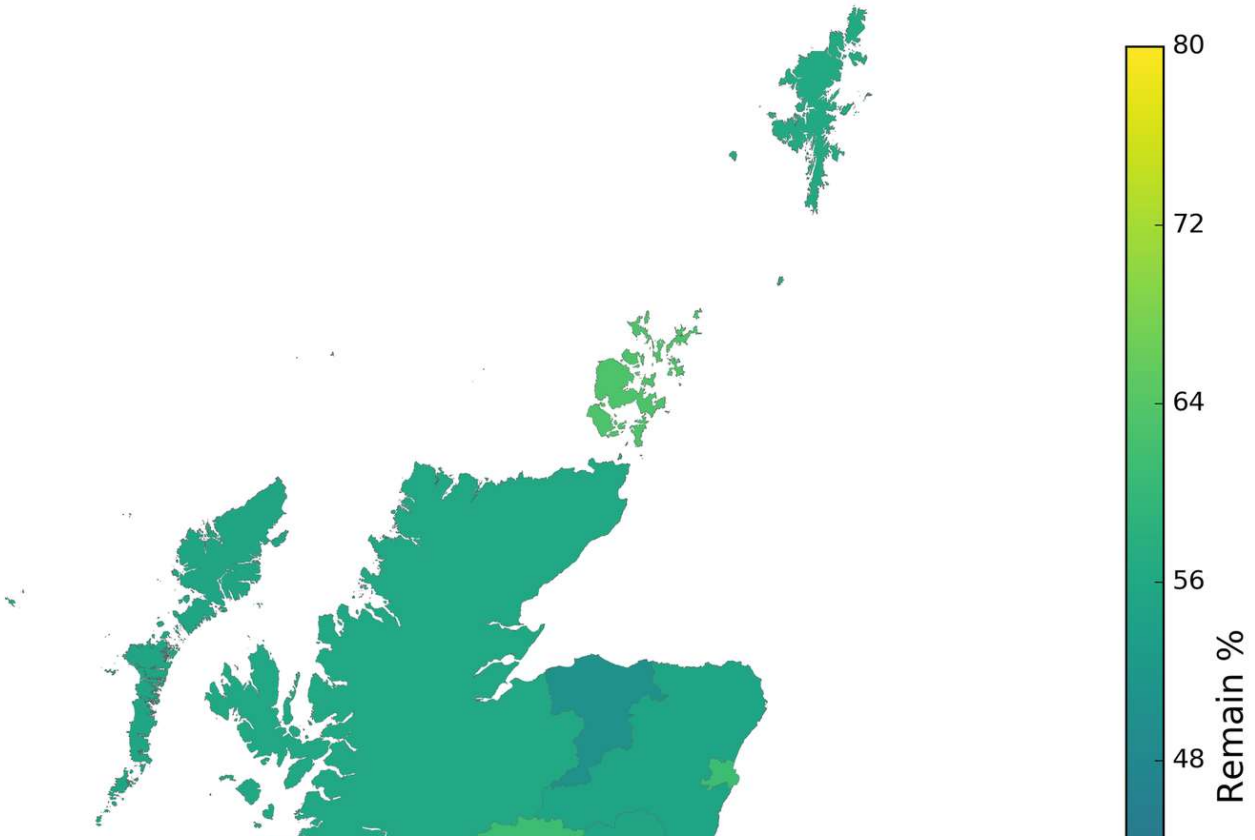
— leaves us with no grey areas. All the muddy ambiguity has been washed out.

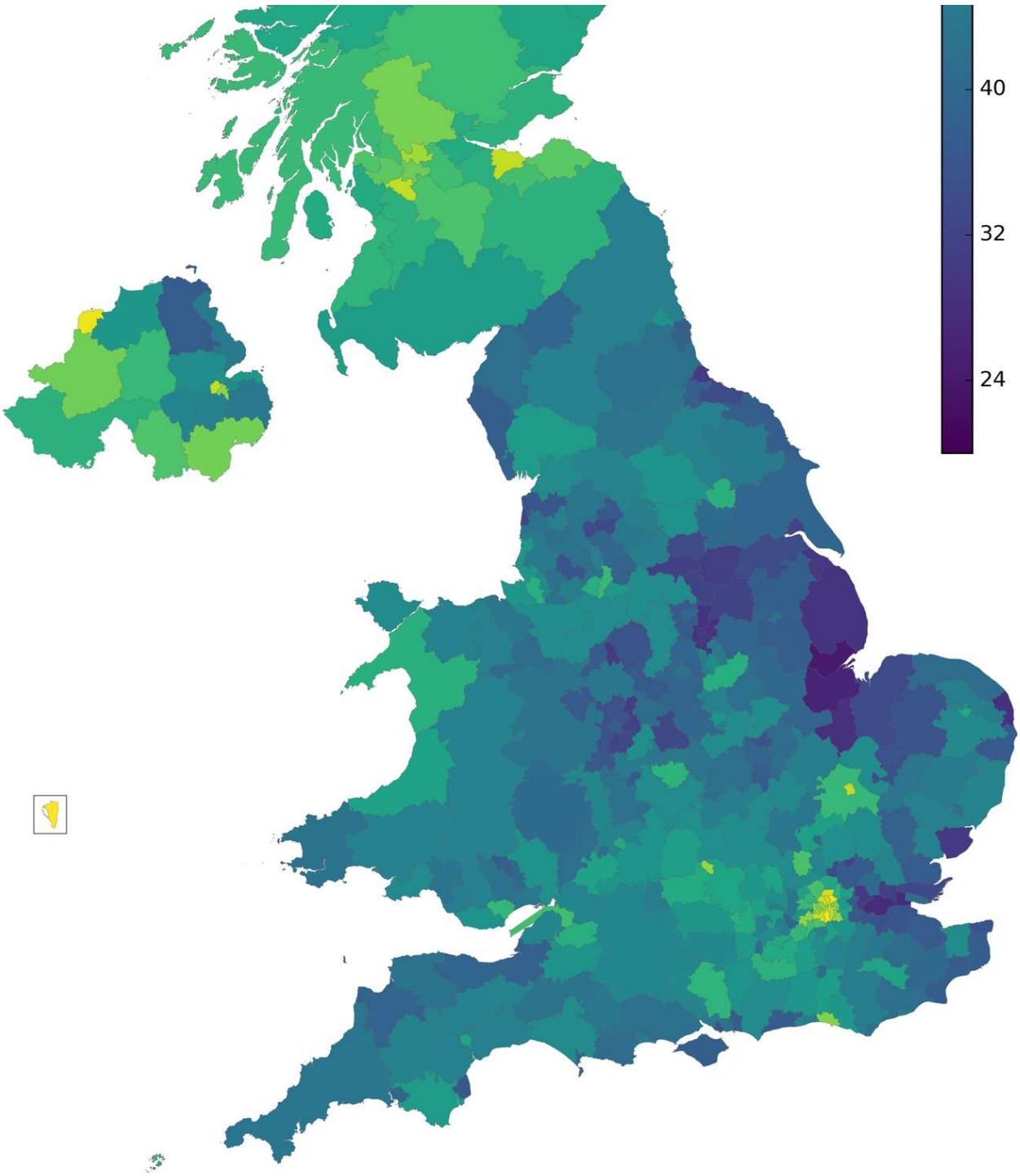
I wondered,

> Is it possible to make a map that better reflects the mood of the country?
>
> How much information can we include on one map?
>
> Can we see how separated the Home Nations are on Brexit?

Enter the data

Luckily, the relevant data is all easily available: the referendum results for each voting area, the map files dividing the country into voting areas, the lot. So, let's dive in and see what we can see.





Map 1: Brexit results plotted using a continuous colourmap from 20–80%

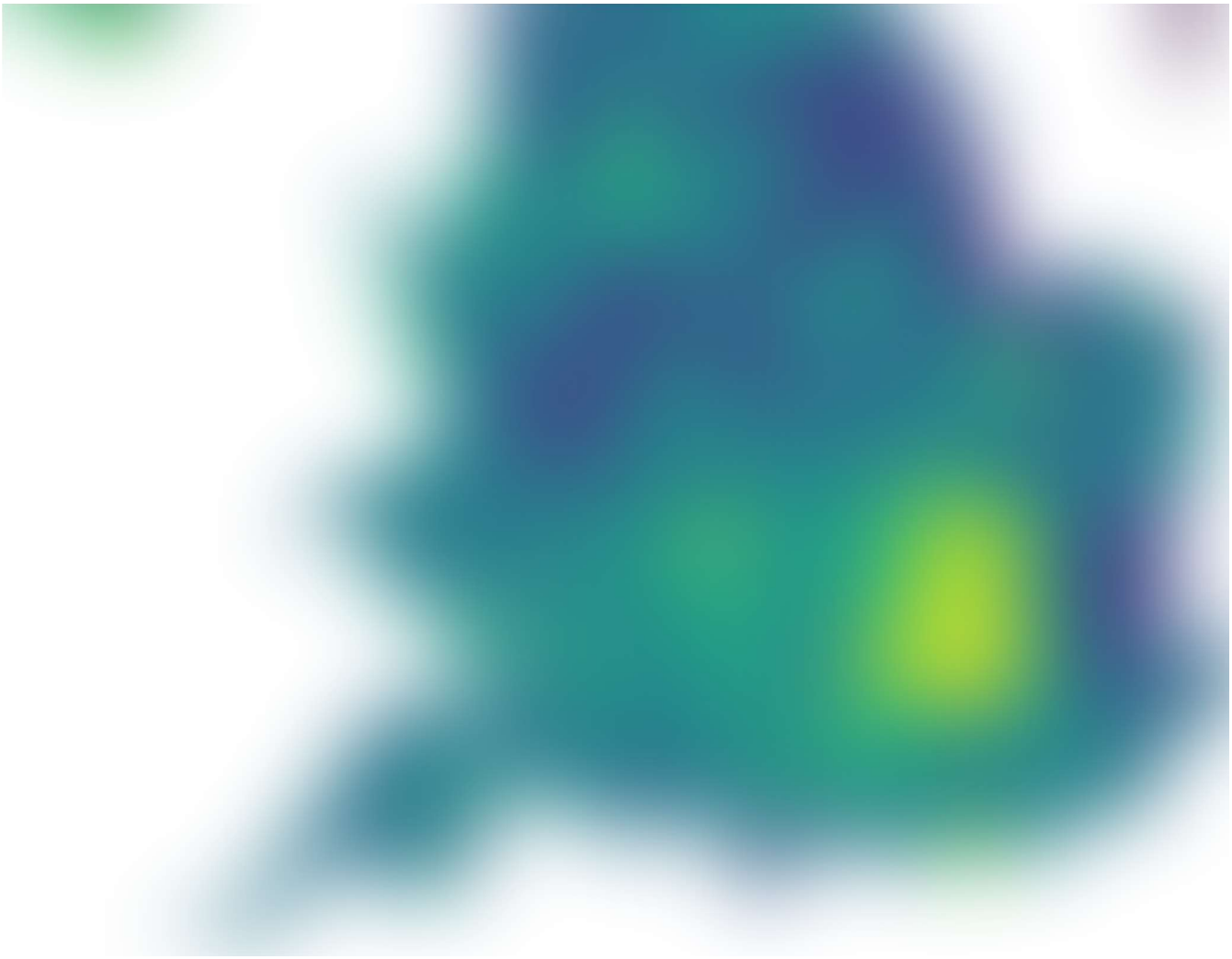
Ahhhh, that's better.

Instead of using two colours I've assigned each individual area a colour based on how it voted. A high *Leave* percentage is coloured dark-blue/purple and a high *Remain* percentage is shown as light-green/bright-yellow.

Especially strong pockets of *Leave* voting (around the Wash say) and *Remain* voting (central London) can be seen clearly.

In general this map tells a more complex and subtle story. Even though Scotland and Northern Ireland voted *Remain* as a whole, both have areas that show less intense support, with seven of Northern Ireland's areas actually voting *Leave*.

Scotland seems to be visually distinct, but is this due to a high level of *Remain* support, or more to do with the disproportionate expanse of map it inhabits? Let's scale the map according to population.



Map 2: Brexit results plotted using a continuous colourmap from 20–80%, voting areas scaled to population

London now takes big bulgy pride of place as the country's largest population centre, and is now visible as a massive hub of *Remain* support.

Scotland's looking a mite pinched, but still certainly more yellow than the non-London parts of the UK.

Poor Gibraltar has disappeared entirely.

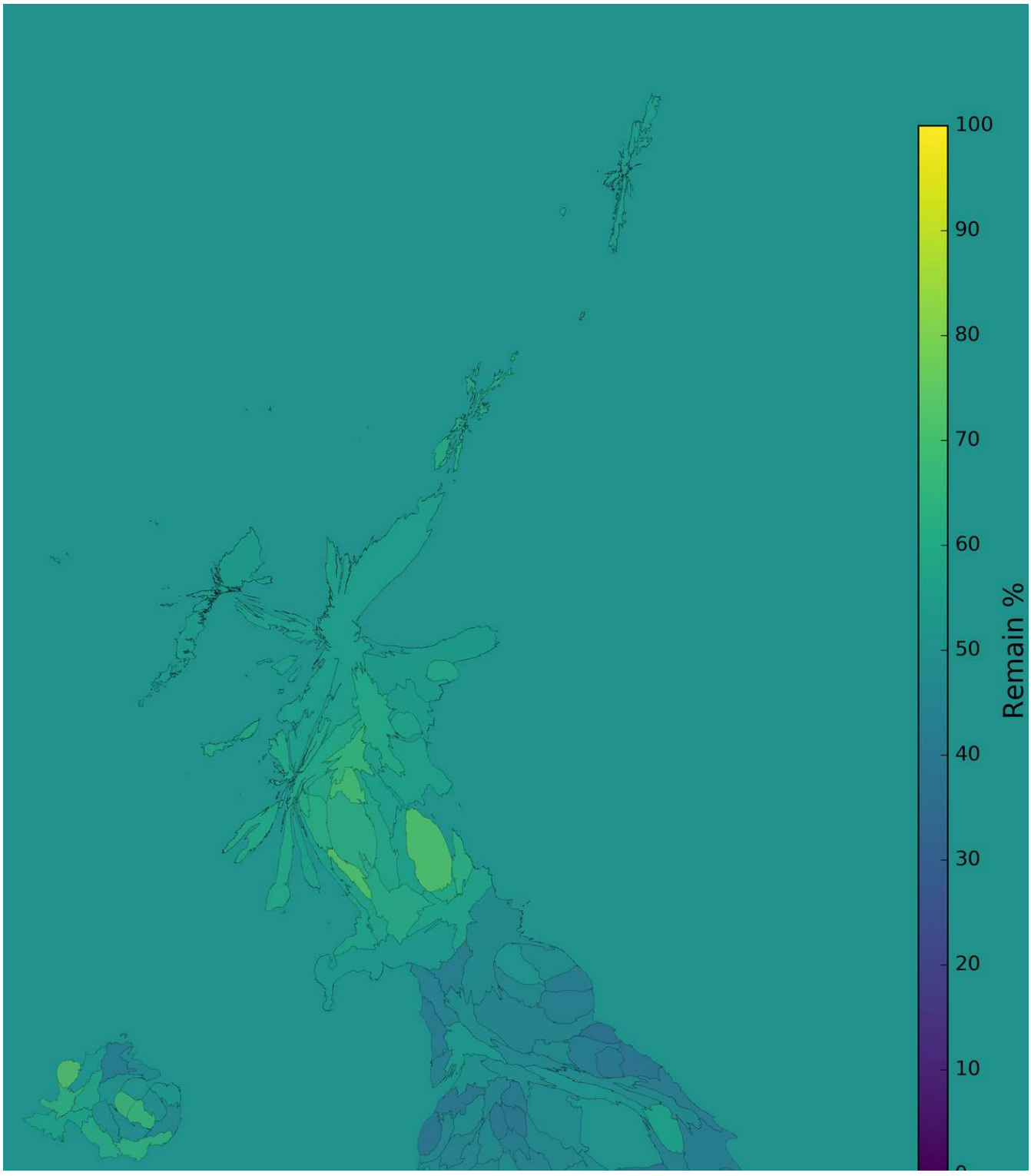
So far we've talked entirely about *voters*. But, if we're dealing with the messy issue of how the whole country feels, and whether the UK should split up over Brexit, it's probably a good idea to include as many people as possible.

Let's adjust the map in a few key ways,

1. scale the voting turnout to opacity. Areas with lower voter turnout will be more transparent and therefore de-emphasised.

2. adjust the colour scale (which was 20–80% in the previous plots) to the full range of 0–100%. The map will have less contrast, but this way only the strongest results will be strongly coloured.

3. add a background green colour that corresponds to a 50/50 result. Areas that are equally split will start to disappear into the background. *Leave* areas will be darker than the background; *Remain* areas will be lighter.



Map 3: Brexit results plotted using a continuous colourmap from 0–100%, voting areas scaled to population, opacity scaled to voter turnout

And this is what we get. It's a bit of a mess really, isn't it?

Nonetheless, this map contains the most information of any single Brexit result map (continuous scale, population density, voter turnout) I've seen.

If the map isn't distinct and obvious, it's because the results aren't either. The more information you add, the closer you get to reality, and the less clear the picture becomes.

(I'm sure there's a philosophical statement in there somewhere)

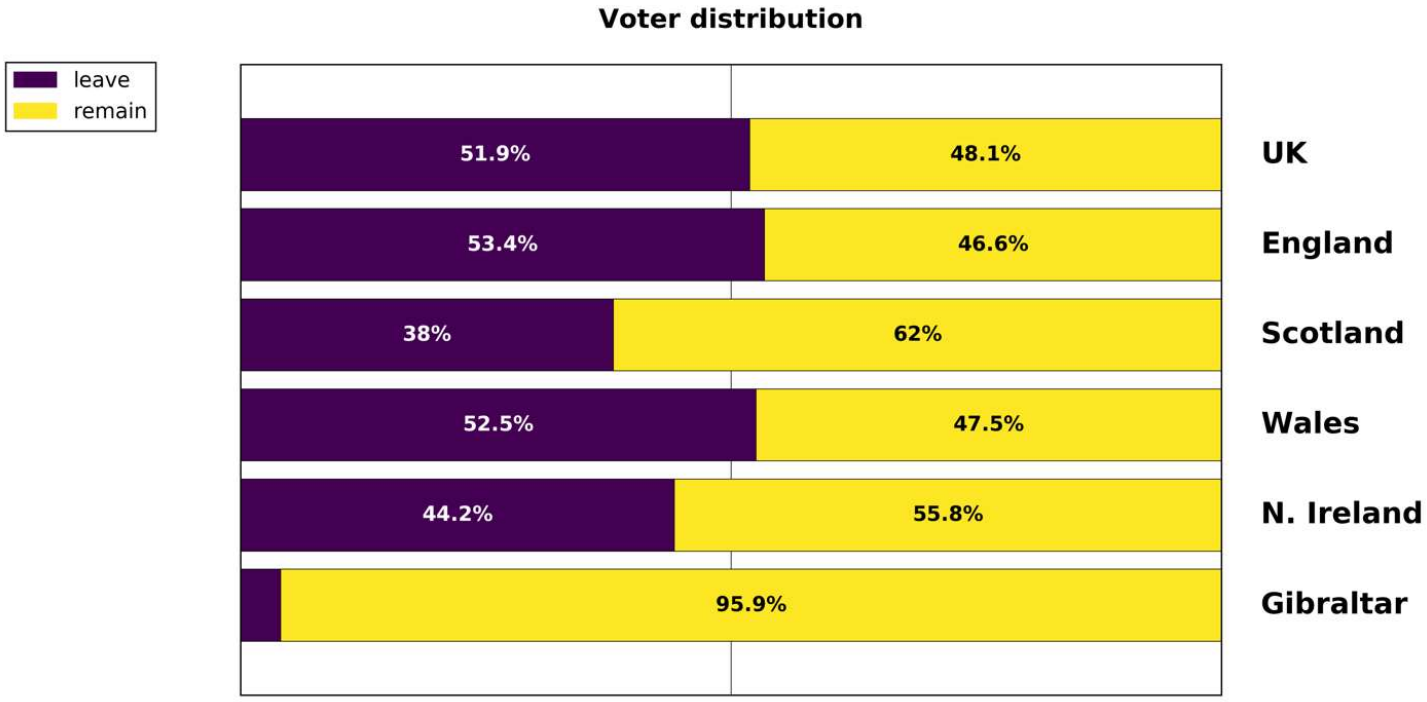
A Disunited Kingdom?

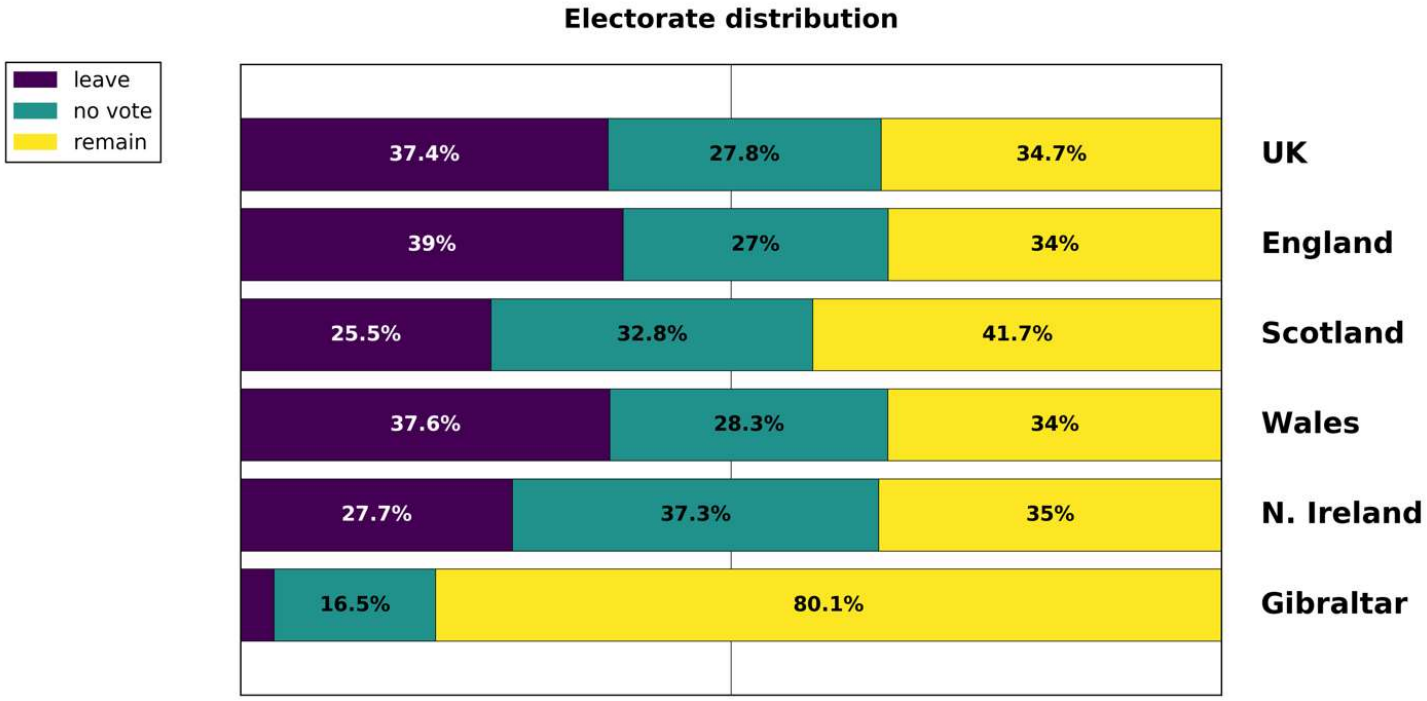
There has been speculation about how the results of the Brexit vote could precipitate the collapse of the United Kingdom. A second Scottish IndyRef has been mooted, along

with the idea of London becoming a city state, a move to a more federal UK, and Irish reunification.

So, let's look at the data and see if we can gain a deeper understanding of the voting patterns in the different countries that make up the UK.

Here we have the distribution of votes from the UK overall, the four Home Nations and Gibraltar, in terms of a) percentage of voters and b) percentage of the eligible electorate.





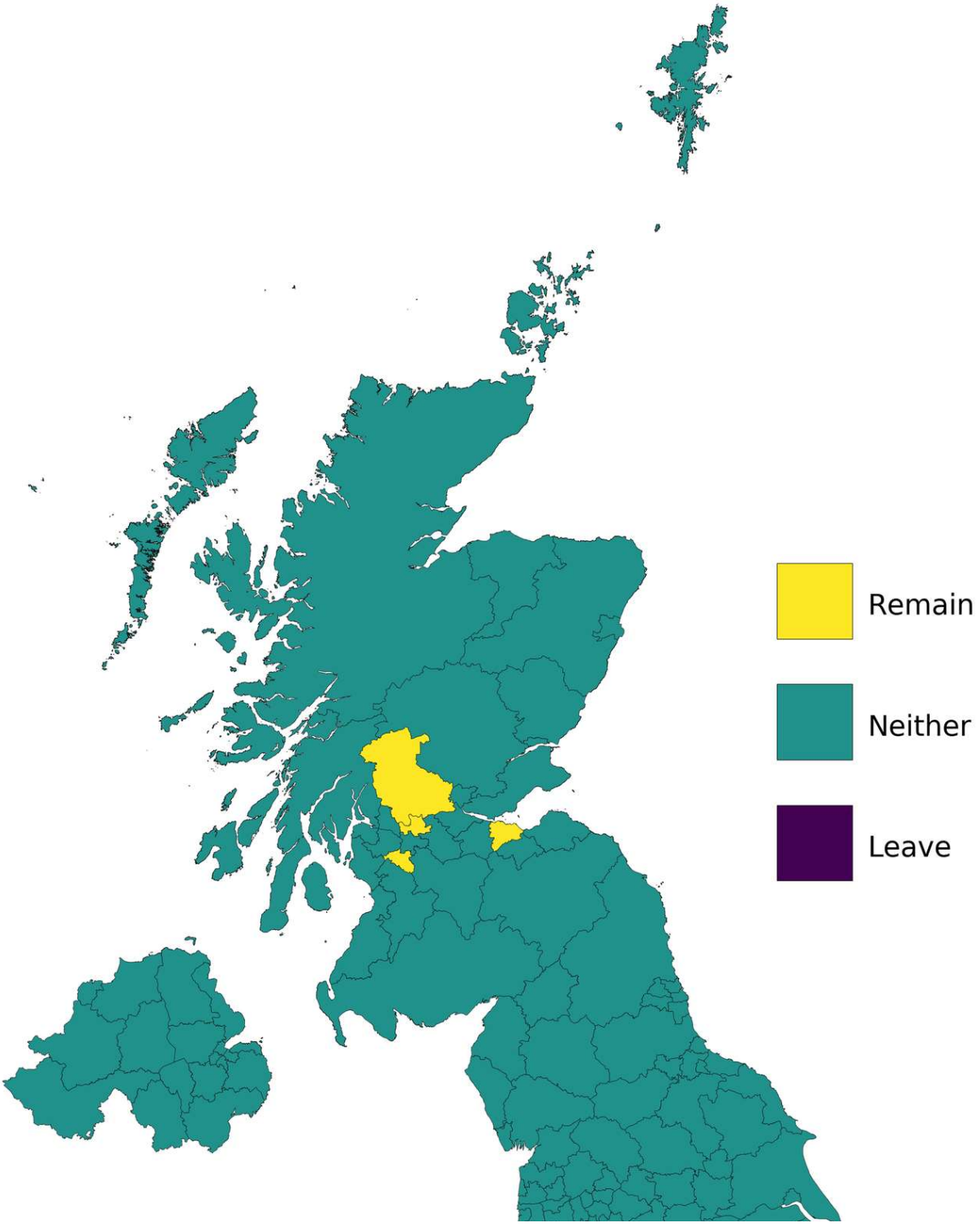
Gibraltar is clearly out on its own, being staunchly *Remain* and having a very high turnout.

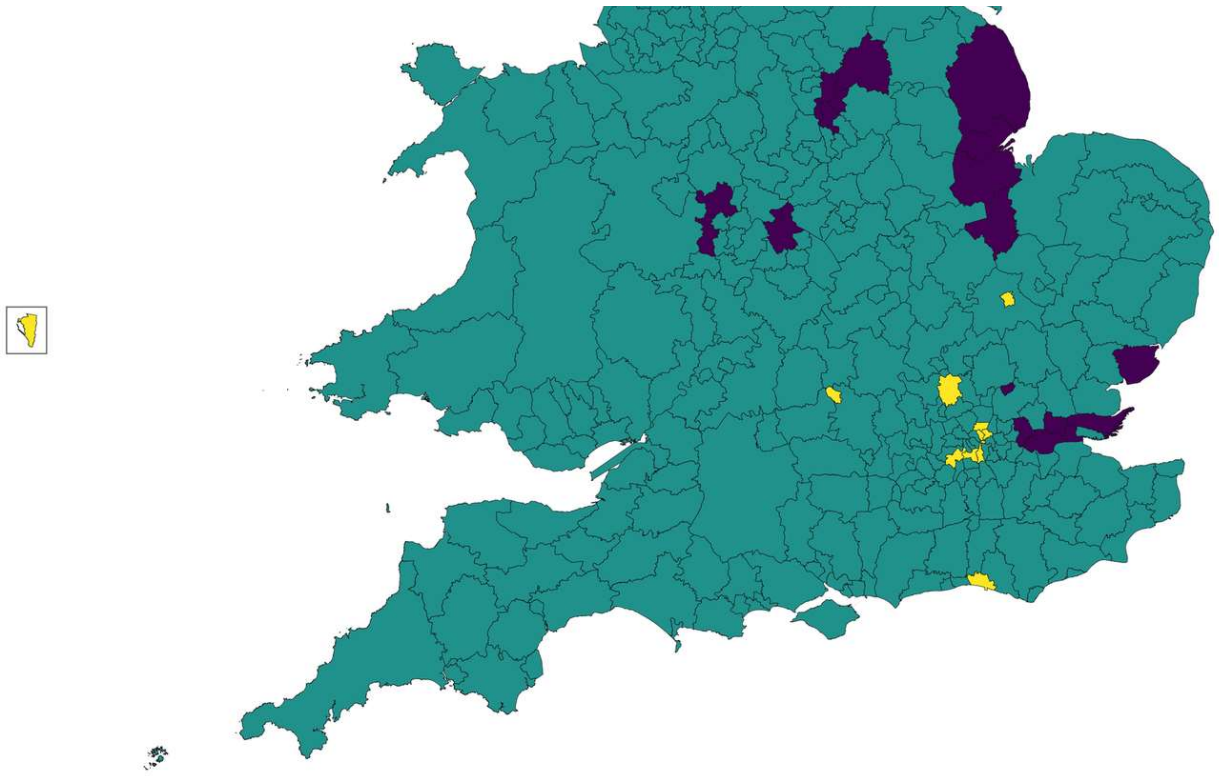
Looking at the four Home Nations we can see that the distribution of *Leave, Remain* and non-voters in England and Wales pretty much match the overall UK result (not a huge surprise given England's population dominates the UK). Wales has the same percentage of *Remain* voters as England, and only slightly less *Leave* support.

Northern Ireland, interestingly, has a similar *Remain* percentage to the UK/England/Wales, but has far fewer *Leave* voters, and a lot more non-voters. In fact the *largest* block of voters in Northern Ireland is *non-voters*.

Scotland has the lowest *Leave* and highest *Remain* vote (outside Gibraltar). However, almost a third of Scots didn't vote (compared to 28% in the UK overall).

Let's have a quick look at each voting area individually.





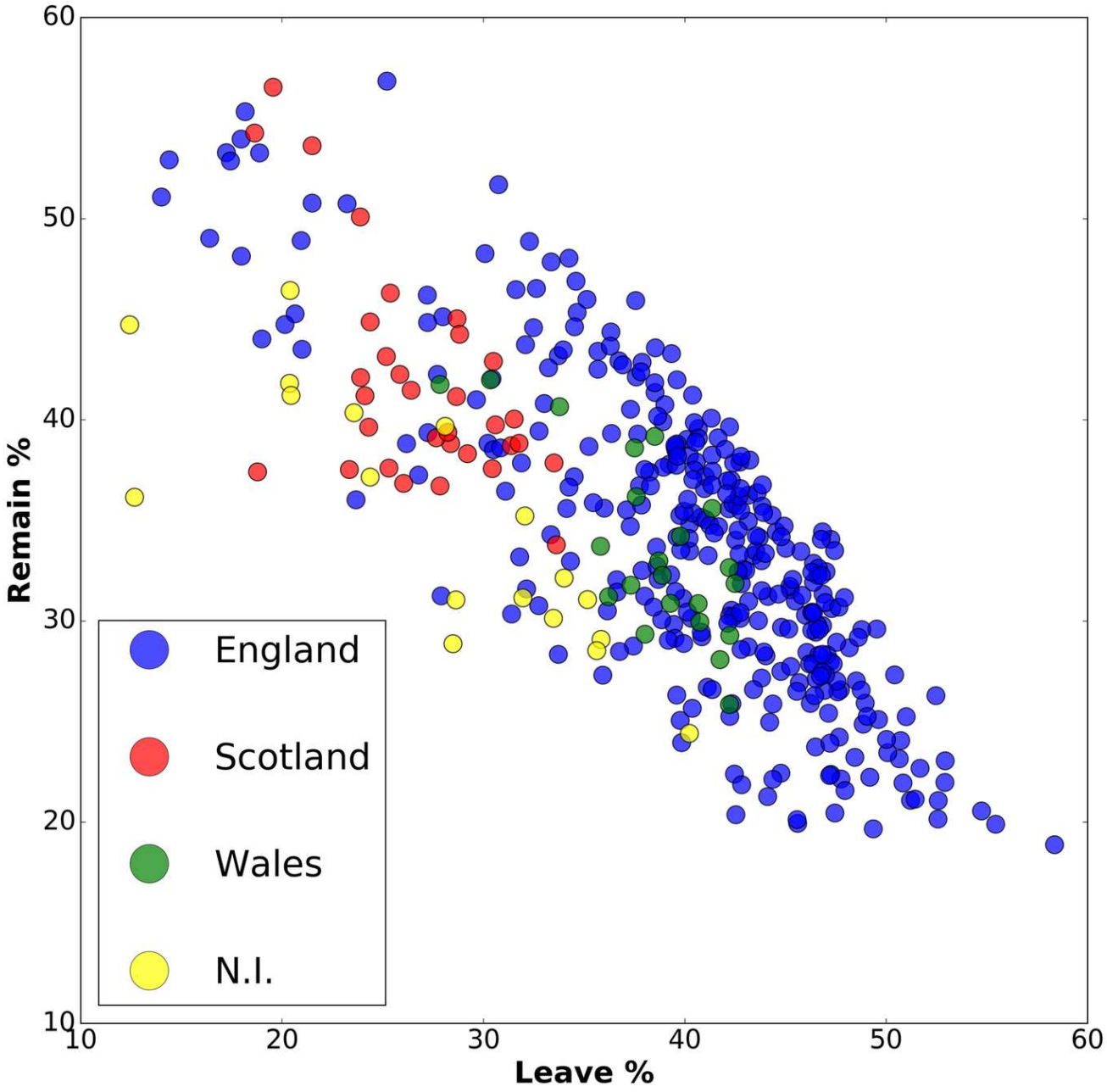
Map 4: Brexit result areas where a majority of the electorate voted **Leave** or **Remain.**

If a majority of the people (more than 50% of the eligible electorate) voted *Leave* the area is coloured purple, if a majority voted *Remain* its colour is yellow, and if neither side had a majority the colour is set to green.

Ugh. There is a *lot* of green — in most areas the winning result was voted for by less than 50% of the people.

The Four Nations of Brexit

From the table of voter distribution above we can see the voting patterns of the Home Nations, when viewed at a country-sized scale. But what about all the individual areas?



Here we can see each voting area represented by a dot. A larger *Leave* vote will place the dot towards the right, and a larger *Remain* vote will place the dot towards the top. (All votes here are shown as percentages of the electorate)

The colours represent each area's parent country; blue for England, red for Scotland, green for Wales and yellow for Northern Ireland.

If the countries voted differently, they would appear as separate clumps of different colours.

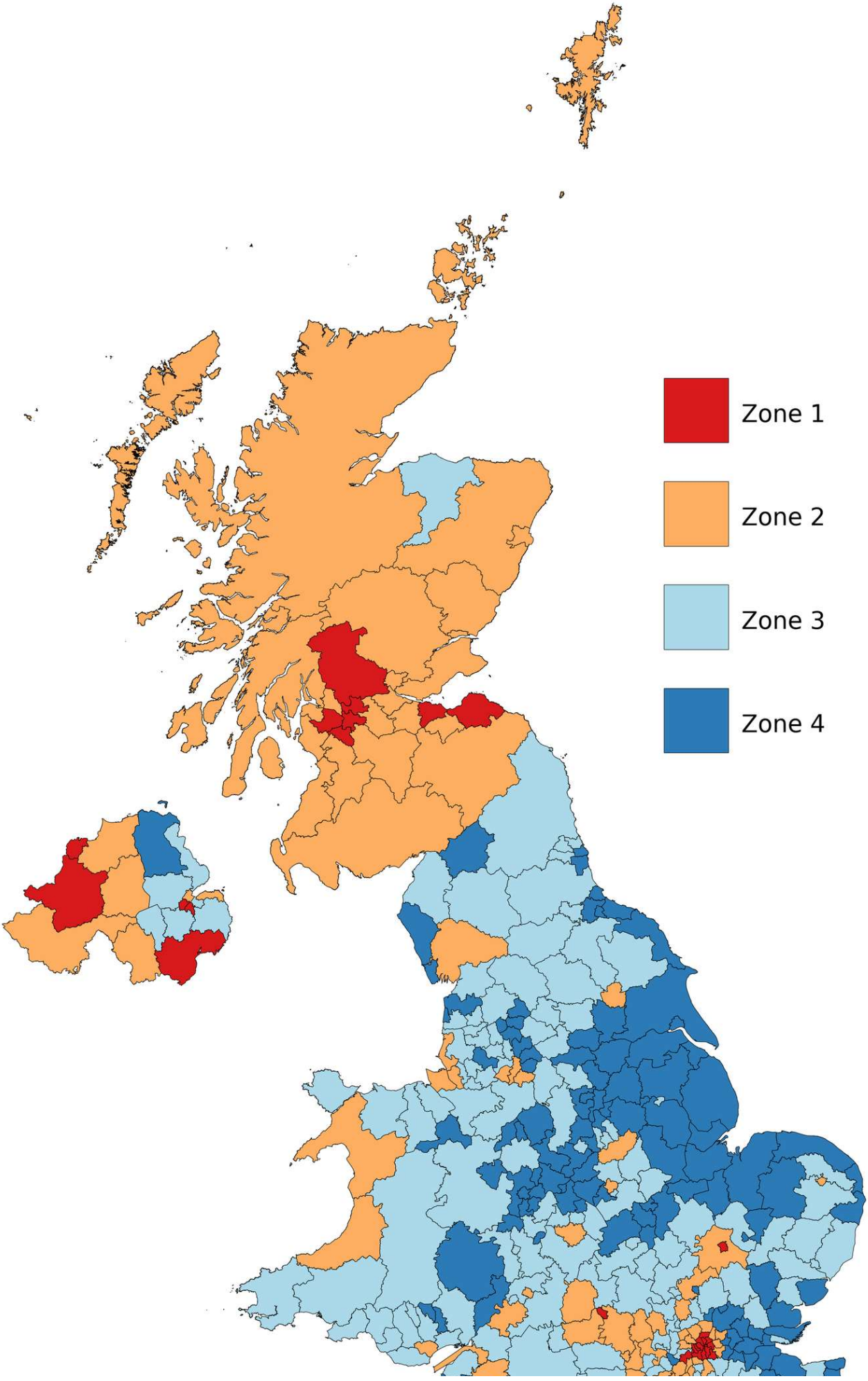
And… they sort-of-kind-of do. Many English areas certainly form a large clump (although many other areas are scattered throughout). The Welsh areas are mostly mixed in as expected, but without the higher-end *Leave* votes present in England.

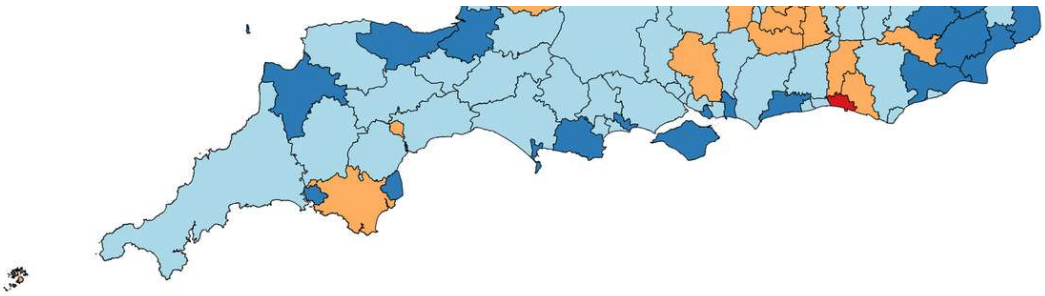
Scotland's areas are clustered above and to the left, with Northern Ireland's a bit more scattered and lower than Scotland's.

So, what would happen if we decided to make four *new* Home Nations, basing our decision *entirely* on the Brexit result?

Let's assign each area to one of four new "countries" (which I'll imaginatively call **Zone 1**, **Zone 2**, **Zone 3** and **Zone 4**) using a k-means clustering algorithm.

Now we can see where these zones would be geographically placed on our map.


Zone 1
Zone 2
Zone 3
Zone 4



Map 5: the four Brexit Nations

In terms of Brexit ideology, **Zones 1 & 4** represent stronger *Remain* and *Leave* support respectively with **Zones 2 & 3** representing more lukewarm sentiments.

In terms of continuous land mass with common Brexit sentiment, three areas stand out to me.

1. Scotland as a whole. The lone exception is the Moray area, which has one of the closest voting distributions (33.8% *Remain*, 33.6% *Leave*, 32.6% non-vote) in the country.

2. The mid-east of England is very distinct, with a large contiguous chunk belonging to our hypothetical **Zone 4**.

3. The London area, which has numerous contiguous areas belonging to **Zones 1 & 2**, and also represents a large population.

Wales doesn't stand out very much, and Northern Ireland is a mixed bag indeed.

Conclusion

What does all this tell us? Well, for one thing I think we can probably all agree that one map does not a referendum make. The same data can be presented in different ways to tell different stories.

In terms of UK political cohesion, concluding remarks are more difficult to come by. The maps and data show a real difference in voting sentiment between different areas of the UK. The mid-east of England has a large swathe of strong *Leave* feeling. London

has a huge population of *Remain* voters. And — in addition to notable *Remain* support — Scotland already has distinct geographical and political differences, as well as a strong independence movement.

However, perhaps the most significant (and depressing) thing I noticed while exploring this data is the effect of the non-voters. Their ghostly influence is writ large on **Maps 3 & 4**, and casts doubt on any firm conclusions you might wish to draw.

Life is messy, and so is data.

Sources

1. *UK results from the Electoral Commission*
2. *Northern Ireland breakdown from the Electoral Office of Northern Ireland*
3. *Great Britain shapefile from Ordnance Survey*
4. *Northern Ireland shapefile from Ordnance Survey of Northern Ireland*
5. *Gibraltar shapefile from DIVA-GIS*

Software

Python3 [pandas, numpy, matplotlib, fiona, shapely, descartes, scipy, scikit-learn, viridis colourmap], pyCharmCE, Pixelmator and QGIS.

Brexit UK Politics Data Science Maps Data Visualization