

Equality, Community and Continuity: Reviewing the UK Rules for Constituency Redistributions

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Foreword

Changing the structure of fundamental political institutions is notoriously difficult, perhaps especially when the subject is the framework of Parliament itself. This requires the consent of the institution as it now is, but questions of principle and fairness can too easily come into conflict with the legitimate interests of political parties and individual politicians with careers at stake.

Parliament has reasonably created the Boundary Commissions to introduce a measure of objectivity. But that does not entirely solve the problem. Parliament, as maker of laws and regulations, can change the Commissions' standing instructions. And the Commissions' recommendations are still subject to final confirmation (and possible veto) – by Parliament!

This is exactly the juncture that the current process has now reached, and the reason why the present report has been produced.

As our authors explain, the present Government saw two problems with previous constituency boundary reviews. First, the variations in constituency electorates – both between and within England, Scotland, Wales and Northern Ireland – made for unequal MPs' workloads and substantial inequalities in levels of representation which were considered unacceptable. So there was an issue of fairness, acknowledged by the three main political parties. Second, with no legal constraint on the size of the House of Commons, the reviews had produced a creeping expansion because it had repeatedly been a little easier to create a few more constituencies than to cut the numbers. This had not necessarily improved Parliament's democratic legitimacy or effectiveness, and had certainly increased its cost. So the *Parliamentary Voting System and Constituencies Act 2011* introduced new requirements: that the size of constituencies should not (except for a few special cases) vary by more than +/-5 per cent, and that the House of Commons' size should be reduced to 600 members from the present 650.

But the first application of the new rules brought provisional results which looked rather bizarre. Other standing requirements, such as respect for natural communities and continuity with previous constituencies, appeared badly threatened by the lower priority they were now given. So one suspects that there was some relief when a separate political dispute deferred the review beyond the 2015 General Election. But the rules remain unchanged, and the Boundary Commissions will soon undertake new reviews on the same basis. These will, without further action and allowing only for demographic changes, redraw the boundaries for the 2020 Election – presumably producing a further set of troubling results.

Our distinguished authors carefully examine whether it could be done better. Would it help to try various degrees of relaxation of the +/-5 per cent variation in constituency sizes? Would greater flexibility in using the substructure of constituencies – the electoral wards and divisions, and even smaller units – ease the apparent problems at community level? And would retaining the number of MPs at 650 or changing to an intermediate figure above 600 yield less disquieting results?

The McDougall Trust, as a charity keenly concerned to promote public understanding of electoral democracy, is delighted to publish the results. Neither we nor the authors seek any outcome apart from a better functioning democracy. The Trust thanks the authors for the high quality of their report, and Colin Rallings, Professor of Politics at Plymouth University's School of Government, who acted as independent reviewer. To those who will soon decide again how to set about restructuring Parliamentary constituencies, we commend this careful exploration of issues and options.

Nigel Siederer
Chair, McDougall Trust

Executive Summary

Concern regarding variations in constituency electorates, coupled with a drive to cut the cost of Parliament in the wake of the 2009 expenses scandal, led the Conservative Party to commit to legislation in its 2010 General Election manifesto to “ensure every vote will have equal value” and to reduce the size of the House of Commons.

This commitment was realised in the *Parliamentary Voting System and Constituencies Act 2011*, with new Rules for Redistribution which: (a) mandated a UK-wide quota for constituency electorates; (b) required the four Boundary Commissions to create all seats (with four exceptions) having electorates within +/-5% of that quota; and (c) cut the number of MPs from 650 to 600. Electoral equality was to be the paramount criterion for defining constituencies.

The four Boundary Commissions were required to recommend new constituencies by October 2013. Their provisional recommendations, especially those for England, provoked a realisation that arithmetic gains were achieved at the expense of continuity and geography. The variability amongst constituency electorates was halved compared with previous reviews, but most existing seats experienced major change and across urban Britain a match between local government and constituency boundaries was now the exception rather than the norm.

Production of a new set of 600 constituencies was not completed as disagreements within the Coalition over constitutional reform led to the Liberal Democrats joining with Opposition parties to block their implementation. The Boundary Commissions’ Sixth Reviews were aborted and the 2015 general election will be fought in the current constituencies. The 2011 Act was not repealed, however, nor were the new Rules for Redistribution amended – the Act’s implementation was merely delayed until 2016. A new set of reviews (the Seventh) initiated then will, if conducted under the same Rules and procedures, be as disruptive to the current map of constituencies as the Sixth. This raises the question:

Is there a better way to balance the competing demands of arithmetic, continuity and geography?

This report provides evidence needed to answer that question. Computer simulations of the constituency-building process have tested how House size, arithmetic tolerance and Commission policy interact to shape the map of Parliamentary constituencies.

- In reducing the number of MPs, the Government was mainly concerned with cutting the cost of Parliament. As MPs and others saw seats disappear from the map amid the general disruption, however, the two issues became conflated. Surely this reduction had to be part of the cause?

Our research suggests the impact of the reduction in the number of MPs was slight. A few more seats would have escaped change had the number of MPs not been altered, but for the cause of (and possible solution to) the disruption, we must look elsewhere.

- If the change in House size was not the cause, did the 2011 legislation set the tolerance around the UK quota too low at +/-5%. If it were increased, would there be less disruption to the constituency map? To answer that question, computer simulations explored the impact of changing the tolerance from +/-5%, at single-point intervals, up to +/-12%. For each of 75 areas into which we divided the UK – individual shire counties plus groups of neighbouring boroughs in England; groups of neighbouring local authorities in the other three countries – we explored whether a substantial number of different sets of constituencies could be created at the given tolerance, thus offering the possibility of a feasible solution for the area.

Those simulations showed that with a +/-5% tolerance, it is not possible to find feasible solutions in most of the 75 areas. As the tolerance is increased, the probability of obtaining such solutions rises quite rapidly at first (at +/-8% tolerance, feasible solutions were identified for 62 of the 75 areas) before the rate of change declines as fewer areas present a problem.

- In a number of those 75 areas, workable solutions could not be identified because the building blocks that the Boundary Commissions have traditionally used to create constituencies – local authority wards – are too large for the purpose. The Boundary Commissions for Northern Ireland, Scotland and Wales were prepared to split wards where they considered that sensible; the Boundary Commission for England was extremely reluctant to do so, and many of the problems that emerged in its recommendations resulted from this.

Our research clearly demonstrated that the use of wards as building blocks meant that major change to constituency boundaries was necessarily the norm in most English urban areas. It also showed that many more such constituencies would comprise parts of more than one local authority than might otherwise be the case. Greater continuity in the constituency map and less boundary-crossing would result, if there were a relatively small amount of additional ward-splitting – with this benefit greatest if the tolerance remained tight (less than +/-8%).

- When the 2011 legislation was debated, it was generally assumed that requiring Reviews of constituencies every five years (rather than the current every 8-12 years) would mean much less disruption at subsequent Reviews after the first (i.e. the Sixth, aborted in 2013). Our research suggests otherwise. Under the current Rules and procedures, a combination of reallocation of constituencies among the four countries, demographic change, and the re-warding of a substantial number of local authorities, seems likely to result in around one-third of all constituencies experiencing major change to their boundaries at each quinquennial review, with only one-third unchanged.

Major disruption to the UK's map of Parliamentary constituencies will be a normal feature of all quinquennial Reviews by the Boundary Commissions under the Rules for Redistribution in the 2011 Act. Ward-splitting and a more relaxed tolerance than +/-5% would reduce this somewhat, with major change affecting no more than one-fifth of all constituencies and as many as one-half not requiring any change.

- We do not offer advice as to whether Parliament should amend the 2011 legislation or, alternatively or additionally, encourage a change of policy on ward-splitting by the Boundary Commission for England, but our research may influence those who will take those decisions. Its main conclusions are these:
 - a) **If the equality constraint were relaxed somewhat – from +/-5% to +/-8% – there would be much less disruption to the constituency map, and if it were relaxed to +/-10%, major problems would arise in a very small number of places only.**
 - b) **If ward-splitting were adopted to avoid crossing local government boundaries and to minimise change to existing constituencies, then with a tolerance of +/-8% problems would arise in only a small number of places.**
 - c) **Even if the number of MPs were retained at 650, the reallocation of constituencies across the UK because of the introduction of a single electoral quota would see a comparable amount of disruption to that with a 600-member House.**
 - d) **Because of population changes and alterations to local government boundaries (especially wards), around one-third of constituencies are likely to undergo major change at each Review unless there is relaxation of one or both of the tolerance constraint and ward-splitting.**

1. Introduction

The *Parliamentary Voting System and Constituencies Act 2011* introduced a new set of Rules for Redistribution to be applied by the four UK Boundary Commissions in their next redistribution of Parliamentary constituencies (this is termed the Sixth Periodic Review¹). This began in March 2011 but was halted by Parliament before its completion, in January 2013. By then, however, each Commission had published both its initial and revised recommendations, the latter following the receipt of written representations and the holding of Public Hearings. Although the Commissions' final recommendations were not produced, the impact of the new Rules – very different from those used in previous redistributions – on the pattern of constituencies was very clear.

The key feature of those new Rules, compared to their predecessors, was the paramount emphasis on equality in the number of electors per constituency across the United Kingdom. This was combined with an increased frequency of redistributions (basically one per Parliament given the passage of the *Fixed Term Parliaments Act 2011*) to minimise the tendency for electoral inequality to increase over time. Previously constituencies could be in place for several general elections (e.g. 1997, 2001 and 2005 in England, Northern Ireland and Wales). Other criteria that formerly had greater priority – fitting constituencies into the matrix of local government boundaries; reflecting community ties; maintaining continuity with pre-existing constituencies wherever possible; and over-riding one or more of the Rules where special geographical considerations suggested to the Boundary Commissions that this was desirable – could only be applied so long as the strict equality criterion was enforced:- apart from the four 'protected constituencies' and possibly, if the Commission there considered a variation necessary, Northern Ireland, *every constituency was to have an electorate within five percentage points of a single UK-wide quota* (i.e. average electorate). 'Arithmetic' considerations were to take precedence over the 'organic' criteria which previously dominated reviews.

The 2011 Act not only changed the Rules for Redistribution, it also altered the composition of the House of Commons. Previously there had been no fixed number of MPs and, given the way the Rules were written, the House had grown in size at every redistribution bar one (the *Scotland Act 1998* led to a reduction in the number of Scottish MPs in 2005 from 72 to 59). The first redistribution under the Rules enacted in 1944 resulted in a House with 625 MPs; there were 659 after the Fourth Periodic Review, completed in 1995, and 650 after the Fifth, enacted in 2007. *The 2011 Act ended that inbuilt growth and fixed the number of MPs at 600* – a reduction of 7.7 per cent (but of 25 per cent in Wales, whose Commons delegation was to be reduced from 40 to 30).

When the Boundary Commissions began their first review under the new Rules in 2011, therefore, they were faced with not only implementing paramount emphasis on electoral equality but also reducing the number of constituencies. (In England, there was a reduction from 533 to 502; in Scotland from 59 to 52; in Wales from 40 to 30; and in Northern Ireland from 18 to 16.)

Although there had been considerable cross-party agreement during the passage of the *Parliamentary Voting System and Constituencies Act 2011* regarding the principles underpinning the new Rules – particularly that of much greater equality in constituency electorates – considerable concern was expressed during the Parliamentary debates (especially the extended ones in the House of Lords) regarding aspects of their implementation, not least the reduction in the number of MPs

¹ The first review under the 1944 legislation was termed the Initial Review; the next two were termed the First and Second Periodical Reviews (reported in 1954 and 1969 respectively); thereafter they were termed Periodic Reviews – the Fourth was reported in 1995 and the Fifth in 2007 (2004 in Scotland) – so that the reviews that commenced in 2011 were the Sixth Periodic Reviews.

and the relegation of the ‘organic’ criteria. The Boundary Commissions and commentators made it very clear before the review started in 2011 that there would be extensive disruption to the existing constituency map, with substantial impacts for both individual MPs – many of whom would probably find their current seats dismembered – and party organisations.

Those fears were exacerbated when the Commissions produced their provisional recommendations for 600 new constituencies in late 2011-early 2012: one MP portrayed the outcome as ‘somewhat more disruptive than we had in mind’.² The Commissions’ revised recommendations produced after the main stages of the public consultation process were just as disruptive of the pre-existing pattern as the provisional ones (although significantly different from them in many areas), and the political parties and their MPs faced major reorganizational changes in their preparations for the 2015 general election.

The reviews were not completed, however. In July 2012 the leader of the Liberal Democrat party indicated that – because of inter-coalition disagreements over other aspects of the constitutional reform programme (notably reform of the House of Lords) – he would direct his MPs to vote against the Boundary Commissions’ recommended new constituencies when they were placed before Parliament in October 2013. Their defeat was thus very likely, but the Commissions’ reviews continued. Parliament subsequently accepted an amendment to the *Electoral Registration and Administration Bill 2012* (enacted in January 2013), which delayed implementation of the relevant parts of the *Parliamentary Voting System and Constituencies Act 2011*, until 2016. The Commissions immediately abandoned their (by then almost completed) reviews, and parties began preparing for the 2015 general election to be held within the existing 650 constituencies.

This delay in implementation of the 2011 Act has not halted discussions about its Rules for Redistribution. In particular, questions have been raised as to:

1. whether the relative balance of the arithmetic (number) and organic (place) criteria can be altered somewhat by amendments to the Rules, so as to reduce the disruption to the constituency maps after each review while retaining the key criterion of electoral equality; and
2. whether it would be better to return to the current number of MPs (650) – albeit as a fixed rather than variable number?

The research reported in this paper was designed to inform those discussions. Its particular focus is the maximum variation in constituency electorates, fixed at 5% around the national quota in the 2011 legislation.

If the maximum variation were relaxed a little, would that help both to reduce the number of constituencies crossing local authority boundaries and to ensure better continuity with previous constituencies, while still achieving much greater equality in constituency electorates than heretofore, with either 600 or 650 MPs?

We express no opinion on the size of the House of Commons, merely reporting the results of our research for each possible size (recognising, of course, that many others might be considered).

² Mark Field, Conservative MP for the Cities of London and Westminster, <http://conservativehome.blogs.com/frontpage/2011/09/newlinks-for-wednesday-14th-september-2011.html>.

2. Unequal Representation

The redistribution process deployed before passage of the 2011 Act resulted in considerable differences in constituency electorates and thus representation levels across the United Kingdom, illustrated by Tables 1-3.³

	1997	2001	2005	2010
England	68,927	68,999	70,203	71,889
Northern Ireland	65,287	66,171	63,333	64,945
Scotland	54,806	55,291	65,287	65,383
Wales	55,015	55,718	55,767	56,625

From 1944 on there were significant differences in mean electorates across the four constituent countries. At recent general elections, for example, prior to 2005 both Scotland and Wales had substantially smaller constituencies than England and, to a slightly lesser extent, Northern Ireland (Table 1). After devolution in 1998 a change in the Rules for Scotland meant that its average constituency electorate came closer to the English figure in 2005 and 2010.

	England	N Ireland ¹	Scotland	Wales
Minimum	55,050	60,050	21,780	41,198
Decile 1	64,679		56,578	48,864
Quartile 1	67,425	61,566	61,387	52,399
Median	71,876	65,100	65,925	56,667
Quartile 3	75,519	68,979	73,320	61,178
Decile 9	79,163		73,534	64,363
Maximum	109,902	76,209	81,869	73,705

1. Because of the small number of constituencies (18) we have not reported the deciles for Northern Ireland.

These inter-country variations were complemented by intra-country differences, illustrated in Table 2 for the 2010 general election. This gives seven indicators of the distribution of constituency electorates within each country: the minimum; the first decile (10 per cent of constituencies had electorates below that figure); the first quartile (25 per cent of constituencies had electorates below that figure); the median (half of constituencies had electorates below than figure and half above it); the third quartile (25 per cent of constituencies had electorates above that figure); the ninth decile (10 per cent of constituencies had electorates above that figure); and the maximum.

At the 2010 general election, half of England's constituencies had electorates between 67,425 and 75,919 (i.e. the quartiles were within about 6% of the average); 80 per cent of constituencies had

³ A brief outline of the history of the Rules for Redistribution over the period 1944-2011 is given in Appendix I to this paper.

electorates between 64,679 and 79,163 (i.e. within the deciles, about 10% of the average); but 20 per cent had electorates either less than 64,679 or above 79,163. (The large maximum figure is for the Isle of Wight which prior to the implementation of the 2011 Act the English Commission was never prepared to split into two small constituencies.) There were similar patterns in the other three parts of the UK, except that Scotland in particular had some very small constituencies reflecting the special geographical circumstances there in the Highlands and Islands region and parts of Strathclyde.

Table 3

Changes in constituency size variations over time, with the same constituencies – England

	1997	2001	2005
Minimum	50,214	52,444	50,975
Decile 1	61,761	61,549	60,594
Quartile 1	65,547	65,616	64,969
Median	68,896	69,992	70,378
Quartile 3	72,496	74,174	74,768
Decile 9	76,189	78,262	79,749
Maximum	101,680	106,305	109,046

During periods when constituency boundaries remained unchanged, these inter- and intra-country differences were compounded over time, as a result of population movements both among the four countries and across constituencies within each. In England, for example, the same constituencies were used for the 1997, 2001 and 2005 general elections, and Table 3 shows the same descriptive statistics for its 529 constituencies then as Table 2. The median constituency electorate increased from 68,896 to 70,378, and variation around that figure also grew. The inter-quartile range (the difference between the first and third quartiles) widened from 6,949 in 1997 through 8,558 in 2001 to 9,799 in 2005 (an increase of 41% between the two end-dates while the median increased by only 2 per cent); the inter-decile range was 14,428 in 1997 and 19,155 in 2005 – an increase of 31 per cent.

3. Tackling the Unequal Representation: the 2011 Act

These variations in constituency electorates show the following:

- There have always been substantial differences in levels of representation across the United Kingdom, with some areas significantly over-represented – notably Wales by 2010, and to a lesser extent Scotland – which was interpreted as unequal; and
- Those differences increased over time after each review of constituency boundaries, thereby exaggerating the degree of under- and over-representation for different parts of the United Kingdom.

Such variations were not only incompatible with the concept of equal representation but also:

- Generated significant variations in MPs' workloads representing individual constituents and the communities/local authorities within which they lived, which was also seen as incompatible with the concept of equal representation.

To reduce these variations and produce greater equality of representation, the *Parliamentary Voting System and Constituencies Act 2011* introduced three major changes to the Rules for Redistribution to be implemented by the four Boundary Commissions:

1. There was to be a single UK electoral quota, thereby removing any significant inter-country differences in average electorates – and as no constituency was to combine parts of two of the countries, the Sainte-Laguë formula was specified for allocating MPs to each country, thereby ensuring minimal variation in average constituency electorate across the four;⁴
2. All constituencies, with four exceptions, were to have electorates that were within +/-5% of the UK quota, thereby ensuring that intra-country electorate differences were also small;⁵ and
3. There was to be a redistribution every five years, with the Commissions reporting their recommendations to Parliament 18 months before the next scheduled general election, thereby removing the 'creeping electoral differences' of the previous procedure and ensuring that every general election is conducted in a new set of constituencies with approximately equal electorates.⁶

The Act also fixed the number of MPs at 600. It made other changes to the redistribution procedure, notably in the public consultation process, but these are not relevant to the present concerns regarding electorate size variations and equality of representation/MPs' workloads.

⁴ The Sainte Laguë method is one of a number of 'largest remainder' procedures for allocating seats to areas and is generally considered the fairest: see S. Hix, R. Johnston and I. McLean, *Choosing an Electoral System* (London: The British Academy, 2010), pp.32-33.

⁵ The four exceptions (named 'protected constituencies') reflected the 'special geographical circumstances' of particular places. Initially, there were to be only two – the Scottish constituencies of Orkney and Shetland, and Na h-Eileanan an Iar – but the House of Lords amended the Bill by guaranteeing two seats for the Isle of Wight (previously the English constituency with the largest electorate – Table 2). All four had electorates substantially less than the quota. There was also a special provision allowing the Boundary Commission for Northern Ireland the freedom to slightly expand the +/-5% tolerance if that were deemed necessary (possible because of the relatively small number of constituencies there compared to the other four countries): this is discussed in M. Balinski, R. Johnston, I. McLean and P. Young, *Drawing a New Constituency Map for the United Kingdom: the Parliamentary Voting System and Constituencies Bill 2010* (London: The British Academy, 2010).

⁶ This timetable would be broken if a premature general election is called, under the stipulations laid down in the *Fixed Term Parliaments Act 2011*.

4. Implementing the New Rules for Redistribution

The four Boundary Commissions commenced their first reviews under the new Rules for Redistribution in March 2011; the data for determining the electoral quota and the allocation of seats became available in December 2010. Three Commissions published their provisional recommendations within eight months of starting that review; the Welsh Commission published its in January 2012. The first stages of the statutory public consultation procedure then followed – a twelve-week period for written representations and the holding of Public Hearings, followed by publication of the written representations and Hearing transcripts and a four-week period for written comments on those documents. The Commissions then revised their recommendations in the light of the evidence received; these were published in early autumn 2012, followed by an eight-week period for further written representations. Work then commenced on their final recommendations; this work was terminated after Parliament voted on the amendment to the *Electoral Registration and Administration Act 2013*.

Publication of the Commissions' provisional recommendations stimulated considerable concern because of the major changes to the constituency map, especially in England and Wales: much less concern was expressed in Scotland and there was very little at all, especially from the political parties and their MPs, in Northern Ireland. The extent of the changes and their nature took many – including a large number of MPs – by surprise, although not the central party organisations; these had teams preparing for the publication of the provisional recommendations which were well aware of the likely extent of the changes – though obviously not the details – and had been briefing their local organisational units and MPs.

The concerns with the changes fell into three main categories:

- The degree to which the proposed constituencies were not, as before, nested within the boundaries of the major local authorities – many more proposed constituencies than previously included parts of more than one authority;
- The lack of continuity between the previous map and the proposed new one – changes were much more extensive than at earlier reviews; and
- The detailed composition of many of the proposed constituencies, many of which split communities formerly in a single seat and/or combined areas within a constituency that had little in common.

The third of these was a common – though not as widespread – feature of the provisional recommendations in earlier reviews and the public consultation procedure was used, as far as possible, to rectify any anomalies brought to the Commissions' attention through the deployment of locally-detailed information that was not likely to be known to the Commissioners and their staff. It is not considered in this discussion of the Rules for Redistribution, therefore, which concentrates on the first two categories only.

Boundary crossings

For England, a few examples illustrate the problems relating to the first of these major concerns.

Greater London comprises 32 boroughs plus the City of London. None of the boroughs is entitled to more than three constituencies, and most to only two. At the previous two reviews, the Boundary Commission for England combined several groups of neighbouring Boroughs to avoid excessive electoral inequalities. It did so again in 2011, when its provisional recommendations involved much more extensive cross-boundary solutions than previously. For example, in its final recommendations in the review reported in 2007, only 10 of the 73 proposed constituencies included parts of two boroughs. However, in the 2011 provisional recommendations:

- As many as 37 of the proposed 68 constituencies included wards from two boroughs – some 54 per cent of MPs elected from London constituencies would be representing parts of two boroughs, compared to 14 per cent in the current House of Commons;
- Furthermore, nine of the 32 boroughs would not have a single constituency comprising parts of that borough alone, so that all of their MPs would also be representing parts of another borough (Lambeth would have been split six ways, for example, and Brent, Ealing and Enfield five ways);
- Only two boroughs would be comprised of constituencies entirely contained within them; and several of the borough borders were crossed by more than one constituency.

After the public consultation, the Commission’s revised recommendations indicated that, while a substantially different set of constituencies could be proposed for some areas, the constraints meant that the disruption was still substantial:

- 34 of the constituencies in the revised recommendations contained wards from one borough only;
- The other 34 constituencies combined wards from two boroughs;⁷
- Eight of the boroughs lacked even a single constituency totally contained within its boundaries.

Outside London: in its Fifth Review, the Boundary Commission for England’s final recommendations included no constituencies which crossed county boundaries (unitary authorities being included within the counties from which they had been removed). Within the Metropolitan Counties, twelve constituencies incorporated wards from two Metropolitan Boroughs/Cities. Its Sixth Review provisional recommendations in 2011 had many more boundary crossings. There were 28 constituencies incorporating wards from two Counties, 37 with wards from two Metropolitan Boroughs, and five with wards from three of those Boroughs.

The *City of Birmingham* illustrates the issues that led to more boundary-crossing constituencies in the Metropolitan Boroughs. It currently has ten MPs, each representing a constituency comprising four of the city’s 40 wards. Under the new Rules it was entitled to 9.55 constituencies, which would almost certainly mean at least one combining parts of Birmingham with parts of an adjacent authority.⁸ However, in order to implement the Rules fully, there and in adjacent local authorities, the Commission proposed:

- only six constituencies entirely contained within the city’s boundaries;
- one of these combined parts of Birmingham with wards in both Sandwell and Walsall;
- another combined several Sandwell wards with one from Birmingham;
- a third combined one Sandwell ward with several of Birmingham’s;
- a fourth recommended constituency combined a Birmingham ward with several from Solihull;
- and, finally, other parts of Solihull were combined with a ward from Birmingham plus one from North Warwickshire – outside the West Midlands Metropolitan County.

What was formerly a very ‘clean’ constituency map reflecting the local government situation of England’s second city would have been replaced by a much more complex one.⁹ The same was true with the revised recommendations: in which the Commission proposed:

⁷ The City of London is not treated as a separate borough in these calculations.

⁸ According to the research reported below, with either 600 or 650 MPs it was impossible to create 10 constituencies all within Birmingham with a tolerance of less than +/-8%, without ward-splitting; with one of +/-8%, however, a substantial number was identified and with +/-10% there were several thousand.

⁹ This multiple crossing of boundaries created a further issue in Birmingham which, while *ultra vires* with respect to the legislation on constituency redistricting, illustrates some of the concerns around the wider implications for

- seven constituencies entirely comprising Birmingham wards;
- five containing wards from Birmingham plus one or more from one other authority;
- one containing wards from Birmingham plus two other authorities (but none crossing the boundary with North Warwickshire).

Elsewhere, the new electoral equality requirement meant that their Boundary Commissions had no alternative but to recommend more seats than previously that incorporated parts of more than one local authority.

In *Scotland*, for example:

- eight of the existing 57 constituencies (excluding the two ‘protected constituencies’) incorporated parts of two local authorities and another comprised parts of three;
- in the 2011 provisional recommendations, 16 of the 50 constituencies contained parts of two local authorities – as did 14 in the revised recommendations.

In *Wales*:

- seven of the current 40 constituencies contain parts of two local authorities;
- in its Boundary Commission’s final recommendations, 15 of the 30 contained parts of two or more authorities
- three of them contained wards from three authorities and one from four.

Finally, in *Northern Ireland*, all of its Boundary Commission’s revised recommendations were for constituencies including wards from two or more local authorities:

- seven constituencies had wards from two authorities;
- seven had wards from three authorities;
- one had wards from four authorities; and
- one had wards from five.

This complexity reflected the smallness of many of the local authorities in those three countries and was deemed necessary by their Commissions, all three of which were prepared to split wards if that was considered desirable.

Continuity

Whenever there is a boundary review, most MPs prefer that the changes to the existing map are as limited as possible, as do the local party organisations; this was the rationale behind major amendments to the legislation in 1958. The Boundary Commissions have generally been able to meet their wishes at recent reviews, with extensive changes mostly confined to those areas where the theoretical entitlement had either increased or decreased – which invariably meant redrawing the entire map for a county or borough. That was not the case with the review commenced in 2011 under the new Rules and with a reduced number of MPs.

To illustrate the difference between the previous and that unfinished review, we adopted an Index of Change used by Rallings and Thrasher in their evaluations of the new constituencies

communities and for local politics. In line with the localism agenda of successive governments, the City Council had devolved much of its service-delivery budgeting to ten district committees each serving an area covered by one of the city’s ten constituencies. The Council Leader claimed in his oral evidence to the Boundary Commission for England’s Public Hearing on its proposals for the West Midlands on 3 November 2011 that that policy would be put in jeopardy by the provisionally recommended new set of constituencies because of the cross-boundary character of many of the proposed seats. (The revised recommendations similarly contained six cross-boundary constituencies including Birmingham wards.)

recommended in recent reviews.¹⁰ That Index contrasts the composition of the new constituency with that of the old constituency that forms the largest part of the new one: for each of the proposed new seats, it is calculated as the number of electors removed plus the number added to the old seat which forms the largest part of the new one, as a percentage of the original seat's electorate – it can vary from 0.0 to over 100.0, with the larger the Index the greater the amount of change. Four groups of new constituencies were identified: those with No Change from the previous situation (an Index of 0); those with only Minor Change (an Index of less than 10); those with Moderate Change (Indexes between 10 and 25); and those with Major Change (an Index greater than 25). Table 4 shows the percentage of all constituencies in those four categories in the final recommendations of the last two completed reviews (the Fourth and the Fifth, from the mid-1990s and the mid-2000s respectively) and the percentages in the revised recommendations in the Sixth, which was aborted in 2013.

<u>Degree of change</u>	<u>4th</u>	<u>5th</u>	<u>6th</u>
None	25	13	18
Minor	19	39	11
Moderate	22	18	17
Major	33	30	54

The contrast in Table 4 between the recommendations of the previous two reviews and those of the aborted Sixth Review is stark. Much greater change was proposed in the last than in the earlier exercises, conducted under the old Rules, even though as far as possible the Commissions sought to minimise change again in 2011. In each of the Fourth and Fifth Reviews, around half of the pre-existing constituencies were either retained intact or experienced only minor change. That was the case with only 29 per cent of the seats in the revised recommendations of the Sixth Review, when over half of all constituencies were subject to major change, compared to one-third or fewer at the previous reviews.

¹⁰ See C. Rallings and M. Thrasher, *Media Guide to the New Parliamentary Constituencies* (Plymouth, 2007), especially pp 2-3.

5. Why the Complexity and Amount of Change?

Although both the amount of change illustrated above and the greater complexity of the new constituency map indicated by the much larger number of constituencies crossing major local authority boundaries in the 2011 review were anticipated, the detailed reasons need further exploration. There were three:

- The introduction of the UK-wide electoral quota and the +/-5% tolerance around that figure;
- The decision by the Boundary Commission for England to continue with its previous policy of not splitting wards when creating constituencies (with the other three Commissions already prepared to over-ride that policy where it seemed desirable); and
- The reduction in the number of MPs from 650 to 600.

Our research takes all three into account. With regard to the first, introduction of the +/-5% tolerance meant that the issue of a local authority's size (its registered electorate) and the associated theoretical entitlement became much more important than at previous reviews; in many cases neighbouring authorities had to be combined to create a viable theoretical entitlement. The extent of this problem is discussed below, as is the second; average ward electorates are so large in many local authorities (especially but not only large urban areas) that it is very difficult, if not impossible, to combine wards into a number of constituencies that fit the entitlement all of which also fall within the +/-5% tolerance.

Local authority size and entitlements

At previous reviews, the Boundary Commissions have calculated a theoretical entitlement of constituencies for each local authority and in most cases rounded that number up or down to determine the exact number to be allocated. This could produce considerable differences in the average constituency electorate between adjacent authorities (such as those shown in Table 2), unless two or more adjacent authorities were combined, which was not the normal practice in England outside London and the Metropolitan Counties.

That flexibility in allocating seats to local authorities was not available to the Commissions in 2011 because of the +/-5% tolerance. Because of their fractional entitlements, especially though not only for relatively small counties and boroughs, adjacent local authorities would have to be combined in the allocation of seats. (A major issue raised by the Boundary Commission for England's 2011 provisional and 2012 revised recommendations was the necessity for it to combine Cornwall, with a theoretical entitlement of 5.47, with Devon and the creation of one cross-boundary constituency – named Bideford and Bude in the provisional recommendations and Bideford, Bude and Launceston in the revised version.)

To illustrate the problem, consider a hypothetical situation where the electoral quota is 100,000, so that the range of allowed constituency sizes is 95,000-105,000. County A has an electorate of 220,000, with a theoretical entitlement of 2.2 constituencies. It would not be possible to allocate two, however, because they would have an average electorate of 110,000; if one had the minimum electorate – 95,000 – the other would have an electorate of 125,000, which is outside the range. County B, on the other hand, has an electorate of 820,000, giving it a theoretical entitlement of 8.2 constituencies with an average electorate of 102,500. This is within the range and eight seats could be allocated. The larger the county or borough, the greater the probability that its theoretical entitlement can be met within the range and it need not be merged with neighbours (assuming, of course, that all of them are similarly situated).

Table 5

The range of fractional entitlements for which it would be feasible to create a set of constituencies (rounded up or down to the nearest integer) meeting each size tolerance from +/-5% to +/-10%.

The feasible entitlement ranges are shown in bold

Entitlement	Tolerance: +/-N%					
	5%	6%	7%	8%	9%	10%
1	1.0	1.0	1.0	1.0	1.0	0.9-1.1
2	1.9-2.1	1.9-2.1	1.9-2.1	1.9-2.1	1.9-2.1	1.8-2.2
3	2.9-3.1	2.9-3.1	2.8-3.2	2.8-3.2	2.8-3.2	2.7-3.3
4	3.8-4.2	3.8-4.2	3.8-4.2	3.7-4.3	3.6-4.4	3.6-4.4
5	4.8-5.2	4.7-5.3	4.7-5.3	4.7-5.3	4.6-5.4	4.5-5.5
6	5.7-6.3	5.7-6.3	5.6-6.4	5.6-6.4	5.5-6.5	5.5-6.5
7	6.7-7.3	6.6-7.4	6.6-7.4	6.5-7.5	6.5-7.5	6.5-7.5
8	7.6-8.4	7.6-8.4	7.5-8.5	7.5-8.5	7.5-8.5	7.5-8.5
9	8.6-9.4	8.5-9.5	8.5-9.5	8.5-9.5	8.5-9.5	8.5-9.5
10	9.5-10.5	9.5-10.5	9.5-10.5	9.5-10.5	9.5-10.5	9.5-10.5

Table 5 shows the range of theoretical entitlements, around each integer, with which it would be feasible to create that number of constituencies, all within the size constraint, whatever the number of MPs and the electoral quota; the fractional entitlements are presented to one decimal place only.

Thus, for example, with +/-5% as the allowed variation (the first column):

- If the nearest integer to the theoretical entitlement is 2, it would only be possible to create two constituencies if the entitlement fell within the range 1.9-2.1.
- If the nearest integer were 5, a feasible solution would be possible within the wider range 4.8-5.2;
- If the nearest integer were 8, then feasible configurations could be found within the range 7.6-8.4; and
- If the nearest integer were 10, then the full range of 9.5-10.5 would provide feasible solutions.

As the tolerance is relaxed, the range of feasible solutions increases, but only those shown in bold in the table allow the full range (e.g. 4.5-5.5). Thus:

- If the tolerance is +/-5%, only an entitlement of 9.5 or more can be rounded up to the nearest integer and allocated to the area.
- If it is +/-8%, then an entitlement of 7.5 or more can be rounded up to the nearest integer; and
- If it is +/-10% an entitlement of 4.5 is sufficient for the rounding up or down.

Thus, the larger the number of seats allocated to an area and/or the wider the tolerance, the greater the probability that feasible configurations will be found.

The clear message from Table 5 is that, with small local authorities entitled to only a few seats, it is not possible – even with a +/-10% tolerance – to create constituencies entirely contained within the authority unless the fractional entitlement is close to the integer value.

Table 6 shows – for England’s 32 London Boroughs, 36 Metropolitan Boroughs within the six Metropolitan Counties, and the Shire Counties plus the residual Unitary Authorities created by the

dissolution of Avon, Cleveland and Humberside¹¹ – the fit within the ranges shown in Table 5, whether their theoretical entitlements using the 2011 electoral quota of 76,641 for a 600-member and 70,708 for a 650-member House (both figures using 2010 electoral data). (We focus only on England here because of the different local government structures elsewhere in the UK.)

Table 6

The distribution of theoretical entitlements for different types of local authority in 2010, with a House of Commons containing 600 and 650 MPs with a +/-5% tolerance (feasible entitlements are shown in bold)

Entitlement	600 seats			650 seats		
	L	MB	SC	L	MB	SC
0.0-0.9	0	0	1	0	0	0
1.0	0	0	0	0	0	1
1.1-1.8	10	4	2	6	2	0
1.9-2.1	6	6	2	6	4	3
2.2-2.8	13	12	2	15	13	1
2.9-3.1	2	5	0	2	5	1
3.2-3.7	1	2	1	3	5	1
3.8-4.2	0	2	0	0	0	0
4.3-4.7	0	2	2	0	3	1
4.8-5.2	0	1	1	0	1	1
5.3-5.6	0	0	4	0	1	1
5.7-6.3	0	0	2	0	0	5
6.4-6.6	0	0	4	0	0	1
6.7-7.3	0	1	1	0	0	4
7.4-7.5	0	0	4	0	0	0
7.6-8.4	0	0	1	0	1	6
8.5	0	0	1	0	0	0
8.6<	0	1	13	0	1	17
Within tolerance	8	16	20	8	12	38
Σ	32	36	41	32	36	41

L – London Boroughs; MB – Metropolitan Boroughs/Cities; SC – Shire Counties

For a 600-member House:

- Only eight of the London Boroughs had a theoretical entitlement which enabled an integer number of constituencies to be allocated to them (these are shown in bold);
- That was the case with only 16 of the Metropolitan Boroughs;
- The situation was slightly better with the Shire Counties, where just under half of the 41 areas had a viable entitlement. (Devon did, but Cornwall didn't, of course, so the two would have to be combined!)

¹¹ These include the former Counties of Cornwall, Durham, Northumberland, Shropshire and Wiltshire which were recreated as unitary authorities, as were the separate authorities created when the Counties of Avon, Cleveland and Humberside were dissolved: two other former shire counties – Bedfordshire and Cheshire – have each been divided into two unitary authorities but they are treated as single entities here, as they were by the Boundary Commission for England since the new authorities had not been implemented when its 2011-2013 review commenced. Rutland is combined with Leicestershire as it traditionally is by the Boundary Commission; the Isle of Wight is excluded.

For a 650-member House:

- The situation would have been no different for London, but it was better for the Metropolitan Boroughs;
- In the rest of England, there was a big difference, where all but three areas had a viable theoretical entitlement.

There is no guarantee that returning the House of Commons to 650 MPs will reduce the problem identified here. The number of authorities with a viable theoretical entitlement will vary according to the exact number but the likelihood is that, whatever the number of MPs, a substantial number of local authorities – especially but not only the smaller ones – will not have a theoretical entitlement which fits within the parameters identified in Table 5, and so will have to be merged with one or more neighbours.

What if there were a wider tolerance than +/-5%?

Table 7 shows the number of authorities of each type with a viable theoretical entitlement with tolerances up to +/-10%. For London, there is little change with a less-than +/-10% tolerance – with either a 600- or a 650-member House. The same is the case with the Metropolitan Boroughs with the 600-member size. Considerable grouping of adjacent authorities will be necessary in those two parts of England, whatever the tolerance. Elsewhere – in the Shire Counties – the necessity for grouping will be rare with a tolerance of +/-6% or above with a 650-member House.

Tolerance (%)	600 seats			650 seats		
	L	M	SC	L	M	SC
5	8	16	20	8	12	38
6	8	16	30	8	13	40
7	8	18	36	11	16	40
8	8	20	36	11	17	41
9	8	20	38	11	18	41
10	18	29	41	17	19	41
Σ	32	36	41	32	36	41

L – London Boroughs; MB – Metropolitan Boroughs/Cities; SC – Shire Counties

The problem of local authorities with small theoretical entitlements was recognised by those drafting the *Parliamentary Voting System and Constituencies Act, 2011*, particularly for England. Realising that its Commission would have to combine adjacent local authorities to make up groups whose constituency entitlements could be met within their boundaries, the Act suggested that it use the nine Standard Regions as the framework for allocating constituencies – and made that almost obligatory by using the regions as the template within which the Public Hearings were to be held. The Commission structured its work accordingly but sought, wherever possible, to divide each region into smaller areas with viable entitlements.

Only in one region was it unable to do this – that with the smallest overall theoretical entitlement: the Northeast. Five of the other eight were divided into three sub-regions, one into 5, one into 6, and the largest (the Southeast) into 9. Of these 35 sub-regions, 18 comprised a single local authority

only, most of them Shire Counties (Berkshire,¹² Buckinghamshire, Cumbria, Essex, Derbyshire, Gloucestershire, Hampshire, Lancashire, Lincolnshire, Oxfordshire, Surrey, and West Sussex – in all cases incorporating any ‘enclave’ unitary authorities contained within their boundaries).

In Wales, only 14 of the 30 constituencies in the revised recommendations were contained within a single unitary authority and just 6 of those 22 local authorities were entirely contained within one constituency.

Only seven of Northern Ireland’s 26 local authorities were not split between two or more of the Commission’s provisionally recommended 16 constituencies, a figure that was increased to eleven in the revised proposals.

The building blocks for constituency definition: local authority electoral wards

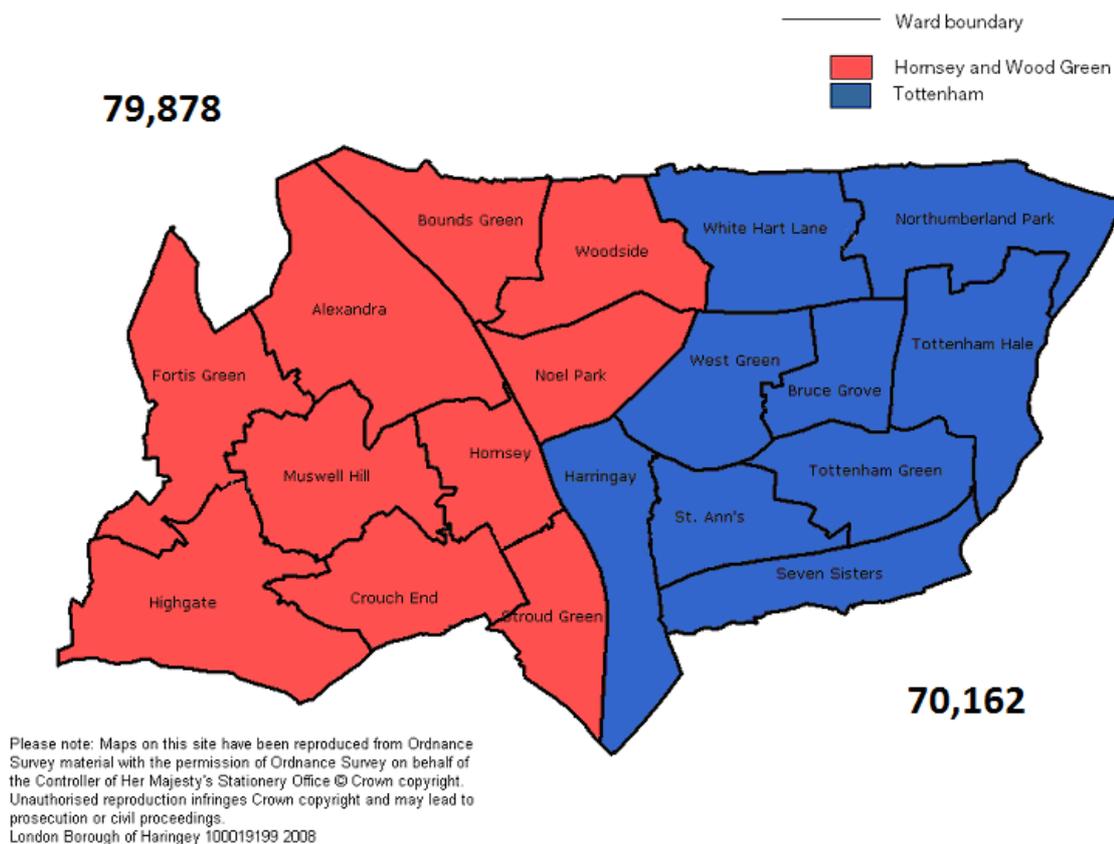
Throughout their six completed reviews since passage of the 1944 Act, the Boundary Commissions have, with very few exceptions, used local authority electoral wards as the building blocks for creating constituencies. (Where there has been a two-tier local government, as in the current English Shire Counties, they have used the smaller district wards rather than the larger county electoral divisions.) Although this has been accepted practice, it has not been a legal requirement except in Northern Ireland, for which the *Parliamentary Constituencies Act 1986* stated that ‘no ward shall be included partly in one constituency and partly in another’. The 2011 Act recognised this near-universal practice, but realised that it might not be feasible to deploy it in all cases: the new Rules for Redistribution indicated (Rule 5) that the Commissions ‘may take into account ...local government boundaries’ and in its interpretation (Rule 9(3)) included electoral wards among the boundaries covered by Rule 5, in all four countries.

In the review which began in 2011, the Commissions varied in their attitude to using wards as their building blocks:

- The English Commission took the hardest line, its Deputy Chairman telling a meeting of political party representatives that it ‘would only split a ward if there was felt to be no realistic alternative in order to create a viable constituency’ – advice that the Conservative and Labour parties fully accepted in preparing their counter-proposals.
- The Scottish Commission, on the other hand, was prepared to split wards where necessary, in order to meet the other criteria, saying that ‘it is impracticable in this Review to create constituencies by simply aggregating electoral wards’. This was based on its experience creating a new set of constituencies for the Scottish Parliament in 2009. Scotland had changed its local government electoral system from first-past-the-post in single-member wards to STV, and ward sizes had been increased accordingly; in 2012, 189 wards returned three councillors each and 164 elected four. In its provisional recommendations published in 2011, the Commission split 29 of the country’s 353 wards; of its 50 constituencies (i.e. excluding the two ‘protected constituencies’), 35 contained one or more part-ward. In its revised recommendations, 31 wards were split and 38 of the 50 constituencies contained at least one part-ward.
- Finally, both the Northern Ireland and Welsh Commissions took a pragmatic approach; they preferred not to split wards, but would do so if necessary. In the event, the Northern Ireland Commission split only one ward in its provisional and revised recommendations (and that ward had been split in the previous review); the Welsh Commission proposed splitting 4 out of 881 electoral divisions, and just 3 in its revised proposals (the term ‘ward’ is not used in Wales).

¹² Berkshire was divided into five unitary authorities in 1996 but these were not given separate county status.

Figure 1. Haringey's wards and constituency electorates in 2010.



The Boundary Commission for England's decision to use wards as its building blocks, unless there were compelling reasons not to,¹³ compounded the problem of creating a set of constituencies entirely contained within a local authority, even where this was mathematically feasible given its theoretical entitlement as discussed above.

This is illustrated by the London Borough of Haringey (Figure 1). An electorate of 150,040 gave it a theoretical entitlement of 1.96, which meant that it could be allocated two constituencies. Of its current two, Hornsey and Wood Green with an electorate of 79,878 was within the +/-5% tolerance limits (72,810 to 80,473) but with 70,162 Tottenham was too small. The 'obvious' solution would appear to be to move some voters from one constituency to the other.

There are four wards along the boundary between the two constituencies, but if any one was moved from Hornsey and Wood Green into Tottenham, although the latter would then have an electorate within the prescribed range, the former constituency would be too small. It is not possible to create two constituencies both having within-range electorates by modifying the boundary between the existing two using the wards as building blocks. Indeed, there is no configuration of Haringey's 19 wards which would satisfy the +/-5% tolerance, even starting with a blank sheet of paper.¹⁴

¹³ It identified no such compelling reasons in its provisional recommendations. Following its public consultations it identified one place – Gloucester – where it was prepared to recommend a split-ward solution to a very difficult problem, which involved splitting two wards. That had been counter-proposed by the Gloucester constituency Conservative party, but not by the central party officer who made representations (oral and written) in all regions.

¹⁴ Of course, even though Haringey had an integer entitlement, one or more of its neighbours may not, making a combination of boroughs necessary. In its provisional recommendations, the Commission retained the two existing constituencies almost intact: it switched one ward from Hornsey and Wood Green to Tottenham, replacing it by one from neighbouring Enfield to the north, thus retaining a ten-ward seat. In addition to the ward

Even where the theoretical entitlement suggests that a local authority *could* have a number of constituencies entirely contained within its borders, its ward structure may preclude this, as illustrated by the case of Leeds. The City's electorate of 545,338 entitled it to 7.1 constituencies, but there was no available solution in which its 33 wards could be configured to create seven, all within the specified size range. Combining Leeds with one or more neighbours was necessary. The Commission recommended eight constituencies, of which:

- only three were entirely contained within Leeds;
- two combined parts of Leeds and Bradford;
- one crossed the Leeds-Kirklees boundary and another the Leeds-Wakefield boundary; and
- the final one combined parts of Leeds with wards in the Harrogate district of North Yorkshire (i.e. outside the West Yorkshire Metropolitan County).¹⁵

That this complexity was not a result of Boundary Commission whims is illustrated by the alternative configurations for Leeds and surrounding authorities counter-proposed by the political parties during the public consultation process:

- The Conservatives argued for nine constituencies including parts of Leeds, only one of which was the same as one of the Commission's recommendations;
- The Liberal Democrats suggested ten constituencies including parts of Leeds, only two of which were entirely contained within the city;
- a Labour counter-proposal also had ten constituencies involving Leeds, of which just four were contained within the City.

The Boundary Commission for England realised that Leeds and the surrounding areas presented a very difficult problem and that the parties – along with others who made representations during the public consultation – were far from satisfied with its recommendations. This was reflected in its revised recommendations. The number of seats including Leeds wards was increased from eight to nine, of which:

- only three were contained entirely within the city (and none was the same as any of the provisionally-recommended eight);
- the others linked parts of Leeds with wards in Bradford (three seats), and Kirklees and Wakefield (two seats each).

North Yorkshire's eight existing seats remained unchanged in the revised recommendations but elsewhere in West Yorkshire boundary-crossing was the norm and the recommended map necessarily much more complex in the amount of local-authority boundary crossing than the one it was to replace.

This problem with the ward structure has two components. The first is that unless an authority has a number of wards that when divided by its constituency entitlement gives an integer number, it is unlikely that a viable set of constituencies can be created. (Haringey has 19 wards, which divided by 2 gives 9.5; Leeds has 33 which divided by 7 gives 4.7.) Wards tend to be equal in size; equality

moved in from Hornsey and Wood Green, the Tottenham constituency also received one from Enfield, but its southernmost ward was switched into a constituency largely drawn from neighbouring Hackney, thereby creating a 10-ward Tottenham constituency as well.

¹⁵ North Yorkshire (including the City of York) was entitled to eight constituencies, and all eight of the current constituencies were within the required new size range. But because of this decision to cross the Leeds-North Yorkshire boundary – and two others further south in West Yorkshire – seven of those eight North Yorkshire constituencies had to be changed.

of electorates is a prime criterion applied by the Local Government Boundary Commission for England when creating new ward systems for a local authority.

The second component is that wards tend to be large in many authorities, relative to the allowed variation, especially in London and the English Metropolitan Counties. The maximum difference between the largest and smallest constituency in the aborted review was 7,663 electors: the majority of wards in London and the Metropolitan Counties had more electors than that, so that if a potential constituency was slightly below the minimum electorate [72,810] adding another ward to it would probably take it over the maximum [80,473] – and taking a ward away from a potential constituency slightly larger than the maximum could well move it to below the minimum.

This situation reflects in part the large electorates of those Boroughs and Cities but, much more so, the legal stipulation that each of the 36 Cities and Boroughs within the Metropolitan Counties all have wards each returning three members.¹⁶ If Leeds' 99 City Councillors were returned from 99 single-member wards rather than 33 (i.e. average electorates of 5,508 rather than 16,525), it is very much more likely that a set of seven constituencies within the size range could be created using the wards as building blocks (six comprising 14 wards each, for example, and the seventh comprising 15). London Boroughs are not required to have three-member wards, but most do; if Haringey's 57 councillors were elected from 57 wards with an average electorate of 2,632, rather than from 19 averaging 7,897, two constituencies within the prescribed size range could certainly be created there.

Elsewhere, especially in more rural areas, this problem is less acute. Most rural wards are single-member and much smaller than in the conurbations – although there is a tendency for them to become larger when authorities' electoral systems are revised, as there is also pressure for smaller councils (as in some of the recently-created unitary authorities replacing Shire Counties, such as Shropshire and Wiltshire). Even if the entitlement to constituencies is not close to an integer, therefore, it should be possible in most cases to create constituency configurations that are combinations of wards. The problem is not particular to major urban areas and conurbations, but it is certainly concentrated there.

¹⁶ The current legal situation, following the passage of the *Local Democracy, Economic Development and Construction Act, 2009*, is that any Council that is elected by thirds (i.e. one-third of the Councillors are elected in each of three years during the four-year electoral cycle) must have three-member wards. Currently all do, although in May 2014 the Local Government Boundary Commission for England published draft proposals for Doncaster in which that is not the case. In place of the 21 three-member wards, it proposes a Council with 54 members with a single election every four years: there would be 13 three-member wards (average electorate 12,434); six two-member wards (average 8,627); and three single-member wards (average 4,376). These proposals are available at <http://www.lgbce.org.uk/current-reviews/yorkshire-and-the-humber/south-yorkshire/doncaster-fer>; further details on rewarding arrangements are available in the Commission's leaflet *How To Propose a Pattern of Wards* – http://www.lgbce.org.uk/data/assets/pdf_file/0014/10409/proposing-new-wards-guidance.pdf. If this practice becomes widespread it may remove some of the need for the English Commission to consider combining adjacent boroughs, though this is unlikely to happen in more than two or three local authorities before the next Review begins in 2016 or to be widespread before that scheduled to commence in 2021.

6. Reducing the Complexity and Lack of Continuity

The analysis so far has shown that, under the Rules for Redistribution in the *Parliamentary Voting System and Constituencies Act 2011*, plus the associated reduction in the number of MPs from 650 to 600, the constituencies recommended by the four Boundary Commissions in their first review implementing those Rules – both provisional and, after public consultation, revised – were very different from their predecessors. There was much less continuity in the pattern of representation than after earlier reviews, and many more constituencies crossed local government boundaries than previously. The implications for party organisation and the nature of MPs' workloads representing their individual constituencies and their various communities and interest groups were substantial – and to a considerable extent unwelcome, as illustrated by the arguments made by MPs and party officials in the public consultation process. That review was aborted, for political reasons, but a further review will begin in 2016, using the same Rules and therefore facing the same problems and producing similar – to a greater or lesser extent unpopular – outcomes.

Can that be changed? While retaining the fundamental principles of the *Parliamentary Voting System and Constituencies Act, 2011* – equal electorates, both between and within the four countries, and more frequent redistributions – is it possible to change either the practices of constituency creation or some elements of the Rules to create more acceptable outcomes? Three possible strategies are available.

1. Splitting wards

Most wards are divided for the administration and conduct of elections into polling districts. (The Welsh term is 'electoral divisions', but we use 'ward' to describe the basic electoral units in all four countries.) If these were used where a solution employing wards as the building blocks was not feasible (as in Haringey and Leeds), then greater continuity of representation (less change to the pre-existing constituencies) and fewer constituencies crossing local authority boundaries would be feasible.

Each polling district has an identified polling place, which can incorporate one or more polling stations; the Electoral Commission's advice is that no polling station should have more than 2,500 electors allocated to it.¹⁷ These polling districts are created entirely for administrative purposes only, with numerical considerations foremost in deciding their boundaries, although the Electoral Commission's advice suggests that accessibility to polling places should be a major determinant in their creation.¹⁸ Although electoral equality is also a prime consideration in the definition of wards, other criteria are also involved: the Local Government Boundary Commission for England, for example, cites 'Reflecting the interests and identities of local communities' and 'Promoting effective and convenient local government' alongside 'Delivering electoral equality for local voters' as the 'main rules' which should be used to determine ward boundaries.¹⁹

To illustrate how wards might be split using polling districts, we examined the situation in London and the six English Metropolitan Counties, where the problem of large wards has the greatest impact; we supplemented the ward data used by the Boundary Commission for England with

¹⁷ See The Electoral Commission, *2010 UK Parliamentary General Election. Interim Report: Review of Problems at Polling Stations at Close of Poll on 6 May 2010*, p.11. http://www.electoralcommission.org.uk/data/assets/pdf_file/0010/99091/Interim-Report-Polling-Station-Queues-complete.pdf.

¹⁸ The Electoral Commission, *Reviews of Polling Districts, Polling Places and Polling Stations*, <http://www.electoralcommission.org.uk/i-am-a/electoral-administrator/polling-place-reviews>

¹⁹ Local Government Boundary Commission for England, *How To Propose a Pattern of Wards*, p.5 – http://www.lgbce.org.uk/data/assets/pdf_file/0014/10409/proposing-new-wards-guidance.pdf.

polling district data and maps from the relevant local authorities (either downloaded from their websites or in response to a request from us).²⁰ Their total electorate in 2010 was 13,557,934.

We created a set of 177 constituencies which involved splitting wards where it was necessary in order to minimise, as far as possible, either or both of disrupting existing constituencies and crossing local government (London Borough and Metropolitan Borough) boundaries.²¹ In total, 64 wards were split into two parts, 21 of them in Greater London, which is less than one ward per local authority involved. We then compared the distribution of electors across this set of constituencies with that in the Boundary Commission for England’s provisional recommendations, using the concept of a sub-optimally placed (SP) elector:– one who is separated from the majority of the other electors in:

- (a) *The existing constituencies.* If constituency *X* currently has 70,000 electors, 63,000 of whom are allocated to one of the new constituencies, the remaining 7,000 are classified as SP;
- (b) *The local authorities.* If local authority *Y* has 200,000 electors, 175,000 of whom are allocated to new constituencies entirely contained within that authority’s boundaries, the remaining 25,000 (placed in constituencies containing parts of other authorities) are classified as SP; and
- (c) *The wards.* If a ward has 8,000 electors and is split so that 6,000 are allocated to one new constituency and 2,000 to one or more others, the 2,000 are classified as SP.

Ward splitting:	Without		With	
	Electors	%	Electors	%
Existing seats	4,231,608	31	2,210,000	16
Local authorities	1,621,930	12	760,000	6
Split wards	0	-	190,000	1

Table 8 shows the number of electors, and their percentage of the total, in each of those categories for the ‘without splitting’ configuration of constituencies (the Boundary Commission for England’s provisional recommendations) and our ‘with splitting’ configuration.

In the Commission’s recommendations:

- almost one-third of the 13.6 million electors were classified as SP according to the first criterion;
- some 4.2 million electors were separated into constituencies other than those in which the majority of the electors they formerly shared a constituency with are placed.

In the ‘with splitting’ configuration, this is almost halved, to 16 per cent. Similarly, 12 per cent of electors were placed in constituencies partly comprising areas outwith their home local authority

²⁰ A fuller presentation of this part of the research can be found in D. J. Rossiter, R. J. Johnston and C. J. Pattie, ‘Representing people and representing places: community, continuity and the current redistribution of Parliamentary constituencies in the UK’, *Parliamentary Affairs*, 66 (2013), 865-886.

²¹ Many more possible configurations of 177 constituencies could have been created: we developed just one – minimising both change and crossing local authority boundaries as far as possible – to illustrate the potential of ward-splitting.

in the Commission's provisional recommendations, compared with only 6 per cent in the 'with splitting' configuration.

Splitting a small number of wards thus, in effect, halves the disruption to continuity and the crossing of local authority boundaries that the Commission considered desirable in order to produce an acceptable set of constituencies. (The two percentages cannot be summed, because an individual elector may be categorised as SP on both of the criteria.) The 'price' for ward-splitting is that 190,000 electors (just one per cent of the total in those areas) are split from the majority of the residents of their wards.

The advantages of splitting wards and using polling districts as smaller building blocks where desirable are clear from this analysis. However, there are three main arguments against that approach:

- The first is technical – polling districts have no legal status and so there is no mapping of their boundaries by the Ordnance Survey. This could readily be overcome, and local authorities required to provide the Boundary Commissions with polling district maps alongside the electoral data that they now provide for wards.
- The second is procedural. The larger the number of building blocks for an area, the (exponentially) larger the number of constituency configurations that could be created using them. In our exploration we created just one solution: we could have created many thousands of others. This much larger choice set would potentially increase the size of the Boundary Commissions' tasks very substantially, not only in developing their provisional recommendations for an area, but also in responding to the public consultation: if interested bodies – especially the political parties – are dissatisfied with a Commission's proposals for an area, the potential use of polling districts provides them with a much wider range of alternative options for counter-proposals (plus counter-proposals to their opponents' counter-proposals) for a Commission to evaluate. The exercise, already constrained by a tight timetable, could become very much larger and difficult to manage.
- The final argument concerns the value of wards as indicators of communities, areas whose residents have common interests – not least through their representation in local governments – that could be fractured if wards are split. Opinion on this is divided: to many, wards are artificial creations, especially in large urban areas, whereas to others they have an identity and utility that should be retained. The Boundary Commission for England pressed the latter case strongly, with statements that:

'...wards are generally indicative of areas which have a broad community of interest';

'...wards have an identity that is generally known to the local electorate who understand how they are organised and where they may vote in them';

'...local party organisations are usually based on wards or groups of wards ... wards usually have an established and well run machinery in place for organising elections'; and

'The Commission's experience from previous reviews also confirmed that any division of a ward between constituencies would be likely to break local ties, disrupt party political organisations, cause difficulties for Electoral Registration and Returning Officers and, possibly, cause confusion to the electorate'.²²

²² Although there is very little evidence that they considered this very seriously at previous reviews!

That argument for wards as the basic components of constituencies was supported by many MPs, party officials and others who made representations to the Commission in 2011 and 2012, but not universally. Some argued that some ward boundaries were no more ‘artificial’ than those of other administrative units (including polling districts) and that splitting wards was not problematic: others disagreed.²³

It is not necessary to use polling districts as the sub-ward building blocks. The Boundary Commission for Scotland did not do so in its creation of provisional and revised constituencies during the aborted 2011-2013 exercise; it said that, where it could not use wards, it ‘followed community council boundaries or other recognisable boundaries’ and then modified them so that they fitted in with the fine-grained data that they had on the distribution of electors (at postcode and other scales); under the *Local Government (Scotland) Act 1973*, the local authorities are divided into community council areas, separately from the electoral wards. The Commission was not constrained by artificial boundaries, and its practice was accepted with virtually no demur (as was also the case with its earlier creation of Scottish Parliament constituencies). Similarly, the splitting of several wards in the Boundary Commission for Wales’ provisional and revised recommendations in 2012 did not generate substantial concern. Nor did the splitting of a ward in Northern Ireland (in the Fifth as well as the Sixth Review).

2. Relaxing the Size Constraint

Our additional research for this report focuses on the consequences of relaxing the +/-5% tolerance. Our goal was to explore whether, by giving the Commissions greater degrees of freedom up to and including a +/-12% tolerance around the quota, it would be feasible for them to recommend constituencies that both involved less crossing of local authority boundaries than their recommendations in 2011-2012 and displayed greater continuity with the existing set.

We used the same data as the Commissions – the wards and their electorates (from the electoral rolls compiled in autumn 2010) – when they undertook their exercise starting in 2011. We are therefore not exploring the possible outcomes of the next review starting in 2016 – the electoral data are obviously not available and many of the ward maps will have been redrawn by then. What we are doing is a feasibility study, for which there is a baseline against which the results can be compared. If the results of our work are clear with regard to the situation using those data and maps, it is extremely unlikely that they will not also apply to the ward maps and electorates in 2016. If many feasible solutions are identified for the 2010 data it is virtually certain that they will for 2016 too.

We began by grouping local authorities into larger areas to provide the framework within which to allocate seats according to their theoretical entitlements. The UK was thus divided into a bespoke set of 75 areas; two in Northern Ireland, four in Wales, six in Scotland, and the remaining 63 in England: the four ‘protected constituencies’ were excluded. The 75 areas were defined following an examination of the history of redistributions. In non-metropolitan England the Shire Counties have provided a template for the allocation of MPs right back to the origins of Parliamentary representation. Most of those currently still in place have electorates of 400-800 thousand and, with the exception of Rutland, are treated separately here.

Within each of those Shire Counties, we included any of the (mainly urban) unitary authorities created in the 1990s (such as Swindon in Wiltshire, and Plymouth and Torquay in Devon), most of which had theoretical entitlements to fewer than three constituencies although in some cases, as

²³ See, for example, the discussion of this issue in R. J. Johnston, C. J. Pattie and D. J. Rossiter, ‘MPs’ responses to a new constituency map: electoral prospects, community ties and party organisation’, *The Journal of Legislative Studies*, doi 10.1080/13572334.2014.878166.

with Swindon, it was possible to isolate them from their surrounding county in the allocation of seats. Five of the six former Metropolitan Counties are larger than our norm of 400-800 thousand, but their 36 districts are mostly too small (as we show in Table 6), so we grouped them into 17 units comparable in size to the non-Metropolitan County average. The 32 London Boroughs were similarly too small, and were combined into eight groups. In Wales, at the last two reviews the Commissions were required to employ the eight ‘preserved counties’ in allocating seats but several of these were also too small, so four pairings were identified. For Scotland, the 29 unitary authorities created in 1994 (excluding the three covering the two ‘preserved constituencies’) were grouped into six areas largely consistent with groups of ‘historic counties’ and the regions used between 1974 and 1994; and Northern Ireland was split into two – Belfast plus Armagh and Down, and the remainder.

Working with each of these areas in turn, we then used specially written software (see Appendix II) to simulate the process undertaken by the Commissions, building constituencies from combinations of wards. Beginning with a tolerance of +/-5% we checked to see whether solutions which met the Rules were possible. If no solution was found we moved on to a +/-6% tolerance and repeated the process, potentially continuing right up to +/-12%. If just a few solutions were found at the relevant tolerance, we noted that fact and moved on to the next tolerance figure. If a large number (typically over 100 solutions from 100,000 runs) was found, we noted the one that involved the least overall movement of electors from the existing situation and moved on to the next area.

Where solutions are not possible for an area, a Commission will need to consider alternative groupings of local authorities in order to satisfy the statutory criteria. In the most recent review, for example, the English Commission’s revised recommendations for London grouped its 32 boroughs and 68 proposed constituencies into just two sub-regions. Similarly, where we were unable to identify feasible solutions for an area at a specified tolerance we also combined areas into larger sub-regions.²⁴ The results from these simulations allow us to investigate, for any degree of tolerance, both the degree to which the Commissions are able to produce constituencies which nest within the local government framework of the UK and the amount of change involved for the constituencies so created.

3. Maintaining 650 MPs

A third possible strategy would involve reversing the 2011 Act’s reduction in the number of MPs from 650 to 600. Change to any aspect of a set of rules is likely to be disruptive and whereas the new +/-5% rule was introduced with the aim of achieving a ‘fairer’ electoral system, the new House size was introduced for other, unrelated reasons. If experience of the former is more unsettling than expected, then might it not be possible to dispense with the latter and thereby maintain a greater degree of continuity?

The choice of House size raises very different questions than do either the choice of tolerance level or policy on ward-splitting, but in terms of its effect on complexity and continuity it can be treated as just another variable. Accordingly our analyses were run both for a 600-seat House of Commons and for a 650-seat House. If a return to present levels of representation would help in terms of continuity and/or complexity, this would allow us to demonstrate it.

So our final set of simulations is now specified. We take 75 areas, two policies on ward-splitting, two alternative House sizes and eight possible degrees of tolerance and try out all combinations. Where feasible solutions are not identified, we combine areas in the same way in which a

²⁴ We did this on an ad-hoc basis depending on the percentage tolerance. With a +/-5% tolerance and 600 seats our English sub-regions were similar, though not identical, to those used by the English Commission

Commission must do until we find a workable solution. We note both the degree of change and the concordance or otherwise with our area boundaries.

We are now in a position to consider the outcomes, first dealing with the results for a 600-seat House, then turning to their counterparts with 650 MPs.

7. The Solutions: 600 Constituencies

This chapter presents the results of our analyses of the feasibility of identifying sets of constituencies within each of the 75 areas – without and with ward-splitting – with a House of Commons containing 600 MPs, as in the 2011 legislation. The first section identifies whether feasible sets of constituencies can be identified for each of the 75 areas at each tolerance level; the second explores the degree of change from the current constituency map associated with the set of constituencies involving least change overall at each tolerance level.

At varying tolerances, without ward-splitting

Table 9, below, shows whether it is possible to find feasible solutions for each of the 75 areas, with tolerances from +/-5% to +/-12% and without ward-splitting. The Table is arranged by country and region; also shown is each area's theoretical entitlement and its integer equivalent using the Sainte Laguë formula. For each area/tolerance, there are four possible outcomes:

- Purple – there are no solutions because of the theoretical entitlement;
- Red – no solutions have been identified with that tolerance;
- Amber – only a small number of solutions has been identified with that tolerance; and
- Green – a large number of solutions has been identified with that tolerance.

The results for Table 9 are summarised in Table 10.

Table 9											Region/ Country	
The number of sets of constituencies that can be created in each of the 75 areas in a House of Commons with 600 members, at different tolerances, without ward-splitting												
TE – theoretical entitlement of constituencies												
SL – allocation of constituencies using the Sainte Laguë rule												
12	11	10	9	8	7	6	5	TE	SL	Area		
								3.16	3	Northumberland	NE	
								4.55	5	Newcastle, N Tyneside		
								6.26	6	Gateshead, S Tyneside, Sunderland		
								6.31	6	Durham		
								5.45	6	Cleveland		
								5.09	5	Cumbria	NW	
								14.51	14	Lancashire		
								5.69	6	Bolton, Wigan		
								3.92	4	Bury, Rochdale		
								7.13	7	Oldham, Stockport, Tameside		
								8.81	9	Manchester, Salford, Trafford		
								10.06	10	Liverpool, Knowsley, Sefton, St Helens		
								3.12	3	Wirral		
								10.20	10	Cheshire		
								7.94	8	North Yorkshire		
								6.20	6	Bradford, Calderdale		
								7.26	7	Kirklees, Wakefield		
								7.12	7	Leeds		
								7.34	8	Barnsley, Sheffield		
								5.37	5	Rotherham, Doncaster		
								8.99	9	Humberside		

										10.12	10	Derbyshire	EM
										10.30	10	Nottinghamshire	
										6.98	7	Lincolnshire	
										9.85	10	Leicestershire	
										6.61	7	Northamptonshire	
										4.57	5	Shropshire	WM
										10.97	11	Staffordshire	
										4.74	5	Walsall, Wolverhampton	
										6.03	6	Dudley, Sandwell	
										5.03	5	Coventry, Solihull	
										9.55	9	Birmingham	
										5.32	5	Warwickshire	
										7.49	8	Hereford & Worcester	
										7.34	7	Cambridgeshire	EA
										8.50	8	Norfolk	
										7.08	7	Suffolk	
										16.71	17	Essex	
										10.59	11	Hertfordshire	
										5.64	6	Bedfordshire	
										8.44	8	Barking & Dagenham, Havering, Redbridge, Waltham Forest	LN
										8.06	8	Hackney, Islington, Newham, Tower Hamlets	
										7.42	7	Barnet, Enfield, Haringey	
										8.44	8	Brent, Camden. Hammersmith & Fulham, Kensington & Chelsea, Cities of London & Westminster	
										9.50	9	Ealing, Harrow, Hillingdon, Hounslow	
										9.74	10	Kingston, Richmond, Sutton, Merton, Croydon	
										7.57	8	Wandsworth, Lambeth, Southwark	
										9.55	10	Bromley, Lewisham, Bexley, Greenwich	
										7.06	7	Buckinghamshire	SE
										6.20	6	Oxfordshire	
										7.94	8	Berkshire	
										17.13	17	Hampshire	
										10.79	11	Surrey	
										7.86	8	W Sussex	
										7.69	8	E Sussex	
										16.12	16	Kent	
										6.03	6	Gloucestershire	SW
										6.57	7	Wiltshire	
										10.42	10	Avon	
										7.51	8	Dorset	
										5.36	5	Somerset	
										11.39	11	Devon	
										5.47	6	Cornwall	
										6.73	7	Clwyd, Gwynedd	WA
										5.05	5	Dyfed, Powys	
										9.71	10	Mid Glamorgan, W Glamorgan	
										8.28	8	Gwent, S Glamorgan	
										8.38	8	Argyll & Bute, Highland, Moray, Aberdeenshire	SC
										8.99	9	Clackmannan, Fife, Stirling, Perth & Kinross, Angus	
										9.86	10	Dunbartonshire, Falkirk, Lanarkshire	
										10.26	10	Borders, Dumfries & Galloway, Edinburgh, E Lothian, Midlothian, W Lothian	
										7.19	7	Ayrshire, Renfrewshire	
										5.85	6	Glasgow	
										7.12	7	Antrim, Derry, Fermanagh, Tyrone	NI
										8.41	9	Armagh, Belfast, Down	

Table 10

A summary of the distribution of the 75 areas in Table 9
(600 MPs; no ward-splitting)

Tolerance (%)	Designation			
	Green	Amber	Red	Purple
5	31	3	16	25
6	38	5	17	15
7	45	13	10	7
8	62	2	6	5
9	65	4	4	2
10	71	1	3	0
11	72	0	3	0
12	73	1	1	0

The summary shows that, as the tolerance is successively relaxed from +/-5%, so the number of green outcomes increases rapidly. With a +/-5% tolerance, only 31 of the 75 areas is designated green; with a +/-8% tolerance that increases to 62 of the areas; and above +/-10% nearly every area is designated green. The obverse of that situation is illustrated by considering the areas designated either purple or red, where there are no viable solutions. Then, the numbers fall from 41 at +/-5% tolerance, through 11 at +/-8% tolerance to just 3 at +/-10%. The red designations indicate the areas where creating feasible constituencies is impossible not because of the theoretical entitlement (which is feasible, otherwise there would be a purple designation), but because of problems with the wards as building blocks (as illustrated above by the Haringey case).

One very clear pattern in Table 9 is the difference within England between the major urban centres and the Shire Counties – pointed up earlier in our discussion of ward sizes. Most of the latter have a green designation even with a tolerance as low as +/-5%. Where this is not the case, it is usually for one or both of two reasons: either the fractional part of the theoretical entitlement is close to one-half (e.g. Norfolk, Dorset and Somerset have theoretical entitlements of 8.5, 7.5 and 5.4 respectively), and/or the area in question is now a unitary authority with relatively large wards (e.g. Shropshire [plus Telford] and Wiltshire [plus Swindon]).

Within England, therefore, the main problems of producing sets of constituencies using wards as the building blocks within tight constraints around the quota are concentrated in the metropolitan counties plus London. Even there, however, a tolerance of +/-10% is sufficient to produce a green designation for each of the eight groups of London boroughs; and only two metropolitan groupings (Birmingham and Barnsley/Sheffield) have no viable solution.²⁵

Outside England, all but one of our twelve areas has a green designation with a tolerance of +/-8%. The exception is Glasgow, where tolerance has to be increased to +/-12% before the first solutions are identified.

In each of Northern Ireland, Scotland and Wales, of course, the groupings used here refer to local authorities most of which have been abolished and replaced by a matrix of much smaller authorities which the Boundary Commissions wish to avoid splitting between constituencies if possible. The small size of those authorities precludes widespread integration of the two maps, however, but as in most cases the new local authorities are nested within the boundaries of the former authorities,

²⁵ In the Boundary Commission's 2011 provisional and 2012 revised recommendations, Barnsley and Sheffield were combined with Rotherham; Doncaster was treated separately because its three existing constituencies all met the +/-5% tolerance.

using the now obsolete authorities here as the matrix for allocating constituencies is a reasonable starting point.

The results of this section of the analysis suggest very clearly, therefore, that:

With a House of Commons comprising 600 MPs, it is possible in most of the United Kingdom to identify a substantial number of possible constituency configurations without substantial crossing of major local authority boundaries with a tolerance of +/-8% around the UK quota. With a tolerance of +/-10%, such an outcome is feasible throughout almost all of the UK.

At varying tolerances, with ward-splitting

Table 11, below, replicates Table 9 except that ward-splitting is explored in all cases where a red or amber designation occurred there. (Ward-splitting has no role to play in areas with a purple designation, as in these cases it is the size of the local authority(ies) rather than the size of the wards which means that no solutions can be found.)

In four cases, even with ward-splitting, a viable set of constituencies could not be identified because the entitlement is very close to the feasible limit. In a further 21 cases, there is an amber designation, for the same reason – polling districts are not so small on average that deploying them rather than wards enables more than a very small number of sets of constituencies to be identified. In the vast majority of areas, however, the dominant colour is green if the theoretical entitlement is viable.

These results for Table 11 are shown in the summary in Table 12.

Table 11											
The number of sets of constituencies that can be created in each of the 75 areas in a House of Commons with 600 members, at different tolerances and with ward-splitting											
<i>TE</i> – theoretical entitlement of constituencies											
<i>SL</i> – allocation of constituencies using the Sainte Laguë rule											
12	11	10	9	8	7	6	5	<i>TE</i>	<i>SL</i>	<i>Area</i>	<i>Region/ Country</i>
								3.16	3	Northumberland	NE
								4.55	5	Newcastle, N Tyneside	
								6.26	6	Gateshead, S Tyneside, Sunderland	
								6.31	6	Durham	
								5.45	6	Cleveland	
								5.09	5	Cumbria	NW
								14.51	14	Lancashire	
								5.69	6	Bolton, Wigan	
								3.92	4	Bury, Rochdale	
								7.13	7	Oldham, Stockport, Tameside	
								8.81	9	Manchester, Salford, Trafford	
								10.06	10	Liverpool, Knowsley, Sefton, St Helens	
								3.12	3	Wirral	
								10.20	10	Cheshire	
								7.94	8	North Yorkshire	
								6.20	6	Bradford, Calderdale	
								7.26	7	Kirklees, Wakefield	
								7.12	7	Leeds	
								7.34	8	Barnsley, Sheffield	
								5.37	5	Rotherham, Doncaster	
								8.99	9	Humberside	

										10.12	10	Derbyshire	EM
										10.30	10	Nottinghamshire	
										6.98	7	Lincolnshire	
										9.85	10	Leicestershire	
										6.61	7	Northamptonshire	
										4.57	5	Shropshire	WM
										10.97	11	Staffordshire	
										4.74	5	Walsall, Wolverhampton	
										6.03	6	Dudley, Sandwell	
										5.03	5	Coventry, Solihull	
										9.55	9	Birmingham	
										5.32	5	Warwickshire	
										7.49	8	Hereford & Worcester	
										7.34	7	Cambridgeshire	EA
										8.50	8	Norfolk	
										7.08	7	Suffolk	
										16.71	17	Essex	
										10.59	11	Hertfordshire	
										5.64	6	Bedfordshire	
										8.44	8	Barking & Dagenham, Havering, Redbridge, Waltham Forest	LN
										8.06	8	Hackney, Islington, Newham, Tower Hamlets	
										7.42	7	Barnet, Enfield, Haringey	
										8.44	8	Brent, Camden. Hammersmith & Fulham, Kensington & Chelsea, Cities of London & Westminster	
										9.50	9	Ealing, Harrow, Hillingdon, Hounslow	
										9.74	10	Kingston, Richmond, Sutton, Merton, Croydon	
										7.57	8	Wandsworth, Lambeth, Southwark	
										9.55	10	Bromley, Lewisham, Bexley, Greenwich	
										7.06	7	Buckinghamshire	SE
										6.20	6	Oxfordshire	
										7.94	8	Berkshire	
										17.13	17	Hampshire	
										10.79	11	Surrey	
										7.86	8	W Sussex	
										7.69	8	E Sussex	
										16.12	16	Kent	
										6.03	6	Gloucestershire	SW
										6.57	7	Wiltshire	
										10.42	10	Avon	
										7.51	8	Dorset	
										5.36	5	Somerset	
										11.39	11	Devon	
										5.47	6	Cornwall	
										6.73	7	Clwyd, Gwynedd	WA
										5.05	5	Dyfed, Powys	
										9.71	10	Mid Glamorgan, W Glamorgan	
										8.28	8	Gwent, S Glamorgan	
										8.38	8	Argyll & Bute, Highland, Moray, Aberdeenshire	SC
										8.99	9	Clackmannan, Fife, Stirling, Perth & Kinross, Angus	
										9.86	10	Dunbartonshire, Falkirk, Lanarkshire	
										10.26	10	Borders, Dumfries & Galloway, Edinburgh, E Lothian, Midlothian, W Lothian	
										7.19	7	Ayrshire, Renfrewshire	
										5.85	6	Glasgow	
										7.12	7	Antrim, Derry, Fermanagh, Tyrone	NI
										8.41	9	Armagh, Belfast, Down	

Table 12

A summary of the distribution of the 75 areas in Table 11 (600 MPs; ward-splitting)

Tolerance (%)	Designation			
	Green	Amber	Red	Purple
5	44	4	2	25
6	51	1	8	15
7	61	7	0	7
8	70	0	0	5
9	70	2	1	2
10	75	0	0	0
11	75	0	0	0
12	75	0	0	0

Insofar as ward-splitting is an acceptable alternative to relaxing the permitted tolerance, however, a comparison of Tables 10 and 12 shows that the role of former is more circumscribed than the latter. So whereas it was not possible to produce viable solutions in 27 of our 75 areas under the current Rules, even with ward-splitting, relaxing the tolerance to +/-8% meant viable solutions were identified in all but 11 areas. This reflects our earlier observation that ward-splitting has no role to play in areas whose theoretical entitlements are the block to constituency building (as is the case in 25 areas with 600 MPs).

These findings lead to the second conclusion:

Where it is not possible to build sets of constituencies in an area at a given tolerance level using wards as the building blocks, a policy of ward-splitting can significantly reduce the number of electors moved between constituencies, though it is less effective than relaxing the tolerance when it comes to matching parliamentary and local government boundaries.

Continuity of constituencies

Turning to the issue of continuity, for each of the 75 areas at each tolerance level we focused on that set of viable constituencies out of all those identified which had the least change from the existing set overall. For that set, we calculated the Index of Change discussed above (p 13) for each individual constituency and classified its member constituencies according to the four-fold categorisation employed in Table 4.

Table 13 shows the percentage of all of constituencies identified in each of the four Index of Change categories, by the allowed tolerance. As the tolerance is relaxed from +/-5 to +/-12% there is an increase in the percentage of constituencies with either no change or experiencing only minor change. With any constraint of +/-6% or greater, at least twenty per cent of the identified constituencies are unchanged from those now in place; that percentage exceeds 30 with a +/-10% allowed variation. At the other extreme, as the tolerance is increased, the number of constituencies that represent a major change from their predecessors declines. That decline is quite rapid at first, but is only small once the tolerance reaches +/-9%; thereafter any further relaxation in the tolerance by one percentage point brings only a minimal decrease in the percentage of constituencies experiencing major change.

Table 13

The percentage of all identified feasible constituencies in a 600-member House of Commons according to their degree of change, by the allowed tolerance, without ward-splitting

Tolerance (%)	None	Minor	Moderate	Major	Total
5	18	11	17	54	100
6	21	12	18	49	100
7	25	12	18	45	100
8	28	12	19	41	100
9	30	12	19	39	100
10	32	12	18	38	100
11	33	12	18	37	100
12	34	12	18	36	100

Although a relaxation of the tolerance means that more of the existing constituencies need be unchanged and fewer experience major change, there is little variation in the percentages experiencing either minor or moderate change. If change is required, much of it will necessarily be major. Nevertheless, minor change is unlikely to be particularly uncomfortable for MPs and their party organisations, and with a tolerance of +/-10% some 44 per cent of all constituencies need be either unchanged or changed only slightly.

These figures therefore indicate that with a House of Commons comprising 600 MPs (and 596 constituencies to be created), a substantial number of the new constituencies are bound to be very different from those in the current 650-member House produced with different electoral quotas for the four countries. Even with a tolerance as wide as +/-10%, nearly 40 per cent of constituencies will fall in the ‘major change’ category. This is a substantial improvement on the 54 per cent in that category with a +/-5% tolerance – as is the increase in the percentage in the ‘no change’ category, from 18 per cent with a +/-5% tolerance to 32 per cent with a +/-10% tolerance – but major change remains a substantial element of any new constituency map.

This amount of change is not unexpected. Only 221 of the current 650 constituencies fall within a +/-5% tolerance around the quota of 76,641 used for the aborted Sixth Review; so, in any set of 596 recommended by the Boundary Commissions, 375 (63 per cent of the total) were bound to experience some change. As the Commissions and others made clear during that review, it was extremely unlikely that anything like 37 per cent of the existing constituencies would be unchanged in any set of recommendations. This is because, while any particular constituency might be within the +/-5% tolerance range, one or more of its neighbours may well not be; so many of those within the tolerance range may thus have to be changed in order to create a new set all of which are within range. The extent of that ‘knock-on effect’ was shown by the Commissions’ revised recommendations (Table 4), in which only 18 per cent of the existing constituencies were unchanged – a figure exactly mirrored by our simulations. With a wider tolerance, around a third of constituencies may be unchanged – but another third would experience major change.

Our conclusion, therefore, is that:

Substantial change to the constituency map is a necessary consequence of the imposition of a uniform electoral quota with a fixed tolerance around it. Relaxing that tolerance reduces the amount of necessary change somewhat, but continuity of representation (where there is either no or only minimal change) cannot be produced for much of the country: major change in many areas is inevitable.

The effect of ward-splitting

Would ward-splitting – elsewhere than in Scotland and Wales where it was used in 2011-2012 – significantly improve the continuity of representation between redistributions? Table 14 replicates Table 13, except that ward-splitting occurs to facilitate the creation of viable sets of constituencies where otherwise none could be created – as in the Haringey case discussed above.

Table 14

The percentage of all identified feasible constituencies in a 600-member House of Commons according to their degree of change, by the allowed tolerance, with ward-splitting

Tolerance (%)	None	Minor	Moderate	Major	Total
5	26	11	17	46	100
6	28	12	18	42	100
7	31	12	19	38	100
8	31	12	19	38	100
9	32	12	19	37	100
10	34	11	19	36	100
11	35	12	18	35	100
12	36	12	18	34	100

The major difference between those two tables is the increase in the percentage of constituencies where there is no change and a compensating reduction in the percentage with major change. But this only occurs with the smaller tolerances. If it is +/-5%, for example, there is an eight points increase in the 'None' column and a corresponding decline in the 'Major' column. As the tolerance limit is relaxed, however, the extent of the change diminishes. With a +/-8% tolerance, it is only three points, for example; with +/-10% it is two points; and with a +/-12% tolerance, it is down to one.

Ward-splitting would be particularly beneficial in enhancing continuity of representation if the tolerance level is tight. In such circumstances, as well as in Scotland, it would be used almost entirely in London and the metropolitan counties, and of value in only a small number of shire counties (at particular tolerance levels only and not generally, as would occur in the major urban areas).

Our conclusion is therefore that:

With ward-splitting, it is possible to have substantially more unchanged constituencies – and, as a corollary, substantially fewer undergoing major change – especially with the tighter tolerances. As the tolerance is relaxed, ward-splitting is needed in fewer areas, and the benefits are less.

8. The Solutions: 650 Constituencies

The analyses reported here replicate, for a 650-Member House of Commons, those presented above for a 600-Member House.

Although it is the case that, with no reduction in the number of MPs, the amount of change from the current situation should be less than with the decrease specified in the 2011 Act, there will nevertheless be substantial change in some areas. The main reason for this is the shift from a separate electoral quota for each of the four countries to a single quota for the entire UK. Using the 2010 electoral data, and excluding the four 'protected constituencies', this quota would be 70,709. With this quota, the allocation of seats, compared to the current situation, would be as in Table 15.

Because of their over-representation in the current Parliament, Wales and Scotland would both see a substantial reduction in their number of MPs – though not as large as with the reduction to 600 overall – while England would have an absolute as well as a relative increase.

The entire map of constituencies in each country – including each English region – would have to be redrawn, relative to the current configuration.

But would it be as disruptive as in the aborted 2011-2013 reviews? Would there be as much boundary-crossing and as little continuity? And to what extent could that be reduced by relaxing the size constraint?

	Current	Single Quota	
<u>MPs</u>	<u>646</u>	<u>596</u>	<u>646</u>
England	531	500	545
Northern Ireland	18	16	17
Scotland	57	50	51
<u>Wales</u>	<u>40</u>	<u>30</u>	<u>33</u>

To answer this question, we have undertaken the same experiments as for a 600-member House of Commons – looking at the situation both without and with ward-splitting.

Without ward-splitting

Table 16 (overleaf) shows the designation for each of the 75 areas, alongside their theoretical entitlements and integer equivalents. The results are summarised below it, in Table 17.

Comparison of the summarised results in Tables 10 and 17 shows little overall difference between the two at tolerances of +/-8% and greater, but there is a noticeably better fit in a 650-member House with lower tolerances. At a +/-5% tolerance, this is largely the result of the lower number of purple designations, something which owes little or nothing to the effect of a larger House size and most to geographic chance.

Table 16

The number of sets of constituencies that can be created in each of the 75 areas in a House of Commons with 650 members, at different tolerances

TE – theoretical entitlement of constituencies

SL – allocation of constituencies using the Sainte Laguë rule

12	11	10	9	8	7	6	5	<i>TE</i>	<i>SL</i>	<i>Area</i>	<i>Region/ Country</i>
								3.42	3	Northumberland	NE
								4.93	5	Newcastle, N Tyneside	
								6.78	7	Gateshead, S Tyneside, Sunderland	
								6.84	7	Durham	
								5.91	6	Cleveland	
								5.52	5	Cumbria	NW
								15.72	16	Lancashire	
								6.16	6	Bolton, Wigan	
								4.25	4	Bury, Rochdale	
								7.73	8	Oldham, Stockport, Tameside	
								9.55	10	Manchester, Salford, Trafford	
								10.91	11	Liverpool, Knowsley, Sefton, St Helens	
								3.39	3	Wirral	YH
								11.06	11	Cheshire	
								8.61	8	North Yorkshire	
								6.72	7	Bradford, Calderdale	
								7.87	8	Kirklees, Wakefield	
								7.71	7	Leeds	
								7.96	8	Barnsley, Sheffield	
								5.83	6	Rotherham, Doncaster	EM
								9.74	10	Humberside	
								10.97	11	Derbyshire	
								11.16	11	Nottinghamshire	
								7.57	8	Lincolnshire	
								10.68	11	Leicestershire	WM
								7.16	7	Northamptonshire	
								4.95	5	Shropshire	
								11.90	12	Staffordshire	
								5.14	5	Walsall, Wolverhampton	
								6.53	7	Dudley, Sandwell	
								5.45	5	Coventry, Solihull	
								10.35	10	Birmingham	
								5.77	6	Warwickshire	EA
								8.12	8	Hereford & Worcester	
								7.96	8	Cambridgeshire	
								9.21	9	Norfolk	
								7.67	8	Suffolk	
								18.11	18	Essex	
								11.48	12	Hertfordshire	
								6.11	6	Bedfordshire	

									9.15	9	Barking & Dagenham, Havering, Redbridge, Waltham Forest	LN
									8.73	9	Hackney, Islington, Newham, Tower Hamlets	
									8.04	8	Barnet, Enfield, Haringey	
									9.15	9	Brent, Camden, Hammersmith & Fulham, Kensington & Chelsea, Cities of London & Westminster	
									10.30	10	Ealing, Harrow, Hillingdon, Hounslow	
									10.56	11	Kingston, Richmond, Sutton, Merton, Croydon	
									8.21	8	Wandsworth, Lambeth, Southwark	
									10.35	10	Bromley, Lewisham, Bexley, Greenwich	
									7.65	8	Buckinghamshire	
									6.72	7	Oxfordshire	
									8.61	9	Berkshire	
									18.57	19	Hampshire	
									11.70	12	Surrey	
									8.52	8	W Sussex	
									8.33	8	E Sussex	
									17.47	17	Kent	
									6.54	7	Gloucestershire	
									7.12	7	Wiltshire	
									11.29	11	Avon	
									8.14	8	Dorset	
									5.81	6	Somerset	
									12.35	12	Devon	
									5.92	6	Cornwall	
									7.29	7	Clwyd, Gwynedd	
									5.48	5	Dyfed, Powys	
									10.52	11	Mid Glamorgan, W Glamorgan	
									8.97	9	Gwent, S Glamorgan	
									9.09	9	Argyll & Bute, Highland, Moray, Aberdeenshire	
									9.75	10	Clackmannan, Fife, Stirling, Perth & Kinross, Angus	
									10.68	11	Dunbartonshire, Falkirk, Lanarkshire	
									11.12	11	Borders, Dumfries & Galloway, Edinburgh, E Lothian, Midlothian, W Lothian	
									7.80	8	Ayrshire, Renfrewshire	
									6.34	6	Glasgow	
									7.72	8	Antrim, Derry, Fermanagh, Tyrone	
									9.12	9	Armagh, Belfast, Down	

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Table 17

A summary of the distribution of the 75 areas in Table 16 (650 MPs; no ward-splitting)

Tolerance (%)	Designation			
	Green	Amber	Red	Purple
5	34	7	21	13
6	41	11	12	11
7	54	7	7	7
8	62	3	4	6
9	65	2	2	6
10	67	1	3	4
11	69	0	4	2
12	70	0	3	2

In general, the most significant problems, even where the theoretical entitlement is viable – i.e. those areas with the largest number of red and amber designations – arise in the same parts of the UK: basically the urban north of England plus much of Scotland.

Once again, most of the Shire Counties are unproblematic – certainly so with tolerances greater than +/-6%.

But there is one big change – in London. With a 600-MP House, all but two of the groups of Boroughs needed a tolerance of at least +/-8% for a substantial number of constituency configurations to be identified; with a 650-MP House, for all but two of the eight groups a +/-7% tolerance is sufficient. This should not be interpreted as showing that, with a larger House of Commons, the problems in London will necessarily disappear; with 650 MPs, there just happen to be fewer problems fitting constituencies into the matrix of Borough and ward boundaries than there are with 600.

Our conclusion from this analysis is thus no different from that for the 600-member House: the only major change is in which parts of the UK the problems arise because of their theoretical entitlements and large wards:

With a House of Commons comprising 650 MPs it is possible in most of the United Kingdom to identify a substantial number of possible constituency configurations without substantial crossing of major local authority boundaries with a tolerance of +/-8% around the UK quota. With a tolerance of +/-10%, such an outcome is feasible throughout almost all of the UK.

With ward-splitting

Table 18 (overleaf) shows the outcomes if ward-splitting is undertaken for a 650-MP House. Again the results are summarised below it, in the next table, Table 19.

As with the previous analysis for 600 MPs, its main feature is the virtual absence of red designations (just two, compared with 56 without ward-splitting: Tables 10 and 12) and the much smaller number of amber designations – 15 with ward-splitting, 31 without. There is one noticeable difference, however, in the far larger number of green designations even with a tolerance of +/-5%. This is a corollary of the smaller number of purple designations with 650 seats previously discussed; if the theoretical entitlement is viable, then ward-splitting can play an important part in allowing the Commissions to devise suitable configurations. But, as already pointed out, the lower incidence of purple designations with 650 seats is primarily a matter of chance and will not necessarily be replicated in future reviews.

Table 18

The number of sets of constituencies that can be created in each of the 75 areas in a House of Commons with 650 members, at different tolerances and with ward-splitting

TE – theoretical entitlement of constituencies

SL – allocation of constituencies using the Sainte Laguë rule

12	11	10	9	8	7	6	5	<i>TE</i>	<i>SL</i>	<i>Area</i>	<i>Region/ Nation</i>
								3.42	3	Northumberland	NE
								4.93	5	Newcastle, N Tyneside	
								6.78	7	Gateshead, S Tyneside, Sunderland	
								6.84	7	Durham	
								5.91	6	Cleveland	
								5.52	5	Cumbria	NW
								15.72	16	Lancashire	
								6.16	6	Bolton, Wigan	
								4.25	4	Bury, Rochdale	
								7.73	8	Oldham, Stockport, Tameside	
								9.55	10	Manchester, Salford, Trafford	
								10.91	11	Liverpool, Knowsley, Sefton, St Helens	
								3.39	3	Wirral	
								11.06	11	Cheshire	
								8.61	8	North Yorkshire	YH
								6.72	7	Bradford, Calderdale	
								7.87	8	Kirklees, Wakefield	
								7.71	7	Leeds	
								7.96	8	Barnsley, Sheffield	
								5.83	6	Rotherham, Doncaster	
								9.74	10	Humberside	
								10.97	11	Derbyshire	EM
								11.16	11	Nottinghamshire	
								7.57	8	Lincolnshire	
								10.68	11	Leicestershire	
								7.16	7	Northamptonshire	
								4.95	5	Shropshire	WM
								11.90	12	Staffordshire	
								5.14	5	Walsall, Wolverhampton	
								6.53	7	Dudley, Sandwell	
								5.45	5	Coventry, Solihull	
								10.35	10	Birmingham	
								5.77	6	Warwickshire	
								8.12	8	Hereford & Worcester	
								7.96	8	Cambridgeshire	EA
								9.21	9	Norfolk	
								7.67	8	Suffolk	
								18.11	18	Essex	
								11.48	12	Hertfordshire	
								6.11	6	Bedfordshire	

								9.15	9	Barking & Dagenham, Havering, Redbridge, Waltham Forest	LN	
								8.73	9	Hackney, Islington, Newham, Tower Hamlets		
								8.04	8	Barnet, Enfield, Haringey		
								9.15	9	Brent, Camden. Hammersmith & Fulham, Kensington & Chelsea, Cities of London & Westminster		
								10.30	10	Ealing, Harrow, Hillingdon, Hounslow		
								10.56	11	Kingston, Richmond, Sutton, Merton, Croydon		
								8.21	8	Wandsworth, Lambeth, Southwark		
								10.35	10	Bromley, Lewisham, Bexley, Greenwich		
								7.65	8	Buckinghamshire	SE	
								6.72	7	Oxfordshire		
								8.61	9	Berkshire		
								18.57	19	Hampshire		
								11.70	12	Surrey		
								8.52	8	W Sussex		
								8.33	8	E Sussex		
								17.47	17	Kent		
								6.54	7	Gloucestershire	SW	
								7.12	7	Wiltshire		
								11.29	11	Avon		
								8.14	8	Dorset		
								5.81	6	Somerset		
								12.35	12	Devon		
								5.92	6	Cornwall		
								7.29	7	Clwyd, Gwynedd		WA
								5.48	5	Dyfed, Powys		
								10.52	11	Mid Glamorgan, W Glamorgan		
								8.97	9	Gwent, S Glamorgan		
								9.09	9	Argyll & Bute, Highland, Moray, Aberdeenshire	SC	
								9.75	10	Clackmannan, Fife, Stirling, Perth & Kinross, Angus		
								10.68	11	Dunbartonshire, Falkirk, Lanarkshire		
								11.12	11	Borders, Dumfries & Galloway, Edinburgh, E Lothian, Midlothian, W Lothian		
								7.80	8	Ayrshire, Renfrewshire		
								6.34	6	Glasgow		
								7.72	8	Antrim, Derry, Fermanagh, Tyrone		NI
								9.12	9	Armagh, Belfast, Down		

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Table 19

A summary of the distribution of the 75 areas in Table 18 (650 MPs; ward-splitting)

Tolerance (%)	Designation			
	Green	Amber	Red	Purple
5	54	8	0	13
6	62	1	1	11
7	64	3	1	7
8	68	1	0	6
9	69	0	0	6
10	69	2	0	4
11	73	0	0	2
12	73	0	0	2

Our conclusion from this analysis is therefore similar (rather than identical) to that with a 600-member House:

With ward-splitting, it is possible to have substantially more unchanged constituencies – and, as a corollary, substantially fewer undergoing major change – especially with the tighter tolerances. The advantages are particularly pronounced at lower tolerances with 650 seats but, as the tolerance is relaxed, ward-splitting is needed in fewer areas and the benefits are less.

Continuity of constituencies

The data in Table 20, showing the percentage of viable constituencies according to their degree of change at different tolerances, is virtually identical to that in Table 13 for a 600-member House: none of the figures in the individual cells differs by more than two percentage points between the two tables. As in the previous analysis, therefore, as the tolerance is relaxed so the percentage of constituencies that need be unchanged increases and that experiencing major change falls, but major change remains the modal type.

Tolerance (%)	None	Minor	Moderate	Major	Total
5	17	12	18	53	100
6	20	12	18	50	100
7	23	12	18	47	100
8	26	11	18	45	100
9	29	11	17	43	100
10	31	11	17	41	100
11	33	11	17	39	100
12	34	12	17	37	100

The lack of difference between the two tables may at first seem surprising: the current House of Commons has 650 MPs so why should the map of constituencies for a new 650-member House have to differ so much from its predecessor? A major reason for this is given by Table 15: because of the change from a separate quota for each of the four countries to a single UK quota, there is a significant redistribution of constituencies: Northern Ireland, Scotland and Wales would together lose 14 seats and England gain that number. Removing seven seats from Wales would almost certainly involve redrawing virtually the whole of the country’s constituency map, even if some of the existing constituencies were within the tolerance range, for example. And adding between one and four seats to an English region would have the same impact there.

An additional reason for the amount of change shown in Table 20 is that the number of constituencies currently within the +/-5% tolerance range is little larger with a 650-member House than it is for one with 600 MPs (254 as against 221). Most constituencies would have to be changed, and many that prima facie may appear not to require changing would have to be altered because of the situation in neighbouring constituencies.

Whatever the size of the House of Commons, the imposition of a uniform, UK-wide electoral quota will require extensive change to the constituency map, and that change will only partly be ameliorated by relaxing the tolerance.

Our conclusion for a 650-member House, therefore, is the same as for one with 600 members:

Whatever the tolerance, major change to the map of constituencies will be necessary in many parts of the United Kingdom – for a 650-member House of Commons, just as for a 600-member House.

To look at ward-splitting again:- as with a 600-member House, if ward-splitting is undertaken, then there will be a substantial increase in the percentage of constituencies in the ‘None’ column – compare Tables 20 and 21 – and consequential reductions in the percentage of constituencies in the ‘Major’ change column, especially in those situations with low tolerances. Indeed, the differences are slightly larger for a 650-member House than for one with 600 members – shown in Tables 13 and 14. This is because – as shown by a comparison of Tables 11 and 18 – more of the 75 local government areas have green designations for a 650-member than a 600-member House.

As with the latter, therefore, our conclusion is that:

With ward-splitting, it is possible to have substantially more unchanged constituencies – and, as a corollary, substantially fewer undergoing major change – especially with the tighter tolerances. As the tolerance is relaxed, ward-splitting is needed in fewer areas and the benefits are less.

Table 21

The percentage of all identified feasible constituencies in a 650-member House of Commons according to their degree of change, by the allowed tolerance, with ward-splitting.

Tolerance (%)	None	Minor	Moderate	Major	Total
5	27	12	18	43	100
6	30	12	18	40	100
7	31	12	18	39	100
8	32	11	18	39	100
9	33	11	17	39	100
10	34	11	17	38	100
11	35	11	17	37	100
12	36	11	17	36	100

This conclusion does not apply only to a House of Commons with 650 MPs. It applies just as well to one with 610, or 630, or 657. We undertook a number of simulations with differing House sizes between 600 and 650, and found no general relationship between the number of MPs and the number of ‘purple allocations’ – i.e. areas among the 75 for which the theoretical entitlement cannot be rounded up or down to produce a feasible allocation of constituencies. With a +/-5% tolerance and no ward-splitting, for example:

- with 600 MPs, there are 25 purple allocations;
- with 610 MPs, there are 19;
- with 620 MPs there are 23;
- with 630, there are 21;
- with 640, there are 16; and

- with 650, there are 13.

With greater tolerance, the number of ‘impossible’ situations drops off dramatically, as can be seen in Table 22:

Tolerance (%)	Number of MPs					
	600	610	620	630	640	650
+/-5%	25	19	23	21	16	13
+/-8%	5	8	7	6	5	0
+/-10%	0	0	0	1	2	4

However, whatever the number of MPs, *some* of the 75 areas are likely to have purple allocations – more so with the tighter than the more relaxed tolerances.

The 650-Member House in Summary

These findings therefore do not indicate that reverting to a House of Commons with 650 rather than 600 MPs would significantly remove the problems of boundary-crossing and continuity identified with the first implementation of the 2011 Rules for Redistribution by the Boundary Commissions requiring a uniform electoral quota for the entire UK.

With a limited tolerance – especially if that is substantially below +/-10% – there will undoubtedly be a number of areas whose theoretical entitlement is outwith the allowed range. In England, most of these are likely to be in the Metropolitan Counties and in London, where entitlements are small, boundary-crossing more likely to be necessary, and large wards exacerbate the difficulties. Elsewhere, whether or not problems present themselves will depend on the particular quota (itself reflecting the size of the House); with 600 MPs, Cumbria and North Yorkshire are unproblematic; with 650, neither has a viable solution even with a +/-8% tolerance. Similarly, whether there are to be 600 or 650 MPs does not significantly alter the amount of change to the constituency map; the new Rules in effect require it, and relaxing the tolerance will only ameliorate it somewhat.

9. Quinquennial Reviews: 2016 and Thereafter

When the Sixth Periodic Review of constituencies, the first conducted under the new Rules for Redistribution, enacted in 2011, was aborted in January 2013, the Boundary Commissions were close to completing their task. Revised proposals had been published for the whole of the UK, written representations about them had been received, and for many parts of the country final decisions about the constituencies to be recommended to Parliament had been made (but remain unpublished). It might be thought that these decisions and near-decisions could form the basis for the next (the Seventh) review, to begin in 2016 according to the *Electoral Registration and Administration Act, 2013*.

This will not be the case in much of the UK, however, and that next review will have to start afresh – resulting in a configuration of constituencies that may be very different not only from the 650 contested at the 2015 general election but also the 600 (save the four ‘protected constituencies’) that formed the Commissions’ revised recommendations in 2012.

These changes will come about because each subsequent review will have to take into account alterations to electorates over the previous five years, at a variety of geographical scales. These changes are best considered in three parts.

National and regional level change may require changes to national and/or regional entitlements

It is less than three years since the Commissions published their recommendations (based on 2010 data), yet already – assuming the retention of 600 MPs in the House of Commons – the increase in Scotland’s electorate merits an additional seat at the expense of England (specifically, the South West region). If we examine all the five-year periods beginning in 2001 for which we have comparable data (seven in all – i.e. 2001-5, 2002-6 through to 2007-2011) we find that none avoided the need to change national entitlements (regardless of House size) and none avoided the need to change at least two and sometimes more of the English regional entitlements. (Changes to English regional entitlements do not have the same statutory status as national entitlements, but it might be considered perverse for the English Commission to grant a region fewer seats than entitled under the Saint Laguë rule used to allocate seats across the four countries – a procedure on which it consulted before deploying it in 2011.)

The effect of such entitlement changes is unlikely to be trivial. If we take the example of Scotland and South West England, the addition and removal respectively of one seat in a 600-member House would produce a ripple effect across many other constituencies. We have undertaken simulations to see how many seats might be affected by this ‘entitlement swap’ alone: in Scotland the effects could be confined to fifteen of the Scottish Commission’s 50 recommended seats; but in the South West most of the English Commission’s proposed seats in Cornwall, Devon and Somerset would require alteration (perhaps as many as 27 of the 53 in the Commissions’ revised recommendations for the region in 2012).

Such changes in these two areas alone would impact on some 7 per cent of the UK’s constituencies, with around half of them experiencing major change. Given that the average number of ‘entitlement swaps’ per five-year interval is three (rising to between three and four for a 650-seat House), this suggests that upwards of 20 per cent of constituencies would be affected at each quinquennial review as a consequence of this aspect of the new legislation. A higher tolerance would lessen the impact – with a tolerance of +/-10% around the electoral quota, for example, these figures would reduce to 12 and 15 respectively for a 600- and 650-member House – but the general conclusion is that:

Evidence from recent five-year periods suggests that the allocation of constituencies both across England, Northern Ireland, Scotland and Wales and between English regions is likely to change between each quinquennial review, requiring alterations potentially impacting around one-in-five of all constituencies.

Changes in electorate associated with demographic change but insufficient to influence national and/or regional entitlements.

These changes to constituency electorates within each of the four countries, resulting from a combination of migration and differing balances between the number of 18-year-olds enrolled and those dying, will generally be less disruptive than those previously considered. The evidence from the most recent five-year intervals available is that the distribution of change is broadly bell-shaped (or statistically normal), with the average constituency electorate increasing by 3 per cent every five years. After allowing for differential rates of increase at national and regional level (which will be reflected in entitlements), we find 95 per cent of constituencies falling within +/-7% of the relevant national (outside England) or regional (within England) average electorates. Assuming this pattern of change is typical – and we have no grounds for thinking it is not – this would take approximately 30 per cent of constituencies outside the +/-5% tolerance range of the new quota by the time of the next review.

This, however, would not be the end of the matter. First, it is likely that some sub-regions used in the previous review would no longer be ‘fit for purpose’. Oxfordshire, for example, was allocated six seats in the Sixth Review, each with an electorate in excess of the UK quota; with projected increases in electorate and with re-warding resulting in larger ward sizes in several Oxfordshire authorities, it may well be that Oxfordshire will need to be combined with another county by the time of the next review. It would be wrong to over-state the probable impact of this factor, however; all but a handful of sub-regions used at a previous review are likely to be suitable next time round.

Second, and of far greater significance, are the ‘knock-on’ effects which come with each review. In addition to the 25 per cent of seats which will no longer be ‘legal’, some that are still within the acceptable range will also need to change: both the Fifth and the Sixth Reviews saw 48 per cent of existing seats which were within +/-5% of the quota (UK in the case of the Sixth; national in the case of the Fifth) changed as a consequence of alterations elsewhere. A quinquennial review ought to be less disruptive because of the shorter time interval, but our modelling suggests that the much reduced tolerance will nevertheless mean that at least one-third of otherwise numerically acceptable seats will still need alteration because of the changed situation in one or more neighbouring seats, bringing the grand total requiring alteration in response to demography to 50 per cent. Thus:–

Demographic changes between quinquennial reviews could require alterations to as many as one-half of all existing constituencies.

Changes which result from the need to realign constituency boundaries with any local government boundaries that have been changed over the five-year interval.

The 2011 Act requires the Commissions to take into account local government boundaries in place at the start of their reviews, including ward boundaries. All local government boundaries in the UK, including ward boundaries, are subject to periodic review – regularly in the case of Wales (every 10 years) and Scotland (8-12 years); and as required in England (as determined by the Local Government Boundary Commission for England (LGBCE), in consultation with the local authorities) and Northern Ireland (where a fundamental reorganisation of local government is imminent).

If we use the evidence of the last forty years in England (LGBCE Database of Local Government Orders), the average review interval between local government re-wardings is some 15-20 years. The more informal approach in England in particular (together with the unpredictability of more fundamental change associated with the formation of unitary authorities) means that there is no such thing as a typical amount of change. It seems safe to assume, however, that an average quinquennial review will have to deal with alterations to the ward boundaries of somewhere between 100 and 150 local authorities (out of the approximately 400 – including county districts – currently in existence across the UK).

If we use the most recent Review as evidence, boundary changes affected a total of 89 local authorities over the preceding five years (with England notably quiet then).²⁶ These changes did not, of course, require alterations to all constituencies within those authorities. Our analyses suggest that 107 seats were affected and although around a third of them had electorates that changed by fewer than a thousand, a similar proportion (mainly in Scotland, which had undergone a comprehensive re-warding) experienced a change in excess of 5,000.

In itself, there is nothing new about this source of change; what is new is the need for the Commissions to address it differently. No longer can most seats' boundaries be routinely re-drawn just to re-align them with the local government template as the Commissions have previously done. In far more cases than before it will be necessary to undertake a fundamental re-drawing of boundaries, perhaps extending to a number of neighbouring seats. The degree of disruption will, as before, also depend upon the permitted tolerance: the lower the tolerance, the greater the disruption, thus:

Re-warding of local authorities between quinquennial reviews could require redrawing the boundaries of around one-fifth of all constituencies.

Having listed the causes of change to constituency boundaries which will be required at each quinquennial review, it remains to quantify them and to see how the degree of change varies in response to House size, tolerance and building block.

The three sets of changes listed above will not affect constituencies in an additive fashion. If 20 per cent of seats need to change because of entitlements, perhaps 50 per cent because of demographic changes, and 20 per cent because of local government (mainly ward) boundary changes then the probability of a constituency escaping change – p(same) – is:

$$p(\text{same}) = (1-0.2) * (1-0.5) * (1-0.2) = 0.32$$

In other words, change will be widespread at quinquennial reviews under the 2011 Rules, with two seats altering for every one that escapes. The nature of that change will probably be far less severe in subsequent reviews (one is scheduled to commence in 2021 under the current legislation) than that expected from the next Review beginning in 2016 (which, as we have seen, will have to deal not only with the new legislation but also attend to 15+ years of demographic and local government changes), but change will still be the norm. The degree of disruption to any constituency can, as before, be characterised as minor, moderate or major. In addition to the 32 per cent which are likely to be unchanged, a further 22 per cent seem likely to experience minor and 13 per cent moderate alterations. This means that:

²⁶This was in the period prior to the aborted Sixth Review. The Commission has since reported completed re-wardings of a substantial number of local authorities: those new wards will be used in the review beginning in 2016, as might many of those in a similar number of re-wardings currently in progress, as shown on their website – <http://www.lgbce.org.uk/current-reviews>.

Around one-third of all constituencies is likely to experience major change at each quinquennial review and about one-third only may be unchanged.

The discussion so far has assumed that future quinquennial reviews will take place under the existing legislation and that the Commissions will employ the same policies as they did at the Sixth Review. What would be the impact if either of these assumptions were to change?

First, we consider the impact of the English Commission adopting a more flexible attitude towards the splitting of wards. Such a change of policy would have little effect upon either the disruption caused by entitlement swaps (which are inevitably characterised by major change) or local government boundary changes (which the Commission would still be likely to recognise wherever possible). There is no doubt, however, that it could play an important role in reducing the disruption caused by demographic change, especially in urban areas.

Our best estimate is that ward-splitting would allow the percentage of unchanged seats to rise from 32 to 36 per cent and would reduce the incidence of major change from 33 to just under 20 per cent, with a compensating increase in the proportion of seats experiencing minor change. The additional flexibility offered by ward-splitting does have drawbacks, however. Over a series of quinquennial reviews the proportion of seats containing divided wards would tend to rise unless the Commissions adopted a policy of ‘unsplitting’ when that became possible, thereby introducing another source of change.

Second, we consider the impact of increasing the tolerance from the current value of $\pm 5\%$. Unlike ward-splitting, this change would impact upon all sources of disruption.

- Each entitlement swap is likely to affect around 40 seats under the current legislation. This figure would fall to 25 with a tolerance of $\pm 8\%$ and 20 with a tolerance of $\pm 10\%$. Given that at least three such swaps can be expected in each five-year period, this is a significant difference.
- While most local government boundary changes are minor, those involving re-warding can be disruptive, more so the less the latitude afforded to the Commissions. A change of tolerance is unlikely to affect more than a handful of seats at any review, however, though locally it could make the difference in local authorities with large ward electorates.
- Demographic change provides the major impetus for quinquennial reviews and this is where the major impact of greater tolerance would be felt. Whereas one-quarter of seats would fall outside a $\pm 5\%$ tolerance range by the time of the next review, we estimate that one in three of these seats would be acceptable if the tolerance were set at $\pm 8\%$; and after allowing for the reduction in knock-on effects discussed earlier, the percentage of seats requiring change would fall from one-half to one-third.

As before, we need to bring the various sources of change together if we are to provide a clear picture of the impact of any policy or legislative change. The following tables are only minimally affected by any decision on the number of MPs; if a reduction does take place, then the initial review under the new rules will witness the impact, not the subsequent five-yearly exercises.

First, Table 23 shows the probable distribution of constituencies across our four change types – as percentages of the total number – if all the Commissions used ward splitting (WS) with polling districts as the building blocks for constituencies where desirable to minimise disruption:

Table 23

The estimated percentage of constituencies experiencing different degrees of change at subsequent quinquennial reviews, by policy on ward-splitting – with a +/-5% tolerance

Policy	Amount of Change				Total
	Major	Moderate	Minor	None	
No ward-splitting	33	13	22	32	100
With ward-splitting	19	11	34	36	100

Next we show the likely impact of different degrees of tolerance but without any change of policy on ward-splitting (Table 24):

Table 24

The estimated percentage of constituencies experiencing different degrees of change at subsequent quinquennial reviews, by the allowed tolerance (current policy on ward-splitting)

Tolerance	Amount of Change				Total
	Major	Moderate	Minor	None	
5	33	13	22	32	100
6	28	12	21	39	100
7	25	11	21	43	100
8	22	10	21	47	100
9	20	9	21	50	100
10	18	8	22	52	100
11	17	7	22	54	100
12	16	7	22	55	100

These tables show that either approach could produce a significant reduction in disruption. Ward-splitting alone could reduce the percentage of seats experiencing major change to 19, a result which would only be matched by doubling the existing tolerance level. The major advantage of the latter approach is the reduction in change across the board; whereas ward-splitting largely works by substituting minor change for major change, increasing tolerance levels works by reducing the number of seats requiring any change at all.

The analysis so far has concentrated on the two approaches as alternatives, though there is, of course, no reason why both could not be employed. So finally we show the likely impact of different degrees of tolerance combined with a change of policy on ward-splitting (Table 25).

Table 25

The estimated percentage of constituencies experiencing different degrees of change at subsequent quinquennial reviews, by the allowed tolerance (changed policy on ward-splitting)

Tolerance	Amount of Change				Total
	Major	Moderate	Minor	None	
5	19	11	34	36	100
6	16	10	32	42	100
7	15	9	30	46	100
8	14	8	28	50	100
9	13	7	28	52	100
10	10	7	27	54	100
11	11	6	27	56	100
12	11	6	26	57	100

It is important to stress that of all our estimates, these are based on the interaction of the largest number of factors and hence have the highest degree of uncertainty. Nevertheless they provide an indication of the scale of the impact which would result from a change in legislation and/or policy, with a general conclusion that:

Ward-splitting and a relaxation of the tolerance constraint could reduce the proportion of constituencies experiencing major change at any quinquennial review to below one-fifth and increase the proportion of those experiencing no change to as much as one-half.

10. Conclusions

This report has outlined the reasons why implementation of the Rules for Redistribution for UK Parliamentary constituencies enacted in 2011, with their emphasis on electoral equality across the UK, resulted in recommended constituencies many more of which were both very different from their predecessors and/or crossed local government boundaries than had been the case at previous reviews.

Our research based on that appreciation has explored whether that disruption – considered excessive by many MPs and party organisations as well as some commentators – could be reduced if either the equality constraint was relaxed somewhat or/and the Boundary Commissions (especially the Boundary Commission for England) were prepared to split wards when recommending constituencies. The results have shown that:

- **If the equality constraint was relaxed somewhat – from +/-5% to +/-8% – then there would be much less disruption and that if it was relaxed even further – to +/-10% – major problems would arise in a very small number of places only;**
- **If ward-splitting was adopted to avoid crossing local government boundaries and to minimise change to the existing constituencies, with a tolerance of +/-8% problems would arise in only a small number of places – mainly where the theoretical entitlement precluded the identification of a feasible set of constituencies.**

Our analyses focused not only on a House of Commons with 600 MPs, as specified in the 2011 Act, but also one with the current complement of 650 MPs. It found that:

- **The reallocation of constituencies across the UK because of the introduction of a single electoral quota would see a comparable amount of disruption to that with a 600-member House.**

Finally, we explored the likely impact of the new Rules at redistributions subsequent to their first implementation, and found that:

- **Because of population changes and changes to local government boundaries (especially wards) around one-third of constituencies are likely to undergo major change unless there is one or both of relaxation of the tolerance constraint and ward-splitting.**

Appendix I: Constituency Definition in the UK since 1944: a Brief History²⁷

The United Kingdom had no fixed procedures (including timetable) for the redistribution of seats until passage of the *House of Commons (Redistribution of Seats) Act, 1944*. The Rules enacted then were amended subsequently; those put in place in the *House of Commons (Redistribution of Seats) Act, 1958*, remained largely unchanged for the next half-century (although they were rewritten, to reflect changes in the local government system, in the *Parliamentary Constituencies Act, 1986*).

The Boundary Commissions have always had to balance the conflicting demands of place/community and number – the organic and arithmetic criteria. The 1944 legislation required that all constituencies have an electorate varying from the national quota by no more than ‘approximately one quarter’, but this very broad constraint was too demanding given the plethora of counties, county boroughs, London boroughs, municipal boroughs, urban districts and county districts whose boundaries were to be inviolate ‘so far as is practicable’, so the guidance on electoral equality was replaced by the phrase ‘as near the electoral quota as is practicable having regard to the foregoing Rules [on local authority boundaries]’: thereafter, organic criteria dominated the redistribution process. Furthermore, Parliament’s clear intention with the 1958 amendments was to have long-term continuity of representation of places rather than frequent reviews creating major changes in order to meet an arbitrary arithmetic requirement. Parties and their MPs preferred minimal change, even if this meant greater inequality of constituency electorates, in order that their local organisations would not have to be uprooted every few years and MPs could continue to serve the same constituents over long periods, developing close ties with them and their local governments. To reflect that, the time period between reviews was extended from every seven years to every 10-15 years.

Over the subsequent five decades, the balance between the organic and arithmetic criteria was changed because of alterations to the local government map. The 32 London boroughs created in 1963 were included in the list of authorities whose boundaries should only be crossed if necessary, but the county borough and county districts lost their protection in 1970s amendments to the legislation. The boundaries of the new metropolitan boroughs/cities were not protected and in the Third Review 12 of those 36 authorities were paired for the allocation of seats: place was being downgraded and number becoming more important. The Fourth Review continued that trend with the pairing of London boroughs – only 18 of the 32 were not affected – as did the Fifth Review. New unitary authorities were created in the 1990s and 2000s; these (with the exception of the five created out of Berkshire) had county status but many of their boundaries were crossed in order to create constituencies with electorates as ‘equal as is practicable’ (as were Bournemouth and Poole with Dorset in the Commission’s 2007 recommendations). County boundaries remained inviolate, however.

Scotland and Wales both had complete reorganisations of local government in 1994, creating systems of 32 and 22 single-tier unitary councils respectively: the Welsh legislation recognised that most of the 22 authorities were too small for the allocation of constituencies, and recommended that its Boundary Commission continue to use the predecessor eight counties (termed the ‘preserved counties’) for that purpose; no similar practice was recommended for Scotland (which had nine regions prior to that change). Finally, Northern Ireland is now divided into 26 Local Government Districts, only three of which have populations exceeding 100,000 and nine have fewer than 50,000; the traditional six counties have no administrative status.

²⁷ For a detailed survey of the Boundary Commissions, see: D. J. Rossiter, R. J. Johnston and C. J. Pattie, *The Boundary Commissions: Redrawing the UK’s Map of Parliamentary Constituencies* (Manchester: University of Manchester Press, 1999).

The 2011 legislation changed the balance between place and number even more, by making equality of electorates the paramount criterion. Even county boundaries could now be crossed, as illustrated by the much contested case of Cornwall which – because of its entitlement to 5.5 constituencies – was necessarily combined with Devon in the Boundary Commission for England’s provisional and revised recommendations in 2011-2012.

The pre-2011 Rules implicitly mandated a separate electoral quota (the average constituency electorate at the review’s commencement) for each of the four parts of the United Kingdom, as a consequence of the 1944 Act’s allocation of seats, which was (after an amendment affecting Northern Ireland alone in 1977):

- For Great Britain, ‘not substantially greater or less than 613’;
- For Scotland, ‘not less than 71’;
- For Wales, ‘not less than 35’; and
- For Northern Ireland, ‘not greater than 18 or less than 16’.

The *Scotland Act, 1998*, required the next review of constituencies there to be conducted using the same quota as that then in place for England (leading to the reduction in the number of Scottish MPs at the 2005 general election from 72 to 59). Nevertheless, because the Scottish Commission continued to apply the ‘special geographical considerations’ rule to create much smaller-than-average constituencies in the country’s sparsely populated areas, the average Scottish constituency electorate was still some 5-6,000 smaller than the English.

The Commissions applied these Rules by ensuring, wherever possible, that constituencies did not include parts of more than one local authority. Having established its electoral quota, each Commission’s first task was to compute each authority’s ‘theoretical entitlement’ of constituencies, a figure then rounded either up or down to the nearest integer to determine how many MPs the area should have representing it. The main exceptions to this practice were with relatively small adjacent authorities, notably London and Metropolitan Boroughs/Cities, some of which were combined. Because of this rounding-up and -down, some neighbouring constituencies differed very considerably in their electorates: in its 2007 recommendations, for example, the Boundary Commission for England recommended four constituencies in the combined Boroughs of Brent and Camden with 71,073, 71,398, 74,573 and 78,307 electors; in neighbouring Westminster (plus the City of London) two constituencies with electorates of 61,621 and 59,016 were recommended; and the two recommended for Islington had electorates of 61,054 and 58,839. (The electoral quota for that review in England was 69,935.)

The wording of the Rules and their implementation by the Commissions resulted in considerable variation in constituency electorates, despite increased attempts to meet the equal electorates rule as well. The Boundary Commission for England’s 2007 report on its Fifth Periodic Review indicated that all but 59 of its recommended constituencies had electorates within 10 percentage points of the quota (based on 2000 electorate data); the Welsh Commission’s recommendations had 26 of its 40 constituencies within 10 percentage points of its quota, as was also the case with 15 of the Northern Ireland Commission’s recommended 18: the Scottish Commission’s earlier exercise – reported in 2004 – had 50 of its 59 within that range.

The Commissions also tried, where possible, to avoid changing constituencies, even if this meant significant electoral inequalities: for example, in the English Commission’s Fourth Review it provisionally recommended substantial changes to the constituencies for Derbyshire and Nottinghamshire, although each county’s entitlement was unchanged. This was challenged during the Local Inquiries because the parties preferred to retain the status quo even though that meant greater inequality than the Commission had recommended. The Commission accepted these cases and in its final recommendations the constituency maps for the two counties were unchanged from those implemented in the Third Review.

Appendix II: The Software used in the Research

The use of software to help in the process of constituency (district in US) building has a history stretching back over fifty years in the United States and over thirty years in the UK. Two of the authors of this report were responsible for the first attempt in the UK. Building on the work of Taylor and Gudgin and of Openshaw, we wrote program *GROUP*, a FORTRAN program which attempted to identify all possible combinations of wards into constituencies within given constraints.²⁸ We then applied the program to several English cities and London boroughs using data from the English Commission's Third Review, demonstrating not only the extremely large number of possible solutions but also the Commission's preference for the more 'shapely' amongst them. Its practical utility became evident following the report of the Assistant Commissioner who conducted the Public Inquiry into the Commission's provisional recommendations for Sheffield, who recommended a solution (accepted by the Commission) which was 'essentially a modified version of the Johnston/Rossiter scheme'.

In producing this report, we have re-written *GROUP* to run in SAS (a statistical software package) and modified several parts of the algorithm to make it more flexible and applicable to the larger combinatorial problems which need to be tackled in rural areas with larger numbers of wards. Despite this, the fundamentals of the program remain the same. It works by taking the ward map for the area and selecting one of its wards at random to act as the core for the first constituency. Adjacent wards are then added to it until their combined electorates are sufficiently large to form a constituency and adding any further wards would take its electorate above the maximum specified. Having created the first constituency, the program selects another ward (outside the first constituency) and builds the next constituency, and so on until all of the constituencies have been created. The composition of each constituency is recorded, to ensure that the full set is not replicated in later runs: all of the sets of constituencies identified are unique. Most runs fail, typically because one or more physically detached sets of wards containing insufficient electors are left behind after completion of an earlier constituency. These failures are not critical, however, for the process is repeated many thousands of times for an area, virtually ensuring that if there are feasible solutions they will be found. Then, for the continuity analyses, we select the run with the lowest transfer of electors from the existing situation and use that as our chosen solution for that area.

The additional flexibility referred to above relates primarily to the agglomeration process whereby adjacent wards are added. The probability of any contiguous ward being added can be varied: to favour wards with long common boundaries and/or to favour those from the same local authority or the same existing constituency. We have taken advantage of that flexibility to ensure that the UK-wide proportion of seats falling in different categories of change is identical to that produced by the Commissions in their most recent exercise. We do not pretend that the resulting chosen solutions would have been selected by the Commissions, for they will be taking into account myriad other considerations, especially those put forward during the process of public consultation. We are confident, however, that they are representative of the class of possible configurations available to the Commissions and as such provide a robust benchmark for analysis.

²⁸ D. J. Rossiter and R. J. Johnston, 'Program GROUP: the identification of all possible solutions to a constituency-delimitation problem', *Environment and Planning A*, 13 (1981), 231-238. For their classic work on this subject, see G. Gudgin and P. J. Taylor, *Seats, Votes and the Spatial Organisation of Elections* (1979: reprinted 2012, Colchester: ECPR Press).

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