Labour electoral landslides and the changing efficiency of voting distributions

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The translation of votes into seats under first-past-the-post electoral systems with single-member constituencies invariably results in disproportional allocations of seats relative to votes among the main two parties. It also tends to produce biased outcomes, with one party getting a more disproportionate share of the seats with a given share of the votes than does its opponent. In Great Britain, these biases favoured the Conservative party until the 1980s, but now strongly favour Labour. Production of those biases results from a variety of influences involving the interaction of the geography of party support with that of constituency boundaries. Increasingly, that interaction has favoured Labour: without any explicit manipulation of the constituency map to its own ends, it now benefits substantially from the equivalent of the malapportionment and gerrymandering cartographic abuses typical of the United States, because of its ability to manipulate its vote distribution within the constituency system.

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Introduction

It is widely appreciated that plurality, or first-past-the-post (fptp), electoral systems using single-member constituencies very frequently produce disproportionate election results (Taagepera and Shugart 1989, and Lijphart 1994, are among the classics in this field). In most cases, this results in the party with the largest number of votes cast getting a substantially larger share of the seats in the legislature being elected than it does of the votes. In addition, where three or more parties contest at least a substantial number of constituencies, the second-largest party may also benefit with a seats:votes ratio of greater than 1.0 – with the consequence that the 'minor parties' receive ratios well below 1.0, with much smaller shares of the seats than of the votes.

The 'winner's bonuses' are not guaranteed, however, and the party with the largest share of the votes may not also get the largest share of the seats – as occurred twice in the second half of the twentieth century in both the United Kingdom (at the general elections of 1951 and February 1974) and New Zealand (the successive general elections of 1978 and 1981). In other words, the process whereby votes are translated into seats usually produces disproportionate outcomes, and sometimes counter-intuitive ones.

To some commentators, including many politicians who benefit from the translation process, the disproportionate outcomes are welcomed, because they mean that the largest party is likely to get a majority of seats in the legislature. This allows 'strong government', whereby the largest

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party is virtually guaranteed success in passing its legislation. It applies to whichever the largest party might be, since a further feature of the electoral system is that it magnifies the impact of changes in vote shares – a loss of 5 percentage points share of the votes may be translated into a 15–20 percentage points share of the seats, so that where the two main parties have relatively equal shares of the national vote total a small change in voter support can lead to a major shift in control of the legislature (Rae 1971).

The magnification process ensures that the majority will prevails, even if the majority is a small one. (Indeed, in many cases – as at every general election in the UK since 1950 – the largest party doesn't even obtain 50% of the votes cast.) And the occasional 'deviant' election, whereby the largest party in terms of votes does not also become the largest in terms of seats, is accepted – so long as it is only occasional – as a price worth paying for the general pattern of outcomes. Against this, others argue that the disproportionality is an unacceptable outcome, since it gives power to parties that lack majority support among the electorate, and makes it extremely difficult for smaller parties to achieve any legislative influence. They argue for proportional representation electoral systems.

But how substantial is the magnification process? Does it vary over elections in both its extent and the party(ies) that it favours? And can it be manipulated for partisan gain? These three questions are addressed in the current paper, which looks at British election results over the period 1950–2001 and emphasizes the role of geography in the transformation of votes into seats. Previous work has shown that up to 1997 the magnification process not only increasingly favoured the Labour party over the Conservatives, but also that the absolute volume of magnification had increased – the election outcomes were increasingly disproportional. This paper not only takes that work forward by incorporating analyses of the 2001 general election, the most disproportional yet in its outcome (posing further questions about how this has come about with no change in the electoral system, or even the pattern of Parliamentary constituencies), but also explores the genesis of that disproportionality further by focusing on the changing efficiency of Labour's vote distribution across the country's constituencies.

From votes to seats: geography and the translation process

It is also appreciated, at least among electoral analysts, that the disproportionality in election results under the fptp electoral system (sometimes termed its exaggeration effect) is a product of processes that are geographical in their nature. (The classic work on this is Gudgin and Taylor 1979; see also Johnston 1979.) The translation of votes into seats involves the interaction of two geographies: that of the support for each of the political parties contesting the election and that of the grid of constituencies laid over those geographies, within which votes are counted and seats allocated.[1] With a given set of constituencies, therefore, different geographies of support can produce different outcomes in the allocation of seats – even if the parties' vote totals are unchanged. For example, with ten constituencies each having 100 voters and two parties competing for their support, one party could win 49 per cent of the votes overall and yet win no seats, if it obtained 49 votes everywhere. On the other hand, a party with 49 per cent could win as many as nine constituencies if it gained 51 votes in each of those nine and just 31 in the tenth. The same overall percentage share of the votes can produce a very different outcome – either no seats or nine out of the ten being contested – depending on the geography of its support across the constituencies.

Clearly, if different geographies can produce different outcomes, then it is in the parties' interests to try and manipulate those geographies – both the geography of support and the geography of the constituencies. Realization of this, and the extent of the electoral abuses that can be created by such manipulations, has led some countries to introduce non-partisan procedures for constituency definition by independent bodies, such as the Boundary Commissions which have operated in the United Kingdom since 1944 (Rossiter *et al.* 1999). But they can only influence one of the maps – that of constituencies. The contours of the maps of voter support can be manipulated – through population movements, by party campaigns, and so forth – but they lie outside any legislative process. Thus, as Taylor and Gudgin (1975) concluded from their detailed analyses of the spatial organization of elections (Taylor 1973; Gudgin and Taylor 1979), all districting is bound to result in disproportionate outcomes, however independent

and non-partisan the boundary-drawers might be: they can only manipulate one of the two geographies.

Although the exaggerative effect of the fptp system is generally appreciated, what is not as widely understood is that it is not necessarily the case that each of the main parties benefits equally from that effect. Party A may on average get 65 per cent of the seats when it wins 55 per cent of the votes at an election, for example, but party B on average only gets 60 per cent of the seats with the same share of the votes. This unequal allocation of the benefits of disproportionality suggests a further feature of the system – that it can be biased, favouring one party over another (see King and Browning 1987). Again, the production of bias is a feature of the votes-to-seats translation process involving the two geographies and, like the exaggeration effect, it too can vary according to their interaction. Manipulation of the two maps can thus generate bias as well as exaggeration – for reasons that were also clearly analyzed by Gudgin and Taylor (1979).

Geography, then, is deeply implicated in the electoral process whereby votes are translated into seats under the fptp system. And different geographies – of support for the various parties contesting the elections, and of constituency boundaries – can produce different outcomes. Most of these outcomes will be disproportionate; many may also be biased. How biased, and in favour of which party? And how has that bias come about; is it just inherent to the system, or can it be (has it been) manipulated? These questions are addressed in the remainder of this paper, which focuses on the UK electoral system and the degree to which political parties have been able to manipulate the two geographies and their interactions – with particular reference to Labour's landslide victories at the 1997 and 2001 general elections when, with 44.4 and 42.0 per cent of the votes respectively, it won 65.4 and 64.3 per cent of the seats in Great Britain.[2]

The production of bias

The ideal situation for a political party contesting a general election is that every vote it attracts should count in terms of winning seats: none are wasted. Votes cast for it in seats that it loses are ineffective, as are those in excess of the number needed for victory in seats that it wins. In a constituency with 100 voters, if party A wins 49 votes and party B wins 51, then all of A's votes are wasted: 50 of B's votes are necessary for defeating A – and thus are effective – and the other is surplus. Thus if the same result was repeated across ten constituencies, all of A's 490 votes would be wasted, 500 of B's would be effective, and its remaining 10 surplus. This is an excellent outcome for B – 500 of its 510 votes (98% of them) are effective – and a disaster for A, which has 49 per cent of the votes cast but all of them (100%) ineffective.

Ideals rarely appear in the 'real world', however, and although parties may yearn for B's outcome they can hardly expect to attain it. (Or something like it: it would only take two voters to change their mind in each constituency for the situation to be reversed and A would be the outright victor. A party needs some surplus votes in each constituency that it wins – i.e. a small majority – as an insurance policy against the time when it loses support.) One basic reason why the ideal is unattainable is that most parties do not have a uniform distribution of support across the country: most are stronger in some parts than others. The nature of that variation is important to the votes-to-seats translation process, as Gudgin and Taylor (1979) made very clear.

If you assume that the frequency distribution for a party's percentage share of the votes across all constituencies is normal, and that each of the two main parties has *c*.50 per cent of the votes cast overall (i.e. the mean percentage for the frequency distribution is, say, between 45 and 55), then as the mean moves along the frequency continuum, so seats will change hands. The number of seats changing hands, as Gudgin and Taylor show (Figure 1, derived from Taylor and Gudgin 1979, 69), is then a function of the standard deviation. The larger the standard deviation (and the more platykurtic – or flatter, with thin tails – the distribution), the smaller the number of seats that will change hands for any given shift in the mean vote percentage. Disproportionality, then, is a function of the spread of values around the mean when it is close to 50 (point B in Figure 1), and affects each of the two parties equally because the frequency distribution is normal. If the mean is either much larger or much smaller than 50, however, large standard deviations produce greater change than small ones in the allocation of seats. Thus, in Figure 1, diagram A shows a situation where the mean vote for a party across all constituencies is

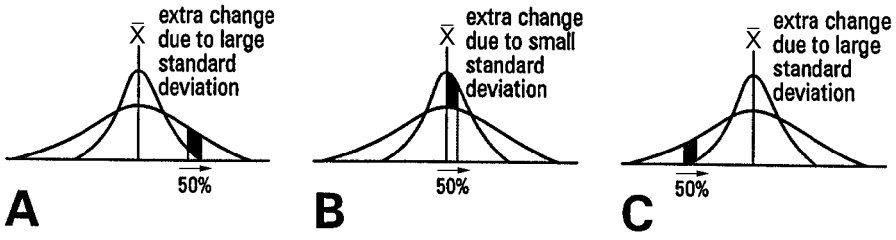


Figure 1 Normal frequency distributions of support for a party: the influence of the location of the mean, the standard deviation and kurtosis on the translation of votes into seats

Source: Gudgin and Taylor (1979, 69) reproduced with permission of Pion Ltd

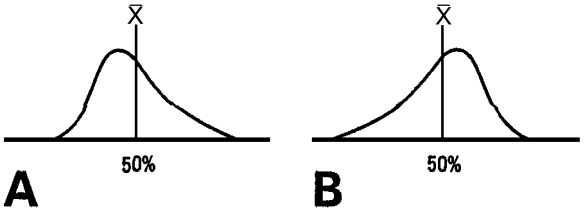


Figure 2 Skewed frequency distributions of support for a party: the influence of the location of the mean and of the standard deviation on the translation of votes into seats

Source: Gudgin and Taylor (1979, 69) reproduced with permission of Pion Ltd

well below 50 per cent: with a small standard deviation it wins fewer seats (i.e. those where its vote percentage exceeds 50) than it does with a larger standard deviation (and/or a more platykurtic distribution). The reverse situation occurs where its mean is well above 50 per cent (diagram C): whatever the standard deviation, it wins a large proportion of the seats – though slightly more with a smaller standard deviation. But where its mean constituency percentage of the votes is close to 50 (as also is its opponent's, since there are only two parties and no abstentions), the size of the standard deviation does not affect the number of seats won, but it does influence the number of seats gained as its vote share increases. In diagram B, as the party's share of the votes increases, the number of seats where it now has a majority is greater with the smaller than the larger standard deviation. Thus disproportionality in the outcomes is a function of the standard deviation, and affects each of the two parties equally.

If the frequency distributions are not normal, however, then bias as well as disproportionality can result. With a positively skewed distribution and a mean close to 50, for example, a party has more seats with a very large percentage of the votes than it does with a very small percentage: as a result it amasses both a lot of surplus votes in the former (in the seats that it wins by large majorities) and a lot of wasted votes in the seats it loses by relatively small margins (i.e. the large number where it obtains slightly less than 50% of the total). With a negatively skewed distribution, on the other hand, it has few very safe seats with large numbers of surplus votes, and a larger number of seats with relatively few wasted votes (where it loses by large margins). Thus, as Figure 2 (derived from Gudgin and Taylor 1979, 69) illustrates, a party with a positively skewed distribution (i.e. with a long right-hand tail) wins fewer seats with the same mean percentage as one with a negatively skewed distribution.

In both diagram A and diagram B in Figure 2, the party concerned has a mean of 50 per cent of the votes cast across the constituencies. But it wins many more seats (i.e. a larger proportion of the frequency distribution is to the right of the mean figure) in B than in A. In A, its average percentage of the votes cast in the seats that it wins is well above 50, which means a lot of surplus votes, and also a lot of wasted votes in those where it loses – the large number of constituencies relatively close to, but below, the 50 per cent figure; in B, on the other hand, the bulk of the constituencies lie to the right of the 50 per cent value – it wins a lot of them by relatively small majorities, whereas in many of

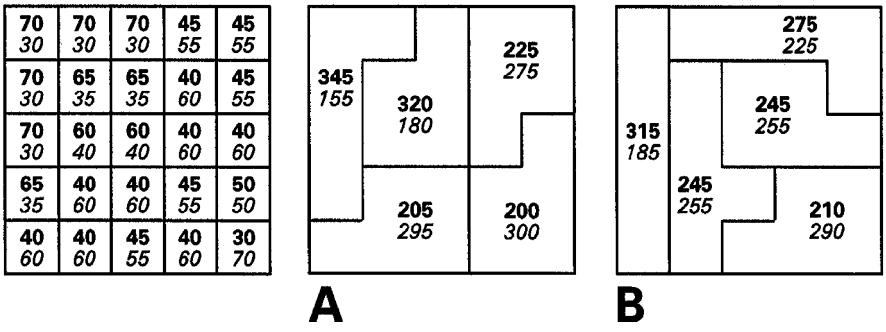


Figure 3 Gerrymanders stacked and cracked: the creation of five equal-sized constituencies from 25 building blocks to produce (a) a stacked gerrymander and (b) a cracked gerrymander. The top figure is the number of votes for party A in each building-block and constituency; the bottom figure is the vote for party B

those that it loses, to the left of the 50 per cent line, it gets only a small percentage of the votes cast – and thus relatively few wasted votes. The frequency distribution of B is much more efficient for the party than is that in A.[3] Bias, then, is (in part) a function of the skewness of the frequency distributions: it favours the party with fewer surplus votes in its safe seats and wasted seats in those that it loses.

Gerrymandering and malapportionment

Electoral bias results from the shape of the frequency distributions of party support across the constituency grid. It may be an inherent feature of the geography of voting in an area: a party whose support is concentrated in certain areas is disadvantaged relative to one whose support is more evenly distributed, when the mean percentage of the votes cast for each is not too distant from 50. But it can be produced by the deliberate drawing of constituency boundaries – a cartographic abuse which has been perfected in the United States over nearly two centuries, generally known as *gerrymandering*.[4] There are two main types of gerrymandering, which are illustrated in Figure 3. There are 25 small areas, each with 100 voters, to be grouped together into five equal-sized constituencies, each of which comprises a contiguous block of territory. Across those 25, party A (whose votes are shown as the top figure in each square) gets 1290 votes (51.6% of the total) and party B gets 1210 (48.4%). Party A's votes are spatially more concentrated, however, producing a positive skew: it gets 70 per cent of the votes in five of the areas (all in the north-west), for example, compared to only one for party B.

The first of the two gerrymanders shown in Figure 3A is an example of a *stacked gerrymander*. Party A's votes are packed into two of the constituencies (in the north-western quadrant), both of which it wins by very large margins. Party B wins the other three constituencies (and thus a majority of the seats with a minority of the votes), but by smaller majorities. Party A has an average surplus of 164 votes in the seats that it wins – [(345–155–1+[(320–180)–1]/2 – and an average of 210 wasted votes [205+200+225/3] in those that it loses: party B, on the other hand, has an average of 167.5 wasted votes per seat lost, but an average of only 79 surplus votes per seat won. Thus just 26 per cent of A's votes are effective, compared to 52 per cent of B's thanks to the 'stacking' of A's votes in two very safe seats.

The second example in Figure 3B, using the same underlying vote distribution, is of a *cracked gerrymander*, in which the votes for the party that benefits from the gerrymander are more evenly distributed than in the stacked gerrymander (i.e. it amasses fewer surplus votes per seat won). In this, A again wins two seats and B three, but the composition of their vote totals is rather different. A wins only one of its two seats (that on the western side) by a large majority, and its average surplus votes per seat won is 89 (much smaller than the 164 in the previous example); B, on the other hand, wastes an average of 205 votes per seat lost. The three seats that B wins all have fairly small majorities: A wastes an average of 233.3 votes per seat lost (more than in the stacked gerrymander) and B has an average of 32.7 surplus votes. Overall, 32 per cent of A's votes are effective, as are 58 per cent of B's. The latter gets a better

return on its votes – more are effective under the cracked than the stacked gerrymander – but at a potential price: two of its majorities under the cracked gerrymander are very small, and the seats could be lost with a very small swing against it – of just six votes, or 1.2 per cent of the total in those constituencies.

When gerrymandering has been practised in the United States, therefore, the strategy has generally favoured stacked rather than cracked gerrymanders. The party in charge of the redistricting seeks to pack its opponents' votes into as small a number of districts as possible, virtually guaranteeing it some representation but also trying to ensure that it will not get a majority of seats in the relevant legislature unless it has a very large percentage of the overall vote total. (And, as Morrill 1973, illustrated, it is possible for both parties to come up with stacked gerrymanders against their opponent using the same voting distributions and building blocks – small areas – for creating the electoral districts.) Producing such stacked gerrymanders may involve creating oddly shaped districts (as in the traditional salamander-shaped district created by Governor Gerry in Massachusetts in 1812: Monmonier 2001), which is why compact districts are sometimes associated with an absence of gerrymandering. But this depends on the underlying geography of the vote: it is possible to produce gerrymanders, or their equivalent, with compact districts in some circumstances.

Bias can be produced by gerrymandering, therefore, by so drawing the boundaries of constituencies that they produce a positively skewed distribution for one party and a negatively skewed one for the other. But there is a further way of biasing the outcome, one that has also been employed as a cartographic abuse in the United States. Our discussion so far has assumed equal-sized constituencies, in terms of the number of voters. But what if the constituencies vary in size, and one party is strong in the large constituencies with the other strong in the smaller ones? Figure 4 gives an example of this, again using the same 25 building-blocks to be grouped into five constituencies. There are two large constituencies, with 900 and 600 votes respectively; the two parties each win one of these. And there are three smaller ones – with 400, 400 and 200 voters – all won by party B. Party A has 299 surplus votes in the seats that it wins, and averages 172.5 wasted votes in the seats

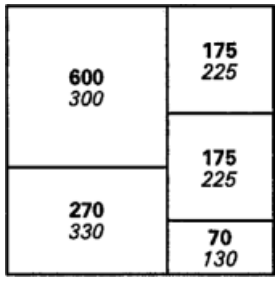


Figure 4 Malapportionment: five unequally-sized constituencies created from the building-blocks in Figure 3 that discriminate against party A. The top figure is the number of votes for party A in each building-block and constituency; the bottom figure is the vote for party B

that it loses: just 24 per cent of its 1290 votes are effective. Party B, on the other hand, averages 54 surplus votes in the four seats that it wins: 57 per cent of its 1210 votes are effective.

This second cartographic strategy for biasing election results is *malapportionment*. It can be produced in two ways. The first is *direct malapportionment*, whereby the party controlling the boundary-drawing creates large constituencies in the areas where its opponent is strong, and smaller ones where it is the stronger party itself. The second is *creeping malapportionment*, whereby growing inequality in electorate sizes (because of population changes, especially migration) favours one party over another – the favoured party wins in constituencies that are losing population; its opponent wins where they are growing – and nothing is done to correct this. In each case, the outcome is electoral bias, but without necessarily any skewness in the two parties' frequency distributions: the bias is produced because the party that wins in the smaller constituencies amasses fewer surplus votes there than its opponent does where it wins in the larger constituencies.

A further way in which bias can be produced involves a variant of malapportionment. Our assumption in the examples above is that all voters in a constituency vote (i.e. turnout is 100%), and that they all vote for one of two parties only. If either or both of these is wrong, then bias can result, operating in the same way as malapportionment. For example, if turnout in a seat with 100 voters is only 80 per cent, then one of the two parties contesting it needs only 41 for victory, rather than 51 if all voted. So, if one party is

strongest in the areas with low turnout, it will need fewer votes to win seats than will a party that is strongest in the constituencies with high turnout. (This can be seen by assuming that each of the five constituencies in Figure 4 has 1000 voters. Party B is then advantaged, because average turnout in the seats that it wins is only 40%, compared to 90% in the seat won by A.)

Alternatively, all of the voters turn out, but some of them vote for a third party: the more of them that do, the smaller the number of votes that the two main parties are competing for, and therefore the smaller number needed for victory. A party whose main strengths are in areas with relatively strong third parties is thus advantaged over one whose main strengths are in areas with little or no third-party presence.

These two influences are termed *reactive malapportionment*, because they operate in the same way as malapportionment but reflect the decisions of voters (whether to turn out; whether to vote for a third party) who are reacting to the local electoral-political situation. Reactive malapportionment can result from intentional placing of boundaries relative to known levels of turnout and/or third party support; it is more likely to result from voter decisions once the district boundaries have been drawn (and can, as argued below, be influenced by party activity).

Measuring bias

Bias in election results can therefore be brought about by three aspects of the interactions between two geographies – the geography of support for each party plus the geography of turnout, and the geography of constituencies placed across that first geography. It can be produced deliberately, involving one or more of gerrymandering, malapportionment and reactive malapportionment, or it can be an unintended consequence of non-partisan decisions regarding the location of constituency boundaries relative to given distributions of support for the two main parties, for third parties and of abstainers (all of which are unknown to the boundary-drawers) – which is why Taylor and Gudgin (1975) follow Dixon (1968) in contending that 'all districting is gerrymandering', even in the United Kingdom where districting (i.e. the definition of Parliamentary constituency boundaries) is undertaken by independent, non-partisan Commissions in whose work no attention is paid to, and no mention made of, political-electoral considerations (Johnston 1982; Rossiter *et al.* 1999).

How can bias be measured, separate from the disproportionality that results from those interactions even when the relevant frequency distributions are all normal, and there is no malapportionment or reactive malapportionment? The basic argument is that with disproportionality each of the two main parties in a system is treated in the same way when they get a particular vote share (i.e. with 55% of the votes, say, each gets 65% of the seats): exaggeration is non-partisan in its impact. But with bias there is unequal treatment; with the same percentage of the votes parties get different percentages of the seats. How different? A straightforward way of measuring this, using a metric developed by Brookes (1959 1960), is to estimate for any given election how many seats each party would have obtained with a given percentage of the votes. If the result is the same, there is no bias (whatever the disproportionality); any difference between the two figures represents bias, differential treatment of the two parties.

That estimating procedure is undertaken using a simple concept that is at the heart of much electoral analysis in the UK and elsewhere – uniform swing. This assumes that when a party's share of the vote total changes nationally, it changes by the same amount in every constituency, so that if Labour's share of the national vote total falls from 55 to 49 per cent (i.e. by 6 percentage points), it falls by the same amount (six points) in every constituency. As an assumption, it clearly has limitations – as illustrated by Blau (2001) – but it provides a very valuable, readily appreciated, metric for identifying and (as illustrated below) decomposing the volume, direction and sources of bias.

This method is illustrated by the 1964 general election in Great Britain, when Labour won 44.8 per cent of the votes cast and the Conservatives won 42.9 per cent. Labour won 317 seats, and the Conservatives 292. What if their total share of the votes cast (87.7%) had been divided equally, so that each had 43.35 per cent? The Conservatives would have won 24 more seats than Labour: with equal vote shares there would have been a considerable bias to the Conservatives. What if they had each won 45.35 per cent of the votes – 2.0 points more than the equal share position?[5] There would still have been a bias to the Conservatives, who would have won 18 more seats than Labour

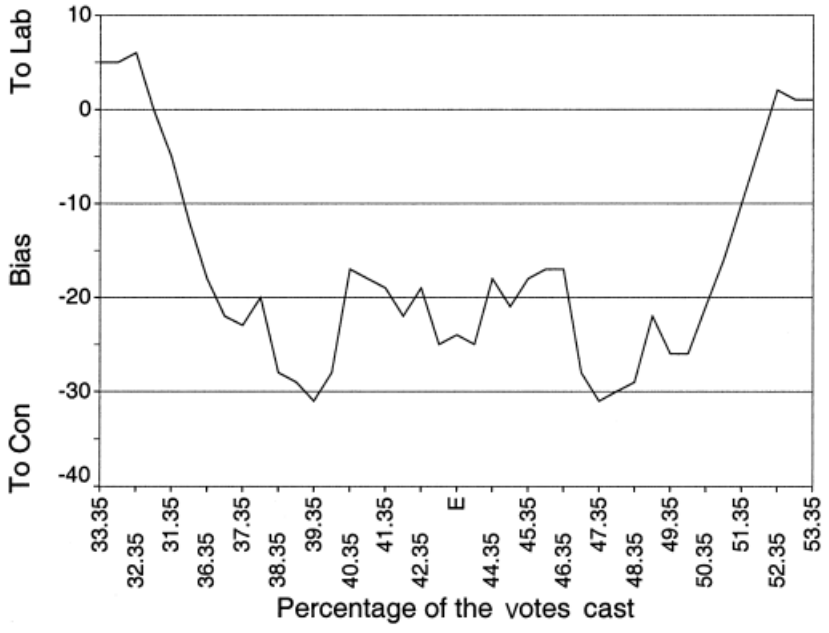


Figure 5 The total bias at different vote shares at the 1964 general election. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives

would with the same share. And what if each had won 5 per cent less than the equal shares portion – i.e. 38.35 per cent; the Conservatives would have won 28 more seats than Labour. In other words, we can evaluate the amount of bias in the system at any share of the total proportion of the votes cast won by the two main parties, as shown in Figure 5 for the 1964 election.

The full trace of the total bias figure in Figure 5 shows that it was at its largest around the half-shares figure of 43.35 per cent each – though it was greatest at the 39.35 and 47.35 per cent levels. With a vote share of between 37 and 49 per cent of the total, there would have been a bias to the Conservatives of 20 seats or more. At the more extreme values, however, there would have been much less bias: indeed with less than 31 or more than 51 per cent of the votes, there would have been a small bias to Labour rather than to the Conservatives. This is a function – as will be explored further in later sections – of Labour having a positively skewed frequency distribution. With a low percentage of the total votes (32 or below) it gets more seats than the Conservatives because of those it wins with large majorities, which the Conservatives lack. And with a large percentage (51 or more), there is a pro-Labour bias because it has fewer seats where it performs very badly than do the Conservatives. With a large vote percentage, the Conservatives are 'penalised' for their negative skew, and with a small percentage for lacking a positive skew: in-between, they are the beneficiaries from the bias production processes.

Bias at general elections in Great Britain, 1950–2001

Using this straightforward measurement procedure, we estimate the amount and direction of bias in Great Britain for each of the general elections between 1950 and 2001: 1950 was selected as it was the first election fought in constituencies defined by independent Boundary Commissions (created by the *House of Commons (Redistribution of Seats) Act, 1944*), one of whose major tasks was to produce constituencies which were as 'equal as practicable' in their electorates (Rossiter *et al.* 1999). In these analyses (as in Figure 5), a bias towards the Conservative party is shown as a negative figure, with a positive figure showing bias to Labour.

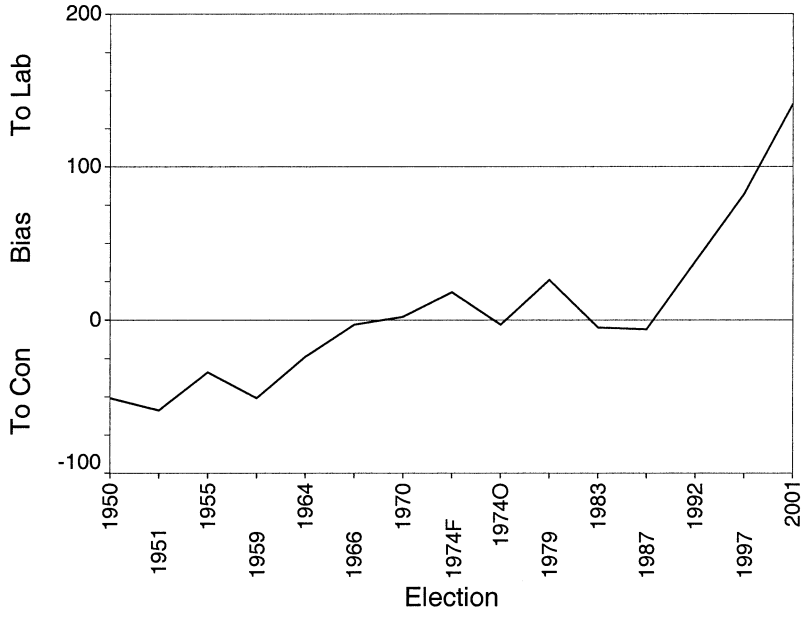


Figure 6 Total bias with equal vote shares: 1950–2001. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives

Looking first at the amount of bias at the equal vote shares position, Figure 6 shows a very significant trend over the 15 elections. In the first two decades, there was a substantial pro-Conservative bias, of up to 60 seats. In the 1970s and 1980s there was relatively little bias: the electoral system seemed to be treating the two parties more or less equally, assuming that they had equal shares of the votes. And then, at the last two elections, there was a massive shift to a pro-Labour bias, of 82 seats in 1992 and 141 in 2001. At that last election in the sequence, when Labour won 42.0 per cent of the votes cast and the Conservatives 32.7, if the two parties had achieved equal vote shares (assuming uniform shift in support away from Labour across the country), nevertheless Labour would have won 141 seats more than its main opponent (out of a total in Great Britain of 641).

Figure 6 shows the situation at one point only – where each of the parties has half of their combined vote total. What would it have been if the frequency distributions were centred at different points on the continuum? Figure 7 does this for each of the 15 elections – which are grouped into three time-periods for ease of presentation. In these, the horizontal scale shows the vote share as the distance from the equal shares position, when each has half of their combined total – which varies from election to election. Between 1950 and 1959 the pattern is consistent: a pro-Conservative bias at every vote share value, but largest close to the half-shares position – save in 1955. From 1964 through the two 1974 elections, there is a general U-shape to the pattern, but the elevation is higher than in the previous four cases. At three of the five elections, there is a pro-Conservative bias close to the half-shares position, which is largest in 1964 (as previously described) but a pro-Labour bias with the largest and smallest vote shares. At the other two, the bias is pro-Labour at all vote shares, but still largest at the more extreme values.

Over the period 1950–1974, therefore, the general U-shape of the bias curves is the same, but over time the elevation is greater, thus reducing the likelihood of a pro-Conservative bias. At every one of the elections, however, the advantage to Labour is greatest at the extremes of the scale: there is a larger pro-Labour bias when the vote share is in the high 40s–low 50s and in the low 30s, than is the case when the figure is in the low–mid 40s (where the half-share position generally lay).

After 1974, however, the pattern changed, as the third set of graphs in Figure 7 shows. (In these, because third-party vote shares were substantially

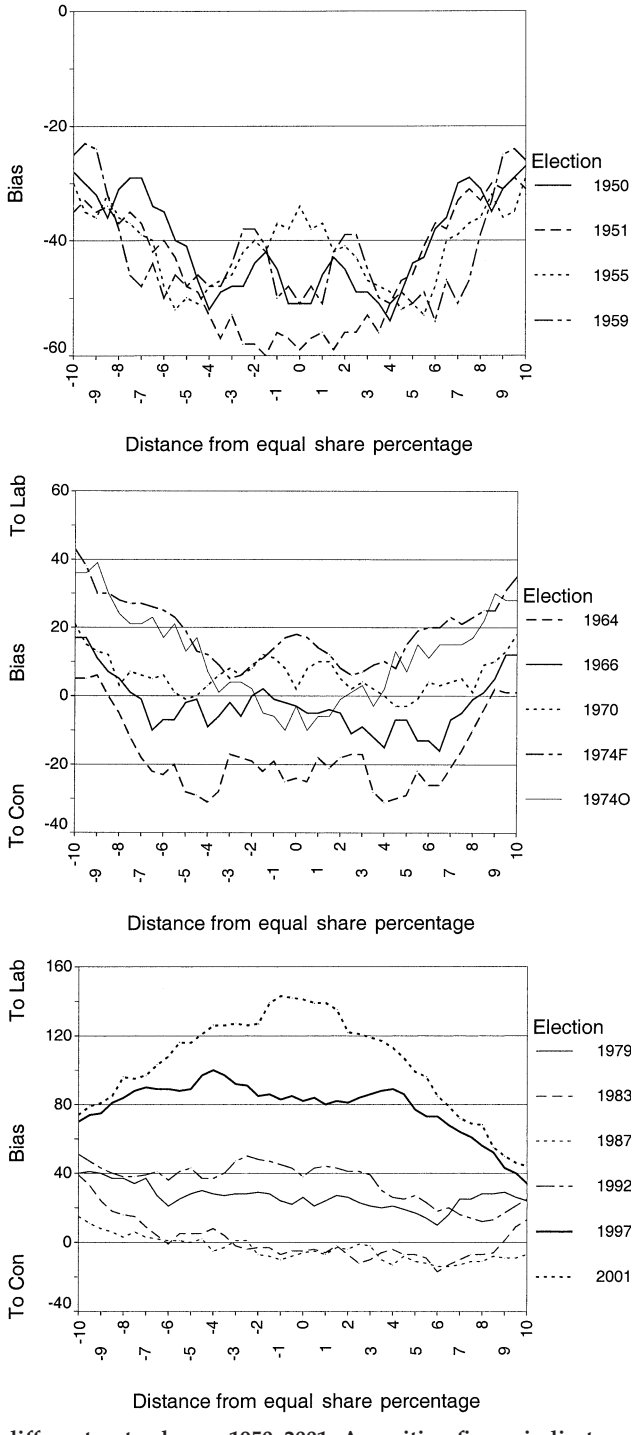


Figure 7 Total bias at different vote shares: 1950–2001. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives. On the horizontal scale, 0 indicates the equal shares position, and the other figures indicate the percentage points distance from that position (so that if the equal shares position is 39% of the votes cast, +3 is the bias when the parties have 42% of the votes each, etc.)

greater than they had been in the 1950s–1960s, the half-share position is in the high 30s, rather than in the 40s, as it was at elections in the 1950s–1960s.) For the first three elections in the sequence, the pattern is fairly flat, with a slight downward slope to the right: with low vote shares there is a somewhat larger pro-Labour bias than with high figures, but the U-shape characteristic of earlier elections has disappeared. Finally, in 1997 and 2001 a new, inverted-U-shape emerges: the pro-Labour bias is greatest close to the half-shares position, especially in 2001.

Decomposing bias

The clear conclusion to be drawn from Figures 6 and 7 is of a major change in the direction and volume of bias, with Labour increasingly advantaged by that change. In order to explore why this has happened, we need to be able to evaluate the relative impact of the malapportionment, reactive malapportionment and efficiency (or gerrymandering) components of the bias-producing process discussed above. One of the advantages of the Brookes' method for measuring bias is that the net figure produced can be decomposed. We have adapted his decomposition method, identifying six separate influences on the level and direction of bias. (Fuller technical details are given in Johnston *et al.* 2001.[6])

The six components are as follows.

Malapportionment

1 National quotas. The legislation establishing the Boundary Commissions guaranteed a minimum number of seats for both Scotland and Wales. Because of the relative voting populations of the three countries, this resulted in much smaller constituencies on average in those two countries (49 662 and 51 641 voters respectively after the Initial Review) than in England (58 734). A 1958 amendment to the relevant Act ensured that this would continue for so long as England's population grew more rapidly than that of the other two countries (see Rossiter *et al.* 1999), so that after the Commissions' Fourth Reviews, which were reported in 1995, the average constituency electorates for Scotland, Wales and England were 54 569, 55 559 and 68 626, respectively.[7] Thus if one party is stronger than the other in Scotland and Wales, where seats are easier to win in terms of the number of votes needed, then this deliberate malapportionment should produce bias in its favour.

2 Constituency size variations There is variation in constituency electorates within each of the constituent countries of the UK at most elections, for three main reasons: (1) precise equality is almost impossible to achieve, given the size of the building blocks used (district council wards in most cases) and the requirement to confine constituencies wherever possible within individual major local authorities; (2) the redistribution process takes several years, so that population change produces creeping malapportionment even before a new set of constituencies is employed (the constituencies first used in England in 1983, for example, were based on 1976 data); and (3) further creeping malapportionment occurs during the period in which a set of constituencies is retained (redistributions are now required every 8–12 years). Thus if one party is stronger than the other in the areas with the smaller constituencies, it will enjoy a bias in its favour.

Reactive malapportionment

3 Abstentions Turnout at British elections has fallen substantially over the period, from some 84 per cent in 1950 to below 59 per cent in 2001. As it has fallen overall, so it has become geographically more variable, ranging from 34.1 (in Liverpool, Riverside) to 72.3 per cent (in Winchester) in 2001. The lower the turnout, the smaller the number of votes needed to win a seat, and so a party that is relatively strong in the areas with low turnout will achieve a bias in its favour relative to the one that tends to win in the areas where abstention rates are relatively low.

4 Third-party votes As with abstentions, the more third-party votes that are cast in a constituency, the smaller the number needed for victory by one of the two main parties. Thus a party that is strongest in the areas with more third-party voters will benefit; seats there are easier to win (in terms of the number of votes needed for victory, as reflected in the votes-to-seats translation procedure) than in areas where third parties are either weak or non-existent. In Great Britain,the third-party share of the vote has

increased substantially since the 1970s, especially in Scotland and Wales and those parts of England where the Liberal Democrats and their predecessors have garnered most votes.

5 Third-party victories Where third parties win seats, they deny one of the two main parties victory there. This can contribute to the bias if they tend to win more seats that would otherwise have been won by one of the main parties than by the other.

Efficiency (or gerrymander)[8]

6 Efficiency As already discussed, this component reflects the shape of each of the two main parties' vote percentage frequency distribution.

With Brookes' method, each of these components can be expressed in the same metric as the total bias – the number of seats difference between the two main parties, with a pro-Conservative bias shown as a negative value and a pro-Labour bias as positive. (In addition, it is possible to derive interaction terms involving two or more of the components, but these are not discussed here. The net impact of the interaction terms is small, however. Over the 15 elections, it has averaged only –4.95, with a standard deviation of –2.90. It has been pro-Conservative at every election, increasingly so over time – achieving its maximum value of –10.75 in 1997. The net impact of all of the interactions, therefore, has been to slightly reduce anti-Conservative bias of most of the individual components.[9])

What the method produces is a set of estimates of the degree to which the difference between the two parties in the number of seats that they would win with any given share of the votes is a function of differences in the ratios of various aspects of their vote distributions. The constituency size variation component, for example, reflects the size of the ratio between the average number of registered electors in seats won by each party; the abstentions component reflects the ratio in the average number of votes cast in those seats; and the efficiency component reflects the ratio in the average number of (wasted plus excess) votes between the two sets of seats. The relative size of those ratios is reflected in the relative size of the relevant bias components.[10]

The bias components in Great Britain: 1950–2001

The trends in each of these six bias components at the half-shares vote position are shown in Figures 8–11. For the two *malapportionment* components (Figure 8), the general pattern is of a pro-Labour bias almost throughout, and increasing over time. With regard to the national quotas, this reflects Labour's growing hegemony over the Conservatives in Scotland and Wales, as the latter's vote share fell substantially in both and reached its nadir in 1997 when the Conservatives won no seats in either country. For constituency size variations, the main areas of population decline between Boundary Commission Reviews have been the cities, especially the inner city areas. Labour is generally stronger there, hence the pro-Labour bias from the 1960s on. (In the 1950s, the Boundary Commission for England used the 'special geographical considerations' clause of its rules to create smaller rural than urban constituencies, which favoured the Conservatives: Rossiter *et al.* 1999.) The impact of each Boundary Commission review is also clear; creeping malapportionment is temporarily halted in 1974, 1983 and 1992, only to be reinstated at subsequent elections – to Labour's benefit.

Just as the trends in the malapportionment components are readily appreciated, so are those in the *reactive malapportionment* group. With regard to abstentions (Figure 9), the trend has been of an increasingly pro-Labour bias. Turnout has fallen most in the inner city and industrial areas of Labour strength, making the number of votes needed for victory there smaller than in the Conservative high-turnout areas.

For most of the period, the third-party votes component favoured the Conservative party (Figure 10). Both the Liberal Democrats and the two nationalist parties have tended to perform better in the Conservative than the Labour heartlands (none of the three have accumulated many votes in industrial South Wales and the central belt of Scotland, for example, and in England the Liberal Democrats have performed much better in the southern, more rural areas than elsewhere). This has favoured the Conservatives: all other things being equal (i.e. constituency size), fewer votes are needed for victory in Conservative-held than Labour-held seats because of the third-party impact. But if a third party wins a seat, it is usually

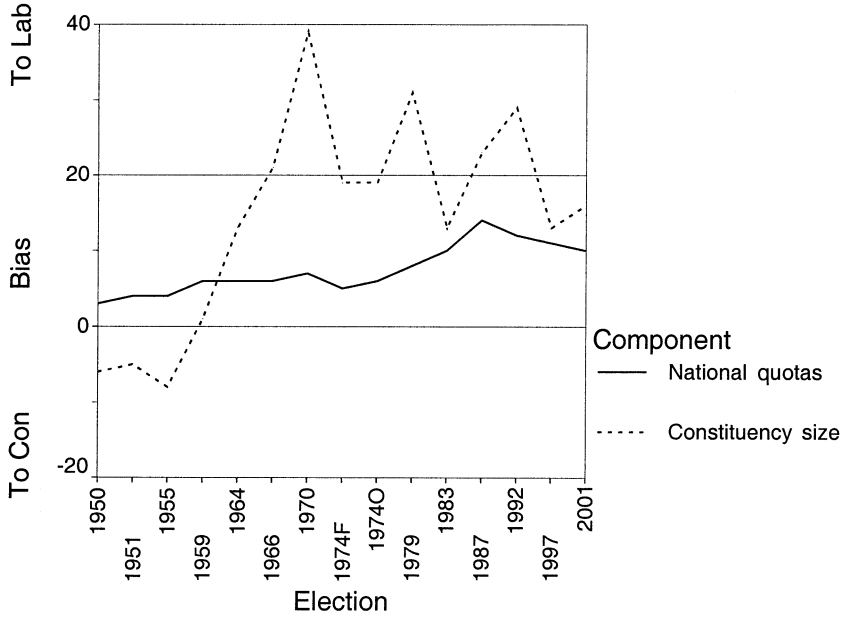


Figure 8 Malapportionment bias with equal vote shares: 1950–2001. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives

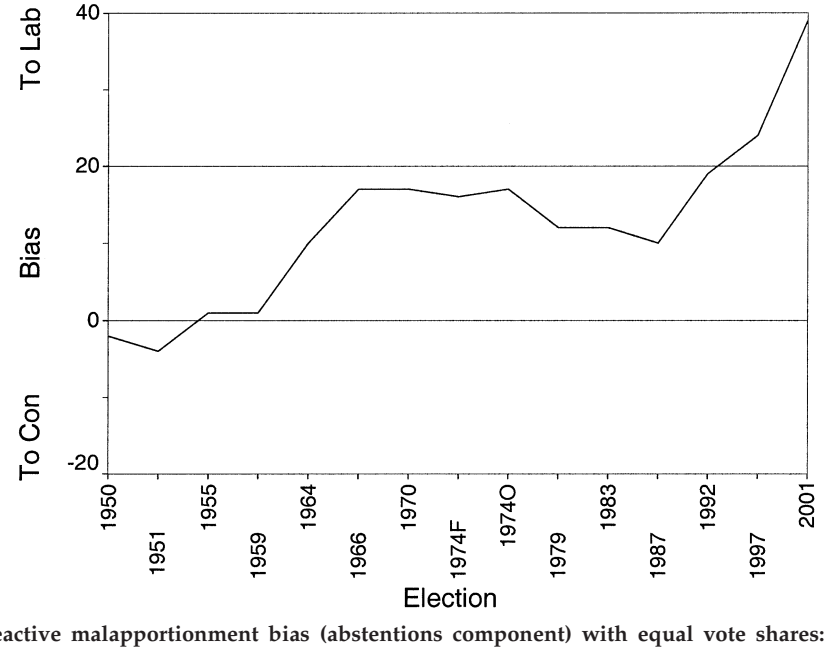


Figure 9 Reactive malapportionment bias (abstentions component) with equal vote shares: 1950–2001. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives

one that the Conservatives would otherwise have gained, thus producing a third-party wins component that favours Labour. There were few such seats until the 1980s, but this bias component increased from then on as the Liberal Democrats' seat total grew: it countered the pro-Conservative

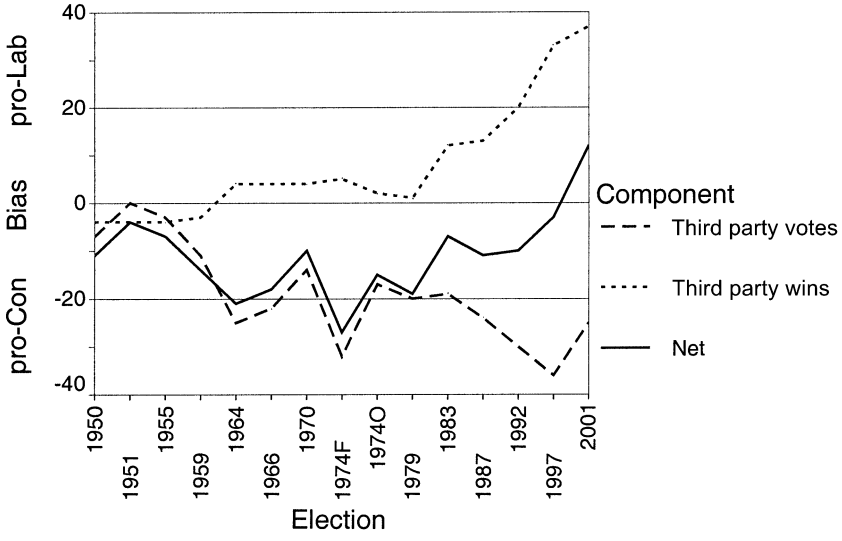


Figure 10 Reactive malapportionment bias (third-party components and their net impact) with equal vote shares: 1950–2001. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives

third-party votes component, and the net impact of the third parties shifted towards Labour. It became positive (i.e. the pro-Labour victories bias outweighed the pro-Conservative votes bias) in 2001. A major reason for this is the reduced size of the votes component in 2001, shown by a change in direction for the trend. During the late 1990s, the Liberal Democrats replaced the Conservatives as the main opposition party in some northern cities, and this was reflected in their 2001 general election performance: in Sheffield, for example, the Liberal Democrats won control of the City Council in 1999; at the 2001 general election, they retained a seat they won from the Conservatives in 1997, and came second to Labour in three of the other five.

Finally, the *efficiency* bias component shows a major change at the last two elections (Figure 11). Until then, apart from the February 1974 contest, this component had always favoured the Conservatives. In 1997, however, there was a pro-Labour efficiency bias of 48 seats with equal vote shares, and in 2001 it was 72 seats.

The changing efficiency of vote distributions

Over the period 1950–2001, therefore, the pattern of bias at British general election results has increasingly favoured Labour. This has occurred across all of the bias components, although the biggest change has been with the efficiency component. The changes with regard to the first two groups (malapportionment and reactive malapportionment) are readily appreciated, as set out above, but why the big change in the efficiency component? Have the Boundary Commissions suddenly started to gerrymander Britain's constituency map in Labour's favour, or has the greater efficiency of Labour's vote distribution relative to the Conservatives' been achieved in other ways?

The importance of the efficiency component for Labour is stressed in Figure 12, which shows the contribution of each component at each vote share in 2001 (i.e. the total figure shown in Figure 7 is decomposed for each vote share). The impact of four of the components is virtually stable whatever the vote share: there is a pro-Labour bias of just under 20 seats from both national quotas and constituency size variations; a pro-Labour bias of about 40 seats from abstentions; and a pro-Conservative bias of about 20 seats from third-party votes. The bias from third-party wins declines as the vote share increases, however; as either party's share of the vote total increases, so third-party victories are reduced, to Labour's overall detriment. But the major feature is the inverted

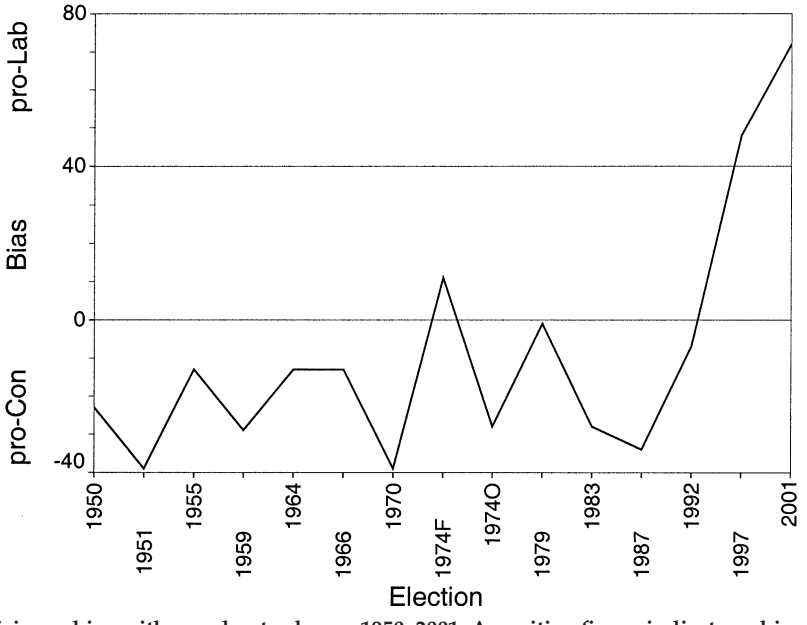


Figure 11 Efficiency bias with equal vote shares: 1950–2001. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives

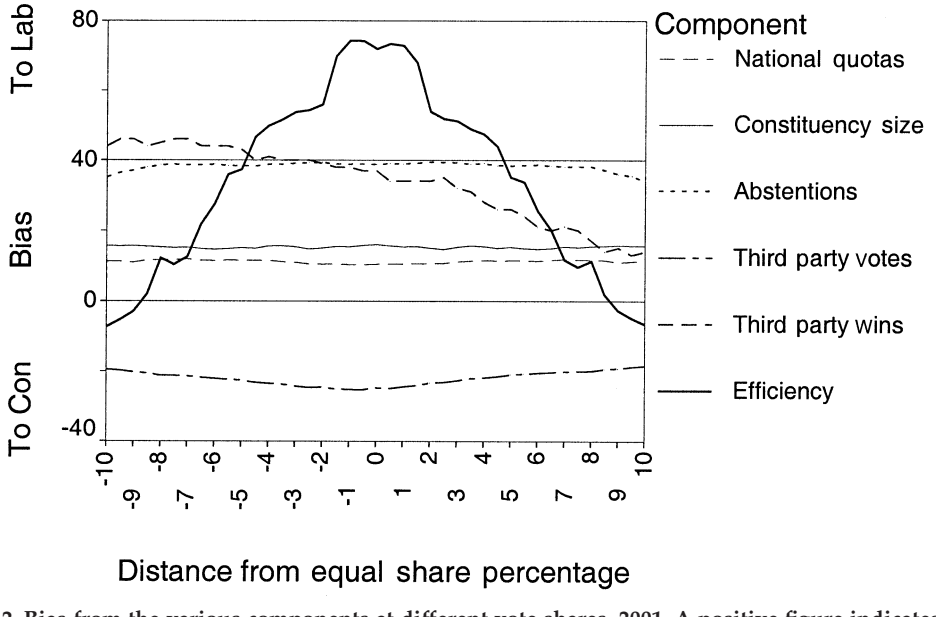


Figure 12 Bias from the various components at different vote shares, 2001. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives

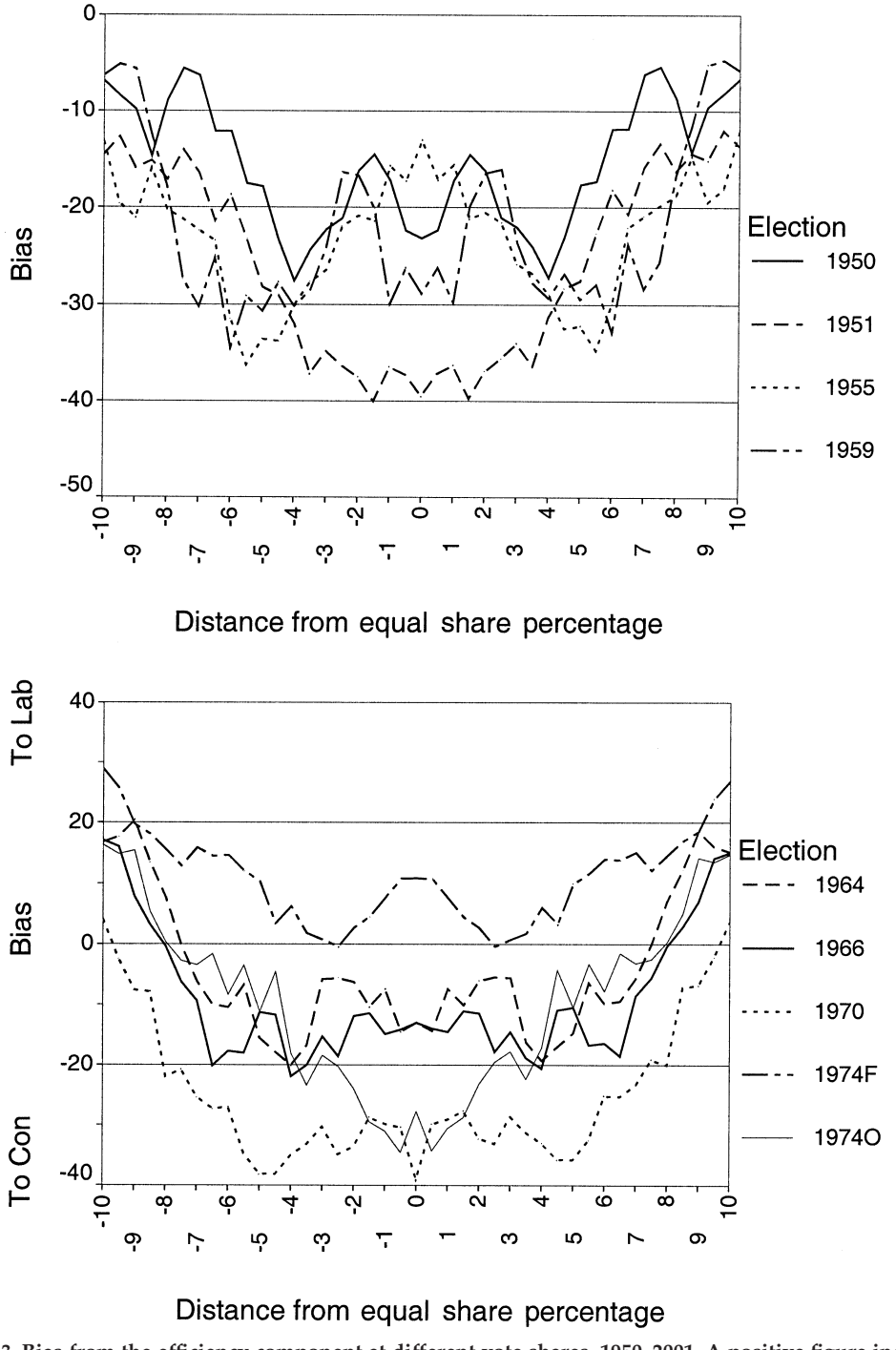


Figure 13 Bias from the efficiency component at different vote shares, 1950–2001. A positive figure indicates a bias to Labour and a negative figure a bias to the Conservatives

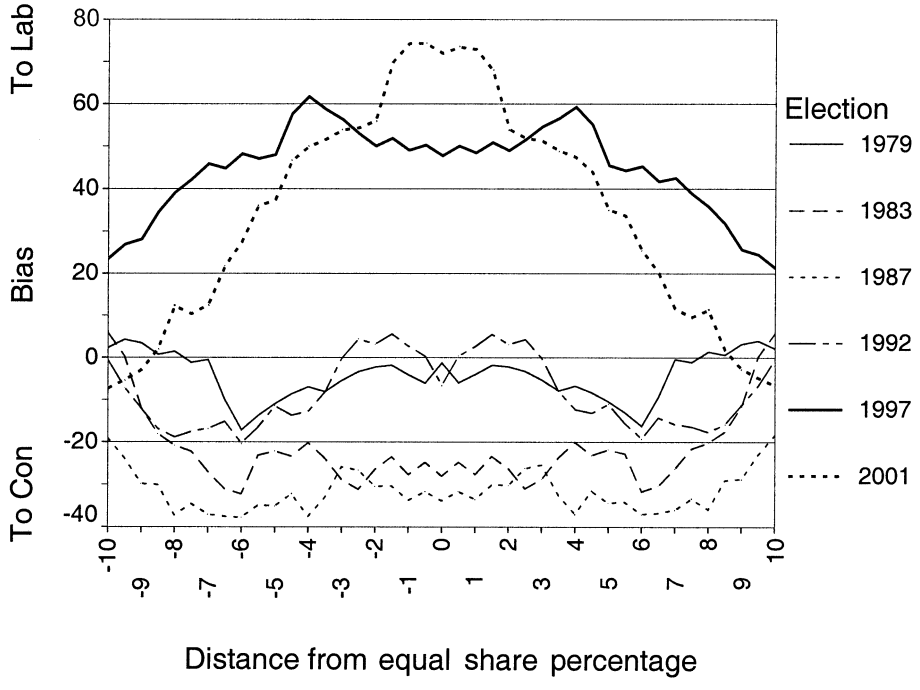


Figure 13 continued

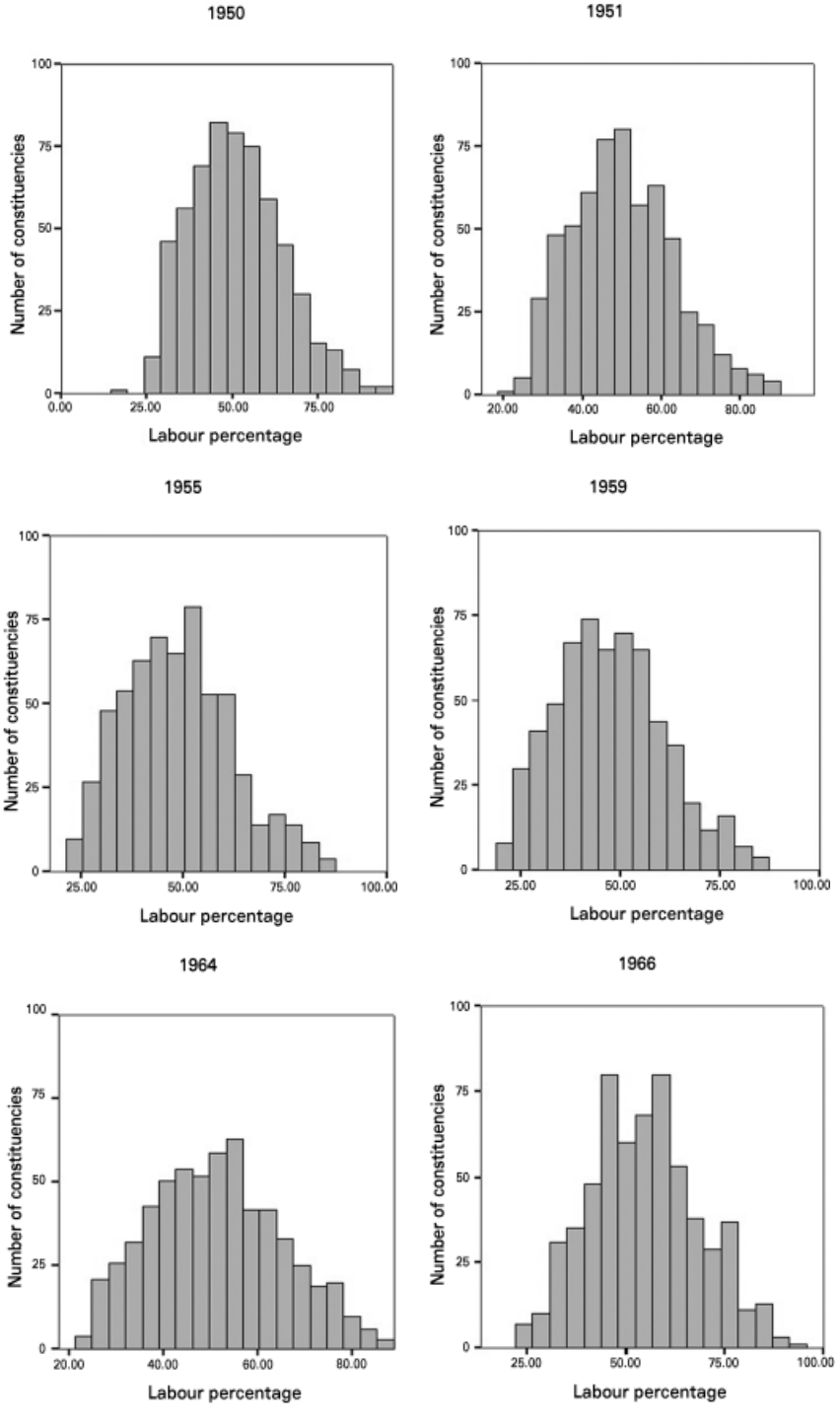
U-shaped trend for the efficiency component: it is strongly pro-Labour at and around the equal vote share position, and weakly pro-Conservative at the extreme values.

This pattern for the efficiency of Labour's vote distribution shows a major shift across the 15 elections (Figure 13). At the first nine contests (shown in the first two graphs in Figure 13), the general pattern was W-shaped: the bias tended to favour Labour at the extreme values, and again close to the equal (or half-) shares position. At the four Conservative election victories of 1979–1992 (shown in the bottom diagram), the W-shape was much less pronounced. And then, in 1997 and 2001, the inverted-U appeared.

Given the relationship between frequency distributions and the efficiency bias discussed above, the clear implication from these graphs is that the distributions for both Labour and the Conservatives have changed significantly over the period, and especially at the last few elections. That this is the case is shown in Figure 14, which gives the frequency distributions for the Labour share of the two-party (i.e. Conservative + Labour) vote at each of the elections, for all seats won by either of those parties (i.e. excluding the small number of third-party victories). The change is remarkable in both (a) the degree of skewness (asymmetry around the mode) and (b) the kurtosis (whether the distribution is more or less 'peaked' than the traditional bell-shaped normal curve).

For the first six elections, the distribution is both leptokurtic (more peaked than normal) and positively (i.e. right-) skewed. Over time, however, the degree of kurtosis is reduced, so that the distributions for the four elections in the 1970s are much flatter, although they are still slightly skewed in a positive (anti-Labour) direction. This is accentuated in 1983 and 1987, but then in 1992 the distribution is almost rectangular. What appears to be happening, therefore, is that Labour continues to have more safe seats with large majorities and relatively large numbers of surplus votes than the Conservatives (the continued positive skew), but that in addition, Labour has many fewer wasted votes in the seats that it loses as the frequency distribution 'flattens' – its modal category in 1987 is 10–15 per cent of the votes.

An even bigger, and certainly more significant, change occurred between 1992 and 1997. The positive skewness disappeared, and instead the distributions are negatively skewed (i.e. elongated


1950
Number of constituencies
Labour percentage
1951
Number of constituencies
Labour percentage
1955
Number of constituencies
Labour percentage
1959
Number of constituencies
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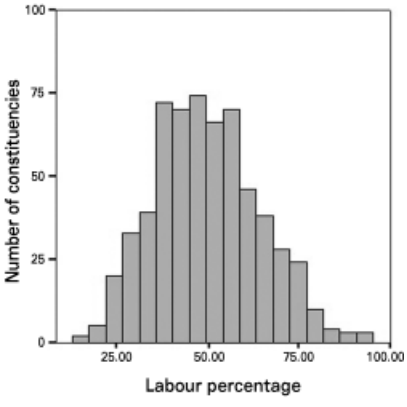
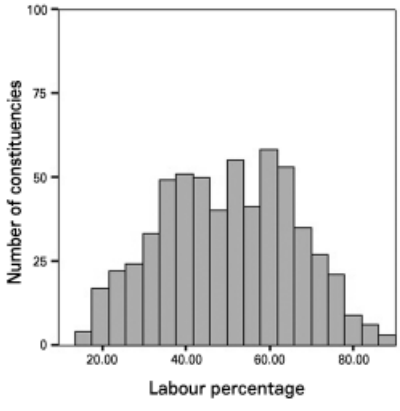
1964
Number of constituencies
Labour percentage
1966
Number of constituencies
Labour percentage

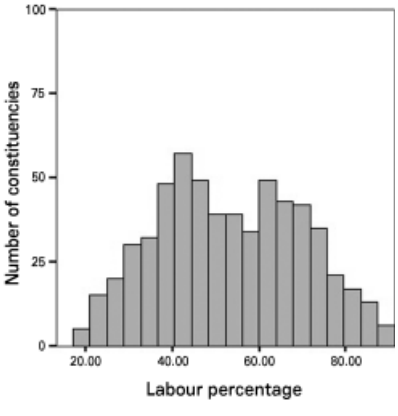
1970



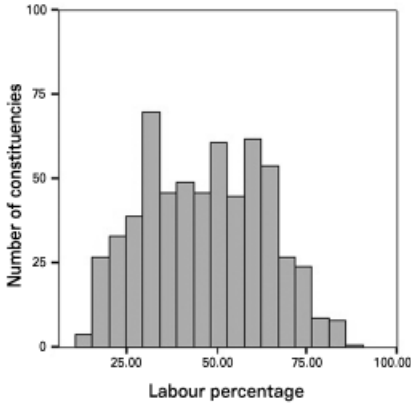
1974 (February)



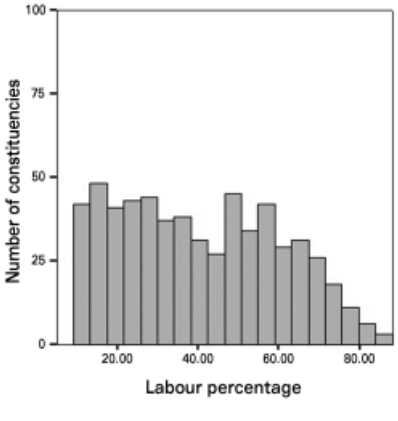
1974 (October)



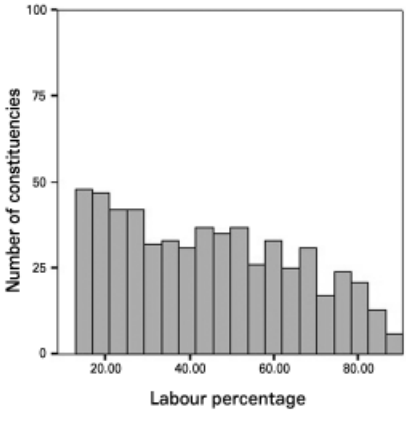
1979



1983



1987



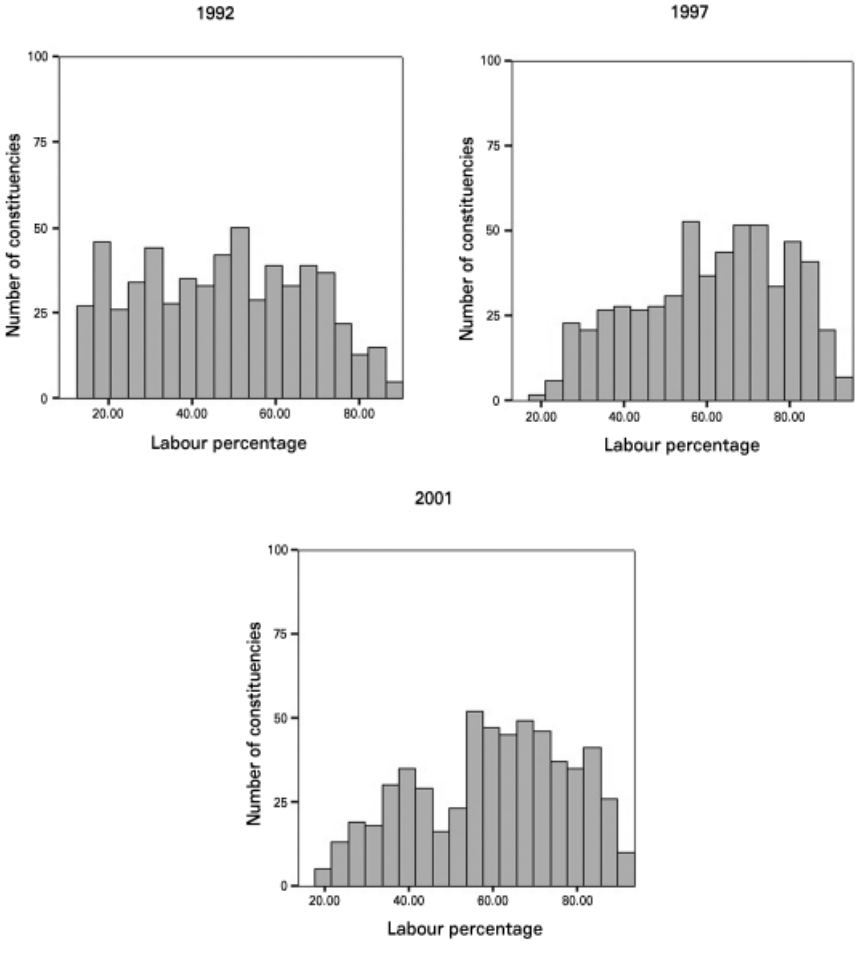


Figure 14 Frequency distributions of the Labour percentage of the two-party (Labour + Conservative) vote: 1950–2001

to the left). No longer, it seems, is Labour disadvantaged by large numbers of surplus votes in the seats that it wins and of wasted votes where it loses. Instead, the situation is reversed, to become the same as that enjoyed by the Conservatives in the 1950s and 1960s (i.e. the mirror image of the Labour pattern). Furthermore, the frequency distributions no longer even approximate a normal distribution: that for 2001 has a central 'hole' between 45 and 55 per cent of the two-party vote total, for example. This accounts for the very high peak to Labour's efficiency bias curve then (Figure 12): with a small shift of support to or from Labour's position relative to the Conservatives then, few seats would change hands: another case of the 'vanishing marginals' (Tufte 1973).

The implications of these trends with regard to surplus, wasted and effective votes are shown in Figure 15, for the equal shares position only. From 1950 until 1997, Labour accumulated more surplus votes on average in the seats that it won than did the Conservatives (though the difference was slight in both 1970 and 1979: Figure 15a). But in 2001 the position was reversed: the Conservatives had more surplus votes per seat won on average. Similarly with wasted votes per seat lost (Figure 15b). Although at some elections the difference between the two was not great, in general Labour tended to get more of these votes than did the Conservatives.

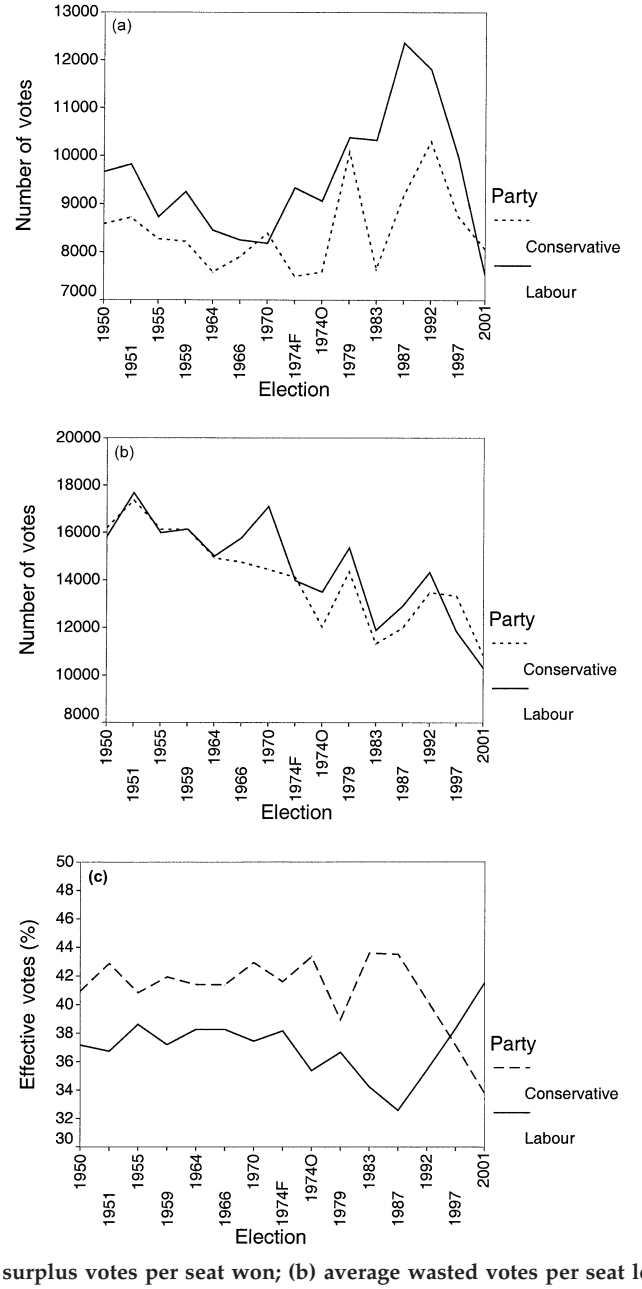


Figure 15 (a) Average surplus votes per seat won; (b) average wasted votes per seat lost and (c) percentage of all votes that were effective – with equal vote shares: 1950–2001

But in 1997 and 2001, the difference was clear and in the other direction: the Conservatives had the larger average number of wasted votes per seat lost. Finally, with regard to the percentage of a party's votes that are effective – neither wasted where they lose nor surplus where they win – until 1997, on average some 4 per cent more of the Conservative's votes were effective than was the case for Labour: in 2001, the position was reversed (Figure 15c).

From a positive to a negative skew – or from inefficiency to efficiency in Labour's vote distribution

What produced this major change? In 1950 and for several elections thereafter, the frequency distribution for Labour's percentage of the votes cast was very similar to one that would be produced if there was a strategy of producing a stacked gerrymander against it – positively skewed and so inefficient. By 2001, however, it was the Conservatives who suffered from such a distribution.

Four reasons can be suggested for this change:

1 Very substantial changes in the geographies for support for the Conservative and Labour parties;
2 Gerrymandering of constituency boundaries, either deliberately and explicitly, or as a consequence of changes in the non-partisan rules operated by the Boundary Commissions;
3 Focused constituency campaigns, so that Labour increasingly wins votes where they matter for the translation into seats; and, associated with this,
4 Anti-Conservative tactical voting.

Of these, the first can readily be dismissed. The overall geography of support for the two parties has remained consistent across the full set of elections, with Labour strongest in the cities and in the northern industrial areas and with the Conservative areas of strength in the suburbs and rural areas. (Using a constant set of 641 pseudo-constituencies, the average correlation between the Labour percentage of the two-party votes across adjacent elections over the period 1950–2001 is 0.901; the correlation between the most distant pair – 1950 and 2001 – is 0.675.[11])

Regarding the second, explicit gerrymandering is clearly not possible because the redistribution process is handled by independent Commissions operating non-partisan rules that have remained largely unchanged throughout the entire period. There is one possibility for some indirect gerrymandering, however. When the Commissions have determined their provisional recommendations for each local government area, these are subject to public consultation. Not surprisingly, the main contributors to this procedure are the political parties, who can use it to press the Commissions to adopt sets of constituencies for the areas under consideration that favour their electoral prospects. The Labour party realized the potential that this offered before the Commission's Fourth Periodic Reviews (1991–1995), planned a careful campaign accordingly and clearly got the better of their Conservative opponents – who were largely complacent about the procedure, believing that it was sure to favour them because it would remove creeping malapportionment (Rossiter *et al.* 1999). But this Labour success was almost certainly worth only about ten seats to the party after the last review – which was reflected in the 1997 result. There was no change of boundaries between 1997 and 2001, so this cannot account for the increased pro-Labour efficiency component at the second of those elections.

This leaves the last two possible influences – both of which involve the party changing its frequency distribution, at least at the margins given that the overall geography of support for each has remained constant. Party campaigns in Britain not surprisingly focus on those places where the victory is most in doubt – the marginal constituencies that could change hands with a relatively small swing from one party to another (i.e. those at the mode of the 1950s frequency distributions shown in Figure 14). Resources are needed for this. Financial resources are used to produce leaflets, posters and in various ways to sustain the campaigning activity; human resources are deployed to staff the campaign, to canvass voters (on their doorsteps and, increasingly, by telephone) in order to establish who are likely to support your party, and then to encourage the identified supporters to turn out on polling day. In general, studies have found that the more a party spends on its local campaign, the better its performance – although this is much more likely to be the case for Labour and the Liberal Democrats than for the Conservatives (Pattie *et al.* 1995). The Conservatives are able to raise more money locally for these campaigns, but are best able to do so in their safest seats, where campaigning for more votes and higher turnout brings few returns. Increasingly, especially at the 1990s elections and in 2001, Labour has targeted its expenditure-raising on marginal seats: it sees little value in campaigning hard either in its safe or its hopeless seats, in neither of which will more votes bring rewards. Similarly, Labour increasingly has targeted its human resources on marginal seats, if necessary moving workers between constituencies

to maximize the benefits for their activities. The Conservative party, on the other hand, is best able to field workers in its safe seats, again focusing its activity where it will have little overall impact on the seat-winning goal (Denver and Hands 1997; Johnston and Pattie 1996).

Until the 1990s, the misdirection of some Conservative campaigning effort was of relatively little consequence. But as the Labour campaign became more targeted, so the Conservatives were outmanoeuvred. By reducing its effort in its safe seats, Labour was less likely to amass lots of surplus votes there: it still won comfortably, but was content if substantial numbers of its supporters abstained. In this, it was assisted by changes in its voter base. Until the late 1980s, when the industry was significantly reduced in size, a lot of Labour's safest seats and largest majorities were in the coalfields, notably in South Wales and Yorkshire, where there was traditionally high turnout among the miners with little effort needed to mobilize that support. In the 1990s, those 'natural' large majorities disappeared, as they did also in some other industrial areas where the impact of the trades unions was much less as a pro-Labour mobilizing force. Nothing replaced them, and so turnout fell very substantially – perhaps exacerbated in 2001 by some of Labour's formerly core supporters in such areas being disenchanted with the policy shifts of New Labour: they no longer felt impelled to go out and vote Labour, and little was done locally to encourage them to do so.[12] And at the other end of the frequency distribution – Labour's hopeless seats – local Labour parties were generally weak, unable to raise much in the way of financial or human resources to mount substantial voting campaigns against the large Conservative 'electoral machines', and so the Labour vote was allowed to dwindle away. Little was done to mobilize support, either at election time or in the intervening years, in such places; Labour had little or no presence in the local government there that could stimulate support, for example, and as a result the number of wasted votes in such seats fell.

The focused campaigning on the marginals can account for the disappearance of the positive skew and the growing number of seats with small Labour vote percentages noted in Figure 14. But what about the centre of the frequency distribution? For this, the key issue over the last three elections has been tactical voting, whereby individuals vote for the second choice party, because it has a greater chance of victory in their constituency over their third choice than does their most-favoured party. Estimates suggest that some 6–7 per cent of British electors have voted tactically at recent elections, with much higher proportions doing so in the marginal than in the safe seats (Alvarez and Nagler 2000; Evans *et al.* 1998; Johnston and Pattie 1991; Johnston *et al.* 1997). In 1992 and 1997, the main goal of tactical voters was to unseat Conservative incumbents. Thus in Conservative-held seats where the Liberal Democrats came second and had most chance of victory, especially marginal seats held by Conservatives, Labour voters were encouraged to vote Liberal Democrat rather than Labour: similarly in Conservative-held seats where Labour had the best chance of victory, Liberal Democrats were encouraged to vote Labour instead (and did so: Johnston *et al.* 1997). In 2001, however, the main focus was not on unseating Conservatives but rather on retaining hold of marginal constituencies by both Labour and the Liberal Democrats. Thus in Labour-held marginal seats, Liberal Democrats were encouraged to switch their support to Labour – with Labour supporters similarly being encouraged to vote tactically in Liberal Democrat-held seats.

Table I indicates the success of these strategies at the 1997 and 2001 elections. The first block of data shows the change in each party's vote share between 1992 and 1997 in Conservative-held seats, according to which party came second in 1992 and the margin of victory then.[13] In seats where the Labour party was the main contender, the only variation was that it did slightly better in the safe than in the marginal seats: at this net scale, there is no indication of tactical voting involving Liberal Democrat supporters. But in the seats where the Liberal Democrats were best-placed to depose the Conservatives, there was very clear evidence of tactical voting: the more marginal the seat, the better the Liberal Democrat performance and the poorer the Labour performance – Labour's vote increased most in the safest seats, where the Liberal Democrat vote actually fell.

Turning to the 1997–2001 period, the second block of data in Table I shows the change in each party's vote share in seats where the Conservative party came second in 1997. In seats held by Labour, the Conservative vote actually increased in the most marginal constituencies, whereas the Liberal Democrat vote fell – allowing Labour to continue holding almost all of them despite the

Table I Change in party vote shares by seat marginality, 1992–1997 and 1997–2001

	Margin at previous election (%)					
1992–1997 Conservative-held seats						
Second-placed party		Labour			Liberal Democrat	
Change in vote for	C	L	LD	C	L	LD
0.0–4.9	–12.8	12.3	–2.3	–11.9	5.5	2.3
5.0–9.9	–11.5	12.2	–2.4	–9.6	3.6	2.8
10.0–14.9	–12.3	13.2	–2.5	–11.2	6.2	1.9
15.0–19.9	–12.8	13.8	–2.9	–11.9	7.9	1.0
20.0<	–13.2	13.3	–3.1	–12.9	9.4	–0.5
1997–2001 Seats with the Conservatives in second place						
Seat held by		Labour			Liberal Democrat	
Change in vote for	C	L	LD	C	L	LD
0.0–4.9	1.4	2.5	–2.2	–1.3	–4.1	7.7
5.0–9.9	0.3	1.6	–0.8	–1.3	0.2	1.3
10.0–14.9	–0.7	–2.0	1.4	0.1	–0.2	–1.0
15.0–19.9	0.3	–1.6	2.1	–0.9	0.0	1.2
20.0<	0.7	–4.1	2.8	2.3	0.8	–0.9

above-average increase in the Conservative vote share. And in the seats held by the Liberal Democrats, their vote increased very substantially in the most marginal constituencies (those won by a margin of less than 5% in 1997), whereas Labour's share fell substantially more than average.

These net change figures indicate how tactical voting helped to change Labour's frequency distributions (Figure 14). In 2001, for example, its vote fell substantially in its safest seats compared to 1997 – thereby reducing the number of surplus votes accumulated. This was also the case where the Liberal Democrats provided the incumbent – thereby reducing Labour's wasted votes per seats lost average. And the Conservatives' inability to increase their vote share in all but the most marginal Labour-held seats contributed to the hollowing-out of the central part of the frequency distribution in 2001. This created the situation whereby there were only five constituencies where Labour's lead over the second-placed Conservatives was less than 2 percentage points, a further seven where its lead was 2.0–3.9 points, and another seven where the lead was 4.0–4.9 points: there are only 16 seats where the Conservatives have to tackle a majority of less than 5 percentage points at the next election. Indeed, there are only 49 seats where the Labour lead over the Conservatives was less than 10 percentage points. A swing to the Conservatives from Labour of that magnitude (i.e. 5 percentage points) would see those 49 change hands, but still leave the Conservatives with 215 seats against 364 for Labour – a majority for the latter of 149 over its main opponent.

Conclusions

The Conservative party dominated British politics for much of the twentieth century, in part because it benefited from both the exaggeration and the bias elements that are built-in to the country's electoral system (without doing much to enhance those benefits: Johnston *et al.* 2002). These gains continued until the 1970s, after which the advantage switched increasingly to Labour. In part, the switch came about without any clear political strategy on behalf of the beneficiary: increased abstentions in its safe seats and the decline of its large majorities in some of those seats, plus the impact of seat-winning by third parties, all occurred serendipitously to Labour's advantage. But then towards century's end, Labour developed strategies that enabled it to benefit even more. In particular, its focused campaigns on marginal seats and the tactical voting that benefited both it and the Liberal Democrats in different areas meant that its vote distribution became increasingly efficient: fewer votes were wasted in the seats that it lost, and many fewer were accumulated that were surplus to requirements in seats that it won.

The efficiency of a party's vote distribution results from the interaction of two geographies – of party support and of constituency boundaries. In achieving a much more efficient distribution, Labour learned how to develop and operate strategies that had very significant geographical elements – to some extent changing the geography of boundaries, but to a much greater extent changing the geography of surplus, wasted and effective votes within those boundaries: it has achieved the equivalent of a very significant gerrymander without any explicit gerrymandering! Geography used to work in the Conservatives' favour: in 1997 and 2001 Labour worked it to its advantage, and thereby created a situation whereby the Conservatives will find future victories extremely difficult to achieve.

Notes

1 It is, therefore, an example of the modifiable areal unit problem, whereby different aggregations of the same set of small areas into larger areas produce different outcomes – in this case in terms of the relative distributions of voters for different parties.

2 Northern Ireland is excluded from these analyses, because of its separate party system.

3 Again, as Gudgin and Taylor (1979) show in more detail, the impact of skewness on the allocation of seats relative to votes is greatest where the party's mean percentage of the votes cast across all constituencies is relatively close to 50.

4 Monmonier (2001) identifies a range of different shapes associated with gerrymanders.

5 Clearly they cannot both win this percentage at the same time, so calculating the bias involves two sets of calculations – one for the number of seats Labour would win if it had 45.35 per cent of the votes (and the Conservatives 42.35) and the other when the percentages are reversed. Only at the equal vote shares does one set of calculations produce the bias figure.

6 The full algebra is set out in Brookes (1960) and reproduced in Johnston (1976). The formulae derived from that algebra, expanded to include additional components from those addressed by Brookes, are in Johnston *et al.* (2001). The basis of the formulae is that the difference between the two parties in the number of seats that they win with a given share of the votes can be accounted for by the ratios between the two parties in, for example, the average size of the constituencies that they win and their average numbers of excess, wasted and effective votes. (See also Johnston *et al*. 1999.)

7 The over-representation of Scotland will end after the next review by the Boundary Commission for Scotland, as a consequence of a change to the relevant Act after creation of the devolved Scottish Parliament. The Commission was directed to use the same electoral quota for determining the number of seats as used in England. With this, the Boundary Commission for Scotland's provisional recommendations, published in January 2002, reduced the number of constituencies in Scotland from 72 to 59. These new constituencies, if confirmed, are likely to be first used for the next but one election after 2001.

8 The use of 'gerrymander' to describe this component has been objected to by some on the grounds that the term implies corruption. In fact, as we have already noted, all districting is – of necessity – gerrymandering. Furthermore, the United States Supreme Court has recognized deliberate gerrymandering for political-electoral ends as a proper activity (in the case of *Hunt v Cromartie*, determined in April 2001): if it is proper it can hardly be corrupt!

9 Further work on the interaction effects is needed. In Brookes' original algebra, he looked at one interaction effect only – that between the two size components that he identified (constituency size and abstentions) and the efficiency (or gerrymander) component. In our adaptation of Brookes' method, we have introduced other components – those for national quotas and for third-party wins. There is thus potentially a large number of interaction terms between the various components in different combinations, and we have as yet not separately identified these.

10 The individual interaction components would show the degree to which various pairs of components accentuated or reduced the bias. For example, the interaction between constituency size and abstentions may show that one party benefited over the other because it tended to win in *both* the smaller constituencies and those with the higher abstention rates.

11 The pseudo-constituencies were designed to produce estimates of the geography of voting for the main political parties in the past, had the current constituency boundaries been in place then. For the most recent elections, detailed estimates of voting patterns in changed constituencies have been made by Rossiter *et al.* (1997) and BBC/ITN (1983). David Cutts used similar procedures to estimate earlier patterns.

12 In 1964, turnout in Barnsley Central was 80 per cent, compared to the national figure of 77 per cent. In 2001, turnout there at 54.9 per cent was below the national figure of 59.2 per cent.

13 Because the constituency boundaries were changed between 1992 and 1997, these calculations are based on estimates of what the 1992 election outcome would have been if it had been fought in the 1997 constituencies (see Rallings and Thrasher 1997).

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