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Australian Journal of Political Science

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713404457>

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To cite this Article Farrell, David M. and McAllister, Ian(2003) 'The 1983 change in surplus vote transfer procedures for the Australian senate and its consequences for the single transferable vote', Australian Journal of Political Science, 38: 3, 479 – 491

To link to this Article: DOI: 10.1080/1036114032000134001

URL: <http://dx.doi.org/10.1080/1036114032000134001>

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The 1983 Change in Surplus Vote Transfer Procedures for the Australian Senate and its Consequences for the Single Transferable Vote

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Among the 1983 changes to the electoral rules for Australian Senate elections using the Single Transferable Vote (STV) was a new procedure for determining the transfer of vote surpluses. The adoption of this modified ('inclusive') Gregory method has tended to be overlooked in the literature, yet as this article shows—using both hypothetical and real-world examples—it incorporates an anomaly that could have significance for electoral outcomes. This has important implications not only with regard to whether the 'correct' candidate is elected, but also for wider social choice debates over the quasi-chaotic nature of STV.

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Australia is (rightly) proud of its long and distinguished contribution to the development of electoral institutions, and this probably is best shown by the imaginative and bold steps taken by electoral engineers in designing the country's preferential electoral systems. While a small, rich literature pays attention to critical junctures in the evolution of the preferential systems at federal level, particularly in 1902, 1918–19, and 1949 (Goot 1985; Graham 1968; Sawyer 2001; Sawyer and Miskin 1999; Uhr 1998; Wright 1980), at most only passing reference is made to developments in 1983–84, when the Senate's single transferable vote (STV) system was amended in a number of important respects (on the 1983–84 reforms generally, see Farrell and McAllister 2000; Sharman 1986; Stone 1998; Uhr 2000). This paper focuses on a detail in the changes made in 1983 that, to date, has tended to be overlooked in the literature on electoral systems, both Australian and comparative.¹ This relates to the new counting rules for transferring vote surpluses.

In order to set this study in its proper scholarly context, in the first section we begin with a review of social choice debates over STV. As we shall see, this literature places emphasis on the quasi-chaotic nature of STV and, in particular, on how variations in the way in which an STV count is administered can have implications for which candidates are elected. The second section examines the change to surplus transfer rules made in the 1983 legislative reform, its shortcomings, and alternatives that ought to be considered in future reforms to the Senate's electoral system. The third section provides a hypothetical example of how variations in surplus transfer rules can affect electoral outcomes. Finally, in the fourth section we examine the debate over the use of the Senate's surplus transfer rules in a real-world setting, namely the Western Australian Legislative Council election of 2001, in which there were accusations that it resulted in the election of the wrong candidate.

The Place of STV in Social Choice Debates over Electoral Systems

In a series of fascinating overviews of historical trends in the study of social choice, Iain McLean and his various collaborators provide evidence of a close symbiotic relationship between the 'modern' historical antecedents of social choice theory and the practical development of systems for electing representatives in the first-wave democracies of Europe, North America and Australasia (McLean and Hewitt 1994; McLean and Urken 1995; McLean, McMillan and Monroe 1996). The debates in Britain in the late nineteenth and early twentieth centuries were particularly significant in this regard, not only reflecting its general status as a world power, but also its influence over electoral system design in some of its colonies. Given the prominence then being given in Britain to debates over electoral reform and the potential of adopting preferential systems such as STV, not least by prominent thinkers such as John Stuart Mill and influential pressure groups like the Proportional Representation System of the United Kingdom and Ireland (see Hart 1992), it is not surprising to find theoretical interest being shown in these systems, notably in the work of scholars like C.L. Dodgson (otherwise known as Lewis Carroll) and the Melbourne-based Edward Nanson who, behind the scenes, played

¹ There is a tendency to date these changes to 1984. In fact, there were two tranches of legislative change, the first of which, and the change we are interested in, passed through both houses of parliament in December 1983.

an important role in the (unsuccessful) efforts of the first Commonwealth government to introduce STV for Senate elections in 1902 (McLean 1996).

While finding much to praise in preferential systems—as compared to other electoral systems in operation or being proposed as alternatives—these scholars were quick to point to some fundamental problems in which preferential systems could produce perverse social choice outcomes,² a finding which is given extensive support by more recent social choice research (for a sample, see Brams and Fishburn 1983; Doron and Kronick 1977; Dummett 1984; Nurmi 1996/7; Tideman 1995).³ The Oxford logician Michael Dummett is probably the most trenchant social choice critic of preferential systems, particularly STV, arguing that they are ‘quasi-chaotic, ... exceptionally erratic in ... operation, producing results that are virtually random’ (Dummett 1997, 142, 151; also Geller 2002). He goes so far as to dub STV ‘the second worst electoral system ever devised’ (Dummett 1992, 111).⁴

The shortcomings of preferential systems are incontrovertible and well documented; however, it is worth noting that social choice criticism is not directed exclusively at these electoral systems. Indeed, throughout the debates in this literature it is observed that similar criticisms can be levelled at all the other available alternatives and, while theoretically there are electoral systems that could be designed to address many of these problems (such as, for instance, Brams and Fishburn’s (1983) ‘approval voting’), it is arguable that no electoral system could ever be perfect (Arrow 1962). This latter point has led some scholars to suggest that, instead of a seeming hopeless striving for the Holy Grail of electoral system perfection, attention might better be directed towards assessing the merits and demerits of the different electoral systems currently on offer, so that instead of judging the systems in terms of pre-defined axioms, the judgement should be based on the purported merits of the systems themselves (Levin and Nalebuff 1995; Sen 1995).⁵ Given the degree to which preferential systems can vary—particularly STV, which is probably more accurately described as ‘an evolving family of vote-counting rules rather than a single rule’ (Tideman 1995; on STV’s variations, see Farrell and McAllister 2003)—this opens up scope for assessing these systems based on their own merits, examining how variations in the detail of STV counting procedures may have implications for the election result. In this article, we examine one feature of variation in STV systems, relating to how surplus votes are

² As McLean (1996) observes, Nanson’s scholarly views on STV were at odds with his role as an expert advisor.

³ The catalogue of failure of preferential systems is large, including the following: an inability to ensure the election of a Condorcet winner (ie the election of a candidate who beats all other candidates in a series of pairwise competitions), non-monotonic tendencies (in which, paradoxically, a candidate’s chances of election can be harmed if her vote increases), and the inconsistent treatment of preferences (with some voters’ preferences being given more weight than others) (in general, see Doron and Kronick 1977; Dummett 1984; Tideman 1995). Attention is also given to the problems of voters acting in an insincere manner, attaching more importance to preferred outcomes rather than preferred candidates, a point encompassed by the Gibbard—Satterthwaite theorem that strategic voting occurs under all (non-dictatorial) electoral systems (see Cox 1997; Ordeshook 1986).

⁴ According to Dummett (1992), the worst is single member plurality. His advice on STV’s perverse social choice outcomes was influential in the decision of an internal British Labour Party commission (the Plant Commission) in the 1990s not to recommend this system for the United Kingdom.

⁵ Indeed, this may be one reason why Edward Nanson seemed prepared to drop his theoretical doubts over preferential systems when advising on the 1902 Commonwealth Electoral Bill.

transferred. As we shall see, an apparently small alteration in the detail of how surplus transfers are dealt with can have profound implications for determining which candidates win seats, and this speaks directly to social choice concerns over appropriate electoral outcomes.

The 1983 Reform and Competing Gregories

A major—albeit frequently overlooked—source of variation in the STV system relates to the process for transferring ballot papers in the case of surplus votes. It used to be standard practice in STV systems that when transferring a surplus after the election of a candidate, only those ballots that are surplus to the quota are transferred, at their full value, and based solely on the next preference marked on the ballot paper. Tasmania used it in its first version of STV in the late nineteenth century; the Australian Senate used it prior to 1984. It is still used in New South Wales (probably reflecting the fact that, as the first State to adopt STV for upper house elections in 1978, it had only the existing Senate system to follow as a model, and since then it has not seen any need to change), as well as in Malta and Ireland. In these cases, the determination of which ballots to actually transfer is based on random selection, which can have important implications in later counts, particularly when the results between two candidates are very close. Depending on which ballot papers were selected from the pile at an earlier stage in the counting process, in a close finish the fate of a candidate could be sealed by the particular pattern of preferences that predominated in those ballot papers. In other words, there are random effects involved in the counting process. While some have suggested that the prospect of this resulting in the incorrect election of a candidate is extremely unlikely (Lakeman 1974, 140), statistical analysis has demonstrated conclusively that, in fact, this procedure of transferring surpluses permits an ‘element of arbitrariness ... that ... can[not] be ignored with impunity’ (Gallagher and Unwin 1986, 253; see also Coakley and O’Neill 1984; Fischer 1978, 1981; Meek 1994).⁶

A solution to the problem is to take account of all preferences when allocating a surplus: this is done by transferring all ballot papers received by the candidate (ie not just a sample of those surplus to the quota) at a fraction of their count value. This is usually referred to as the ‘Gregory method’, after the Melbourne mathematician J.B. Gregory, who devised the scheme in 1880. The Gregory method was first used in Tasmania in 1907 when the State re-introduced STV, and it has been used there ever since. The ACT has also adopted this method. But, in other parts of Australia there is one significant difference in the version of Gregory method used. This relates to the transfer of surpluses at later stages in the count (ie *after* a first surplus transfer has occurred).⁷ Under the Gregory method, only the last parcel of ballot papers is transferred; all the other ballot papers are undisturbed.⁸ By contrast,

⁶ The Proportional Representation Society of Australia produced reports on New South Wales elections in the early 1980s that demonstrated the significance of this random element in cases of recounts when new random samples are drawn (pers. comm. from Bogey Musidlak).

⁷ We are grateful to Paul Wilder for drawing our attention to this issue, and to Bogey Musidlak for guiding us through its intricacies. In general there has been a tendency to overlook this modification of the Gregory method (Fischer 1988, 142; Gallagher and Unwin 1986, 247; McLean 1996, 377; Reilly and Maley 2000, 58).

⁸ Like Gregory, Edward Nanson also saw good mathematical reasons for advising that only the last parcel received should be included in the surplus transfer (for discussion, see McLean 1996, 277).

under the inclusive Gregory method used for the Senate and in South Australia and Western Australia, no distinction is made between the different ballot papers; instead, all of the ballot papers are transferred at a fractional value.⁹ The implications of this variation are discussed below. In the following paragraphs we briefly outline its origins.

As part of the 1983 reform, attention was given to changing the Australian Senate's system for transferring vote surpluses, and instead of following Tasmanian practice it was decided to develop an adapted form of Gregory. This decision provides an interesting illustration of the contingent nature of electoral system design (Goodin 1996).¹⁰ A series of close Senate elections in the 1970s and 1980s raised concerns over whether random sampling always produced the correct result. Perhaps the most celebrated case was the 1974 double dissolution, which threw up evidence of the dangers of random sampling, as well as of the problems of taking account only of the last parcel received. In Queensland, the Labor Party candidate, Malcolm Colston, failed by a narrow margin to win the last seat. One of the Liberal candidates was the incumbent Neville Bonner, who was placed third on the Liberal ticket. There was evidence from scrutineers' reports that a large proportion of the first-preference votes for Bonner had subsequent preferences for Labor candidates. However, because Bonner was elected on the basis of votes transferred from another candidate, only those ballot papers received in the last parcel were transferred on to the remaining candidates; none of the second preferences from Bonner's first-preference votes were transferred. There is good reason to believe that, had all of Bonner's ballot papers being included in the transfer to the remaining candidates, Colston would have secured the final seat (Colston 1975, 109; Fischer 1981, 59).

'Bonner syndrome'¹¹ and the problem of random sampling featured in the deliberations of the Joint Select Committee on Electoral Reform (JSCER) over reform of the Senate electoral system in 1983. Advice from the Proportional Representation of Australia (particularly by its President, Jack Wright), from academic experts (such as Alastair Fischer), and from the research staff of the Australian Electoral Office (the precursor to today's Australian Electoral Commission) all favoured a shift away from random sampling, but it is apparent that there was some ambiguity over what exactly was being proposed as an alternative. Certainly the presumption on the part of some of those providing the JSCER with advice was that it would opt for the Gregory method.¹² But advice from the Electoral Office, and the desire of Labor politicians to prevent the reoccurrence of the 1974 debacle, favoured moves to modify the Gregory method so that it would

⁹ We refer to this as 'inclusive' because it involves the inclusion of all ballot papers.

¹⁰ Some of the following discussion is based on personal communications from Alastair Fischer, Michael Maley and Bogey Musidlak.

¹¹ See the comments of the chair of the Joint Select Committee on Electoral Reform 8 August 1985 (JSCER 1986, 1057).

¹² See, for instance, the submission by the Proportional Representation Society of Australia to the JSCER in 1983, which, while acknowledging the possibility that a modified form of the Gregory method to take account of all ballot papers might be adopted, warned that 'this would impose a very considerable additional burden on the Electoral Office' (PRSA 1983, 739). At no other point, either in its written submission or in its public evidence, does the PR Society make any further reference to this possible modification. Alastair Fischer has also informed us (private communication) that he was unaware that such a modification was being considered.

include all ballot papers, not just the last parcel received. This was the recommendation of the JSCER in 1983 (JSCER 1983, 65), and it was adopted—virtually without any parliamentary debate¹³—in the Commonwealth Electoral Legislation Amendment Act of that year.¹⁴

It is possible to imagine scenarios in which the method of transferring surplus votes could have a significant effect on the election result. Take the case of Candidate A, who is a fundamentalist Christian and who is swept to victory on a strong anti-abortion manifesto. A certain proportion of A's supporters gave their second preferences to Candidate B who, despite holding more secular views on politics, is also a Right-of-Centre politician. It is likely that a large proportion of B's supporters, who gave her their first preference, did so on the basis of her Right-of-Centre views on the economy; if anything, many of them may have been put off by A's views on abortion. We can expect, therefore, that the patterns of preferences of those who gave A their number one is likely to show some significant difference to those giving B their number one. Under the random selection and Gregory methods, only the parcel of ballot papers received from A would be available for transfer, and it is debatable whether they represent an accurate sample of the average B supporter.

Such a scenario—which had featured in the 1974 election—weighed in the minds of some of the advisors involved in drawing up proposals for amending the Senate system a decade later, and in large part this explains the reason for adopting the inclusive Gregory method. Unlike the Gregory method in which the transfer value (TV) for the ballots being transferred is calculated as s/a , where s is the candidate's surplus vote and a is the last parcel of ballot papers received, under the inclusive Gregory method, $TV = s/n$, where n is the total number of ballot papers in the candidate's pile. This removes the problem of 'Bonner syndrome' because all ballot papers are included, not just the last parcel received. However, in fact, it merely replaces one potential anomaly with another. As critics point out, under the inclusive Gregory method, it is possible for a ballot paper's TV to increase in later counts, thereby attaching undue weight to some ballot papers and insufficient weight to others. As ever, and as we shall see below, such an anomaly brings with it the danger of electing the wrong candidate.

To avoid this potential pitfall, it has been suggested—by, among others, the Proportional Representation Society of Australia—that all ballot papers should be included in calculating TVs, but in order to do so correctly the contention is that all past TVs should be given appropriate weights to reflect their contribution to previous counts (see Dummett 1997, 129; Meek 1994, 2–3). This is achieved by taking account of the TVs that were applied in previous counts. The adaptation that

¹³ The closest that parliamentarians came to addressing this issue was when Senator Missen read out a letter he had received from Jack Wright (*Commonwealth Parliamentary Debates, Senate* 30 November 1983, 3055) which warned of several problems in the proposed reforms of the Senate system, one of which was the modifications to the Gregory method. The letter was hardly a model of clarity, and most of Wright's warnings appear to have fallen on deaf ears.

¹⁴ The merits of the inclusive Gregory method were given far greater prominence in the subsequent report of the JSCER in 1986, in which, in particular, the Proportional Representation Society of Australia fought a rearguard action to have it replaced by a weighted inclusive version (discussed below). While this proposal received a sympathetic hearing from some committee members, ultimately it was deemed too cumbersome to implement. In addition, the Electoral Commission staff argued in favour of retaining the inclusive Gregory method.

has been recommended by the Proportional Representation Society, which we shall call the weighted inclusive Gregory method, produces the following procedure for determining the TV for a candidate's surplus votes. For those votes that the candidate has received at full value, $TV = s/v$, where v is the candidate's total vote. For those votes that the candidate has received from another candidate's surplus, $TV = (s/v)\beta$, where β is the TV that was applied in the transfer of the surplus votes to the previous candidate.

In recent years, the Proportional Representation Society of Australia has tended to downplay this option, favouring instead a strategy of simply trying to replace the inclusive Gregory method with the Gregory method. But given that, in certain prominent cases, there has been a shift towards computer-aided counting—eg the ACT, Western Australia, and also recent experiments in Ireland (that have also included computerised voting)—there are now good grounds for giving the weighted inclusive Gregory method some serious consideration. For that matter, attention might also be given to even more elaborate revisions of STV counting rules, such as the Meek method (Hill 1994; Meek 1994) recently adopted by New Zealand for its district health board elections and possibly also for local government elections.¹⁵ The Meek method builds a number of innovations into STV, most notably that an elected candidate should continue to receive vote transfers until the count is completed (thereby ensuring that the transfer of votes proceeds in the original order set by the voters on their ballot papers) and that the quota should be recalculated throughout the count to take account of non-transferable ballot papers. The implication of this is that the count process becomes so complex that it can only be done by computer. Under the Meek method, the transfer of vote surpluses is very similar to the weighted inclusive Gregory method outlined above, namely it takes account of all ballot papers and attaches appropriate weights to those ballots transferred on the basis of previous surpluses (Meek 1994), and for this reason we shall not include it in the analysis to follow in the third and fourth sections of this paper.¹⁶

The Effect of Different Surplus Transfer Rules on the Election Result: A Hypothetical Example

The difference between the three types of Gregory method, and their effects on election outcome, is best illustrated by way of a hypothetical example.¹⁷ Shirley has received 35,000 first-preference votes, but is still short of the quota of 50,000. In the second count, she receives a further 10,000 votes from Tom's surplus, representing 100,000 ballot papers at a TV of 0.1. Ultimately, Shirley is elected in the third count, when she receives 25,000 votes, at full value, from Dick who had been excluded after the second count. Shirley's vote total of 70,000 ensures her election, with a surplus of 20,000 votes. The fourth count involves the distribution

¹⁵ Another variant that should also be mentioned in passing is the Warren method, but to date this has not been adopted anywhere (Tideman and Richardson 2000).

¹⁶ As Narelle Miragliotta points out, however, because the Meek method also recalculates the quota throughout the count process and transfers ballot papers to candidates already elected, 'it is possible that it might occasionally produce slightly different election results to the weighted inclusive Gregory system' (Miragliotta 2002, 33).

¹⁷ This example is based on one produced by the Proportional Representation Society of Australia.

Table 1. Variations in the value of surplus ballots under different STV counting procedures: a hypothetical example

	Shirley's ballot papers		
	First count: Shirley's 35,000 first preferences	Second count: 100,000 ballot papers from Tom	Third count: 25,000 ballot papers from Dick
Gregory method			
Incoming value	1	0.1	1
Outgoing value	0	0.1	0.8
Contribution to surplus (%)	0	0	100.0
Inclusive Gregory method			
Incoming value	1	0.1	1
Outgoing value	0.125	0.125	0.125
Contribution to surplus (%)	21.9	62.5	15.6
Weighted inclusive Gregory method			
Incoming value	1	0.1	1
Outgoing value	0.286	0.029	0.286
Contribution to surplus (%)	49.9	14.5	35.6

Note: Calculations are subject to rounding errors.

of her surplus. It is at this point that the differences between the various forms of Gregory method become all too apparent.

The differences in outcome are revealed in Table 1. In the case of the classic form of the Gregory method (as used in the ACT and Tasmania), the potential for 'Bonner syndrome' is shown by how neither Shirley's 35,000 first preferences nor the 10,000-vote surplus she received from Tom make any contribution to her 20,000-vote surplus. Instead, the only ballot papers to transfer are those that she received in the third count from Dick. The inclusive Gregory method (used in the Australian Senate, South Australia and Western Australia), by contrast, does take account of all Shirley's ballot papers; however, here the problem is that the transfer value of Tom's ballot papers has actually increased from 0.1 to 0.125. To put it another way, the 100,000 ballot papers that were worth 10,000 when received from Tom, are now worth 12,500, in effect, giving all those voters involved in first voting for Tom more than one vote.

The weighted inclusive Gregory method avoids both anomalies: all ballot papers are included, and the transfer values are weighted appropriately. To date, the Proportional Representation Society of Australia has been unsuccessful in its attempts to persuade the Joint Standing Committee on Electoral Matters (JSCEM, the successor to the JSCER) to change the method used for transferring surplus votes (either to Gregory or to weighted inclusive Gregory). This is despite the fact that the Society has produced evidence of real-world cases where TV has increased in value.¹⁸ The most likely reason why the JSCEM has not been minded to recommend change is a feeling (certainly one held by its advisors in the Australian Electoral Commission) that such occasions of where TV increases in value are likely to be very rare.

¹⁸ According to Bogey Musidlak (pers. comm.), this was found in an analysis of periodic national elections for the Aboriginal and Torres Strait Islander Commission (ATSIC), which also uses the inclusive Gregory method.

Regardless of whether or not the types of anomalies identified in the two versions of the Gregory method currently in use in Australia actually affect real election results, the point is still worth stressing that in the case of each version of the Gregory method, different values are being given to the ballots papers that are available for transfer. This is shown by the 'contribution to surplus' entries in Table 1. Compare, for instance, the values for the 25,000 ballot papers that Shirley received from Dick across the three methods. Under the Gregory method, they are transferred from Shirley with the value of 20,000 votes; under the inclusive Gregory method they are worth 3125 votes; while under the weighted inclusive Gregory method they are worth 7150 votes. Without having to make any judgement on our part as to which of the three values is most appropriate, it is apparent, nonetheless, that the choice of procedure for allocating surplus votes is bound to have significant effects on the final election result. It is inconceivable that the fate of some candidates will not be influenced by this decision, particularly in close races.

Was a 'Wrong' Candidate Elected in Western Australia in 2001?

In 1974 Malcolm Colston's supporters felt they had good reason to argue that, by only taking account of the last parcel of ballot papers received when transferring Neville Bonner's surplus votes, Colston had been robbed of the election. In 2001, similar accusations flew in the Legislative Council elections in the Mining and Pastoral region of Western Australia, except on this occasion the argument was in reverse: the basis of the criticism now was that only the last parcel of ballot papers should have been taken into account in determining a transfer.

The relevant details are as follows. One of the One Nation candidates, John Fischer, was elected in count 234 as a result of receiving 4397 vote transfers from the exclusion of Mark Nevill (Independent). Fischer's final tally of 11,874 votes gave him a surplus of 3813 votes to be distributed among the remaining candidates. This surplus transfer would determine which of the two remaining candidates—Robin Chapple (Greens) or Greg Smith (Liberal)—would be elected: only 214 votes separated them. In the event, more of Fischer's transfers went to Chapple (1949 votes) than to Smith (1233) and Chapple was elected.

Smith's supporters argued that the wrong candidate had been elected, and their criticisms (for the most part, implicitly) centred on the use of the inclusive Gregory method in Western Australian STV. The criticisms were twofold. First, it was observed that the weight of Nevill's transfers to Fischer (the bulk of which, under Nevill's voting ticket, placed Smith above Chapple) was greatly reduced when they were being transferred from Fischer, because of the inclusive Gregory method of taking account of all ballot papers, not just the last parcel received.

The gist of the argument was that, if the Gregory method had been used instead, in which account is taken only of the last parcel received, then Smith would have won the last seat.¹⁹ This claim—which reverses the Colston (1975) criticism of Senate counting rules in 1974—is undoubtedly correct. As can be seen in Table 2,

¹⁹ The matter was debated by the Standing Committee on Legislation, resulting in a minority recommendation to replace the inclusive Gregory method with the Gregory method (SCLWA 2001). While this recommendation was not adopted, it cannot be ruled out that the Western Australian government might in the future propose changes to the procedures for transferring vote surpluses.

under the Gregory method, only Nevill's votes would have counted and, since all but 88 of these placed Smith above Chapple, there can be no doubt that Smith would have won the seat.²⁰ However, the point is that under the existing legislation (the 1907 Electoral Act), the correct procedures were applied, and therefore Chapple was the correct person elected.

The second criticism made by Smith's supporters—and one backed up by detailed analysis by mathematicians²¹—relates to the issue raised in the third section of this paper about the potential for the inclusive Gregory method to inflate the value of a vote. This centred on 89 ballot papers that Fischer had received (directly and indirectly via other candidates) from the surplus votes of Jon Ford (ALP). As Table 2 shows, Ford's transfers were each worth 0.14246115 when received by Fischer, but their outgoing value increased to 0.26582596. This provides tangible support for the arguments made above (see Table 1) about how the inclusive Gregory method can result in anomalous situations.

However, as the Western Australian Electoral Commissioner observed (Evans 2002, iii), on this occasion—given the tiny number of ballot papers involved—there was a negligible effect on the ultimate electoral result. This is shown by our analysis in Table 2 of how the weighted inclusive Gregory method would have performed. The differences between it and the inclusive Gregory method are tiny. In short, while there may well have been an anomaly in how the inclusive Gregory method dealt with votes transferred from earlier vote surpluses, this had no bearing on the eventual electoral outcome on this occasion. But there is no guarantee that more serious problems may not emerge in the future.

Conclusion

This paper has reviewed one of the changes made to the Senate's electoral system in 1983, relating to the procedures for transferring vote surpluses. In the first instance, the decision to implement a modified version of the Gregory method, while understandable in the light of the 'Bonner syndrome' debacle of a decade earlier, nevertheless points to a logical shortcoming in the operation of the STV system. As we discussed, by varying the type of Gregory method used it is possible to influence the weight being attached to particular vote preferences. In a close race, this can be crucial in determining the fate of individual candidates. Such an inconsistency in the treatment of candidates under the different variants of STV provides support for the theoretical criticisms of STV in the social choice literature.

As we saw in the first section of this paper, a central concern of social choice theory is that an electoral system should ensure that the correct candidate, the Condorcet winner, is elected. Staunch critics of STV—prominent among them Michael Dummett—berate STV for producing 'quasi-chaotic' results in which the fate of an individual candidate is determined by particular features of the counting procedures, most notably with regard to how voter preferences are treated. Given

²⁰ According to information supplied by the Western Australian Electoral Commission during a debate in the Legislative Council's Estimates Committee, 4252 of Nevill's 4397 ballot papers consisted of ticket votes, and of the remaining 145 ballot papers, 57 placed Smith above Chapple, and 88 placed Chapple above Smith (WALCEC 2001).

²¹ *Parliamentary Debates, Western Australian Legislative Council* 20 February 2002, 7657–8; 21 February 2002, 7773–5.

Table 2. Variations in the value of surplus ballots under different STV counting procedures: the Western Australian Mining and Pastoral count of 2001

	John Fischer's ballot papers						4397 from Nevill's exclusion
	Fischer's 7073 first preferences	385 ballot papers from exclusions	24 ballot papers from Stephens	6 ballot papers from Moore	89 ballot papers from Ford		
Gregory method							
Incoming value	1	1	0.57172424	0.36829482	0.14246115	1	
Outgoing value	0	0	0	0	0	0.72390266	
Contribution to surplus (%)	0	0	0	0	0	100	
Inclusive Gregory method							
Incoming value	1	1	0.57172424	0.36829482	0.14246115	1	
Outgoing value	0.26582596	0.26582596	0.26582596	0.26582596	0.26582596	0.26582596	
Contribution to surplus (%)	59.1	3.2	0.2	0.0	0.7	36.7	
Weighted inclusive Gregory method							
Incoming value	1	1	0.57172424	0.36829482	0.14246115	1	
Outgoing value	0.268064679	0.268064679	0.153259074	0.098726832	0.038188802	0.268064679	
Contribution to surplus (%)	59.5	3.2	0.1	0.0	0.1	37.0	

Note: Calculations are subject to rounding errors.

that, as we have seen, the weight attached to voter preferences can vary dramatically across each of the three Gregory methods reviewed in this paper, there is strong empirical evidence to support social choice criticisms of STV.

The evidence presented in this paper also provides strong support for the criticisms levelled, among others, by the Proportional Representation Society of Australia against the particular variant of Gregory that has been used for Australian Senate elections (as well as in South Australia and Western Australia) over the past 20 years. The inclusive Gregory method can produce a significant anomaly, namely that under certain circumstances a ballot paper can actually increase in value at later stages of the count. While the Australian Electoral Commission officials may well be correct in the view that the likelihood of such an occurrence affecting the outcome of an election is very small, surely such a view is too sanguine. The count in the Mining and Pastoral region of Western Australia in 2001 provides real evidence of this anomaly occurring. Even if this had no effect on the election result on this occasion, the fact that it can occur is surely reason enough to consider changing this procedure. And given the potential now being offered by computer-aided counting (as used in parts of Australia and as likely to be used in the next Irish general election), now is an opportune time to re-examine the potential of more appropriate surplus transfer methods such as offered by the weighted inclusive Gregory method or, indeed, by Meek.

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