A LINEAR PROGRAMMING APPROACH TO THE ECONOMIC THEORY OF ELECTIONS
J. Ronnie Davis and Louis H. Zincone, Jr.*

In recent years economists and political scientists have demonstrated an increasing interest in the "theory of committees and elections" [1], the "theory of parties and candidates" [4, 6, 8], and the "theory of constitutions" [3]. From this body of literature, many important conclusions have been drawn. Black [1] demonstrated the importance of single-peaked preference functions, Downs [6, p. 118] and Davis and Hinich [5], the importance of the mean preference in one- and n-dimensions, respectively, and Buchanan and Tullock [3, p. 183ff] and Riker [8, esp. pp. 32-46], that parties will seek the minimum coalition necessary to win an election.

The purpose of this paper is to show how a linear programming model of elections (especially at-large or multimember elections) leads to identical conclusions and at the same time admits the important possibility in at-large or multimember elections that a particular candidate(s) may be supported by more than one party, a situation not previously considered in the literature. When this occurs, a classic "free rider" situation results, and the best strategy for a minority party is to refrain from voting for the candidate which the other party supports. 1

I. THE LINEAR PROGRAMMING APPROACH

Introduction

In the literature on public choice, almost all analysis has dealt with the party’s strategy in elections in which two parties compete against each other in order to place a previously selected candidate or set of candidates in office. In such analyses, political parties have been viewed correctly as firms which transform given inputs (support for candidates and positions) into outputs (votes) by varying their factor proportions (positions on issues) and scale. Just as in the Hicksian theory of the firm, this literature assumes that the technological problem of the party has been solved. Thus, a party need determine only the positions it will take on the various issues to maximize its votes (just as the Hicksian firm decides only the proportions in which it will employ given factors of production and the scale of its enterprise).

*The authors are associate professor of Economics at University of Florida and associate professor of Economics at East Carolina College.

1The free rider problem refers to the ability of a person or set of persons to consume a good or use a factor of production without paying for it. Simple maximizing behavior then dictates that the individual abstain from paying taxes unless compelled to do so.
This approach neglects the behavior of parties in many local elections throughout the country which are nominally nonpartisan and at-large. In these elections, candidates simply declare themselves candidates for the city council, school board, etc., without party affiliation; and the would-be party, whatever its basis for supporting candidates, chooses a subset of these candidates to support. Consequently, one candidate may well receive the support of more than one party.

Since linear programming is concerned with choosing the correct “processes” (or subsets of all inputs available) as well as the proper combination of these processes and the scale at which the firm will operate, it is particularly suitable for analyzing the selection of a subset of candidates to form a slate. To use the linear programming approach to public choice really amounts to analyzing not only how parties should choose their candidates but also the strategic implications when two parties support a given candidate. Only when we push the analysis back to the level of choosing the candidates as well as the support levels can we obtain a clear picture of the strategy of parties in at-large elections.

The importance of investigating the actual choice of candidates becomes clear when we investigate the specific differences between the single-member election (which has been assumed implicitly or explicitly in most public choice literature to date) and an at-large election.

The first and most important difference is that each party in a multimember or at-large election must make an explicit decision about candidates to support. The final decision, as we see later, may be to support less than a full slate of candidates, but this is something to be determined from the conditions prevailing at the time of the elections. The second important difference is that it may be entirely rational for two parties to support, either explicitly or implicitly, one or more of the same candidates. Again, whether or not this occurs depends on the particular situation. In the numerical example introduced in Section III, we force this to

---

2 It should be noted that most of these coalitions are in fact political parties and use the party’s machinery, but this is not always true. In other words, a party is always a coalition of individuals, but a coalition of individuals supporting a candidate is not always a party, as generally understood.

3 For a definitive statement on the differences between the Hicksian theory of the firm and linear programming, cf. Thomas F. Naylor [7]. It should be noted here also that a choice of processes necessarily is observable in terms of factor proportions, but the usual Hicksian theory assumes a square matrix of production constraints and one and only one set of factor proportions which satisfies these constraints and still minimizes costs at given prices. Linear programming, on the other hand, involves a non-square matrix with several square subsets or partitions. In each of these square partitions, there is a cost-minimizing solution, but they are different and only one will be a global minimum.

4 Some may suggest that at-large elections are not important. We would differ from this in that many elections for local governing boards are held at-large.