

## **PROPORTIONAL REPRESENTATION: BROADENING THE OPTIONS**

### *Abstract*

Using Monroe (1995) as a springboard, we extend and generalize his system of proportional representation (PR) by developing a general method for determining a set of winners from the ballots. Central to our analysis is the use of integer programming, which is a type of linear programming. Under Monroe's system and our generalizations of it, one minimizes total misrepresentation, where misrepresentation is based on approval votes, the rankings of candidates, or other ballot information. Our method allows for a variety of PR systems, including those proposed by Monroe, Chamberlin and Courant (1983), and Tullock (1967), as well as a new system we call "hierarchical PR." Ties, the filling of vacancies, and certain problems of both large and small electorates are all rendered manageable with integer programming. We discuss nonmanipulability, representativeness, and other criteria for selecting a PR system and conclude with some recommendations.

*JEL Classification:* D72. *Keywords:* Proportional representation; voting; approval voting; manipulability; integer programming.