FISCAL POLICY, ECONOMIC PERFORMANCE, AND VOTE-GETTING

EFFICIENCY: A DEA RANKING OF PRESIDENTS, 1880-2000*

William B. Tankersley** and Alfred G. Cuzán***

**Assistant Professor of Public Administration, Division of Administrative Studies, The

University of West Florida, Pensacola, FL, 32514, wtankers@uwf.edu.

***Professor of Political Science, Department of Government, The University of West Florida,

Pensacola, FL, 32514, acuzan@uwf.edu.

FISCAL POLICY, ECONOMIC PERFORMANCE, AND VOTE-GETTING EFFICIENCY:

A DEA RANKING OF PRESIDENTS, 1880-2000

William B. Tankersley and Alfred G. Cuzán

The University of West Florida

Abstract. Using DEA methodology, we estimate and rank the relative efficiency of presidents at converting fiscal, economic, and political variables at the end-of-term election into votes for themselves or their party's candidate. Thirty administrations spanning the period 1880-2000 are compared. The analysis yields several efficient presidents from each party. On the basis of these findings, we offer recommendations to students of the presidency, including would-be aspirants to the office and their advisors.

I. Introduction.

Data Envelopment Analysis is a technique for evaluating the efficiency of organizations in terms of inputs and outputs. In the only application DEA to presidential elections that we know of, Berry and Chen (1999) ranked the efficiency of incumbent party reelection campaigns between 1948 and 1996 by comparing two election inputs, presidential popularity and the growth in employment, to the percent of the popular vote garnered by the party occupying the White House, their "output." This paper follows in Berry and Chen's footsteps, albeit with a different election model and a longer data series. In our model, which we call the fiscal model, the output variable is the percent of the two-party vote going to the incumbents and the input variables total five: two measures of economic growth, one of voter fatigue, one of party (Democrat or Republican) and one of fiscal policy. Be it noted that both Berry and Chen and ourselves take a

vote measure as the "output" and at least one economic measure as our "input," and we both use DEA to rank the relative efficiency of the incumbents at winning votes. However, unlike Berry and Chen, we do not use presidential popularity as one of the inputs. Instead, we take into account how long the incumbents have been in office and, most distinctively, the impact of the fiscal policy during the presidential term on the vote. Moreover, we estimate the model over 31 consecutive elections between 1880 and 2000.

The rest of the paper is organized as follows. We briefly review the fiscal model of presidential elections in the next section. In Section III we review Berry and Chen's model, present our own DEA application, and compare our results with theirs. Our conclusions and recommendations make up Section IV. Finally, a discussion of DEA is placed in Appendix A, and all data in Appendix B.

II. The Fiscal Model: A Summary.

The fiscal model of presidential elections rests on the supposition that changes in federal spending relative to Gross National Product between elections is an important though not the only factor going into the voters' decision on whether or not to return the incumbents, the president or his party's candidate, to the White House (Cuzán and Bundrick 2000; Cuzán, Heggen, and Bundrick 2003).[1] It is assumed that even as voters value the goods and services provided by Washington, absent an emergency such as war the electorate evaluates presidential performance, and hence are inclined to vote for or against him or his party's nominee at the next election, partly according to fiscal policy. Fiscal policy takes two values, expansionary or cutback. (A third possibility, a steady-state policy, is absent in the data. See Appendix B.) Generally, fiscal policy is expansionary if, relative to the previous four-year presidential term,

the ratio of federal outlays to Gross National Product has increased at the same or greater rate between election years. Fiscal policy is cutback if, again relative to the previous term, the ratio of federal outlays to GNP has either decreased or slowed down in growth. A mathematical definition of these two policies is presented in Table 1.

It is hypothesized that *other things being equal* fiscal expansion is associated with defeat and fiscal cutback with victory at the polls. History appears to bear out this expectation. In the 31 elections held since 1880, fiscal policy alone accounts for four-fifths of presidential election outcomes. Administrations that implement a cutback policy have usually found favor with the voters at the end-of-term election, while those that pursued an expansionary policy have not. Multiple-regression models show that the relationship persists after controlling for economic conditions, consecutive terms in office (a measure of "voter fatigue"), whether the president himself is running for reelection, whether the incumbents are Democrats or Republicans, and war. On average, switching fiscal policy from a cutback to an expansionary mode costs the incumbents between about five percent points in the two-party share of the popular vote for president (Cuzán, Heggen and Bundrick 2003).

In the most recent version of the fiscal model, here re-estimated with the latest economic data posted by Fair (2002),[2] it takes the following form:

$$VOTE2 = 50.8 + 0.59(g3) + 0.47(NEWS) - 2.9(FISCAL) - 1.4(TERMS) - 1.9(PARTY) + \varepsilon_i$$
$$(26.1) \ (5.1) \qquad (2.0) \qquad (-4.6) \qquad (-3.2) \qquad -(3.3)$$
$$N=31, \ Adj. \ R^2=0.73, \ S.E.=3.2, \ D.W.=2.0$$

where all variables are specified as shown in Table 1, t-statistics are shown in parentheses, the standard error is 3 percent points, and the Durbin Watson statistic is 2.0.

In plain English, what the statistical model shown above says is that *other things equal* the percent of the two-party vote going to the incumbents rises with a growing economy, but falls when fiscal policy is expansionary, the more consecutive terms the incumbents have occupied the White House, and when the incumbents are Democrats.[3] The model accounts for almost three fourths of the variation in the vote over the last 31 elections, beginning with that of 1880. On the basis of these findings, the authors draw a practical recommendation for presidents and their advisers: if they wish to retain control of the White House for their party, they should reject a policy of fiscal expansion.[4]

. . . .

Table 1 about here

. . . .

In the next section, we take this model as our point of departure for the DEA application. Our primary objective is to assess and rank the relative efficiency of presidents at converting the fiscal, economic, and political conditions incorporated in the fiscal model into votes for themselves or their party's candidate and the end-of-term election. Secondarily, we wish to see what, if any, patterns are discernible in the distribution of presidential vote-getting efficiency scores.

III. Evaluating Vote-Getting Efficiency.

Presidents have to persuade voters to grant them or their party another term in the White House. In the fiscal model it is assumed that voters take certain economic, fiscal, and political variables into account when deciding whether or not to consent to the incumbents' wishes. Going into a presidential election, the values of these variables are pretty much given. These

constitute the "inputs" of the election. The "output" is the actual percent of the two-party vote

that the president or his party's candidate garners at the polls. An input-output analysis allows

one to evaluate the relative efficiency of incumbents at converting inputs (the given values of the

variables incorporated into the fiscal model) into output (votes). Our goal is to find out which

presidents have done relatively better at getting the most votes for themselves or their party's

candidate given the conditions at the time of the election. To do so, we resort to the

methodology of Data Envelopment Analysis.

In the only other study that to the best of our knowledge has employed this technique in

presidential elections, the "'output' variable selected for the case study is the percentage of the

popular vote received by the incumbent party in the 13 presidential elections held from 1948 to

1996 (P_y). The two 'input' variables are the incumbent president's July approval rating A_y and

the state of the economy in July as indicated by the growth rate of employment in the preceding

12 months (1 July of the preceding year to 30 June of the election year) E_y" (Berry and Chen

1999: 382). Of the 13 cases incorporated into their analysis, six times the incumbents proved to

be relatively efficient at translating the July conditions into November votes: 1948

FDR/Truman, 1952 Truman II, 1964 Kennedy/Johnson, 1972 Nixon I, 1980 Carter, and 1984

Reagan I.[5] These administrations, located at the DEA "efficiency frontier," serve as "reference"

points for the others. By contrast, seven administrations performed relatively poorly at winning

voter support given their respective July conditions: 1956 Eisenhower I, 1960 Eisenhower II,

1968 Johnson II, 1976 Nixon/Ford, 1988 Reagan II, 1992 GHW Bush, and 1996 Clinton I.

These cases are located "behind the [DEA] frontier" (Berry and Chen 1999: 384). This means

that a greater vote output could have been obtained had the incumbents been more successful at

persuading the electorate that they deserved another term in the White House, again given the July conditions. Thus, "The [DEA] frontier identifies those campaigns that were most effective in converting the July baseline into their popular vote shares in November, those that were less effective and by how much" (Berry and Chen 1999: 385).

Be it noted that being located on the efficiency frontier and winning the election are not synonymous. Incumbents may wage a relatively efficient campaign for votes yet still lose at the polls and vice-versa. In fact, Berry and Chen found no relation between efficiency and victory (1999: 383). As we shall see, neither did we.

Our application of DEA to presidential elections is somewhat different than Berry and Chen's (1999), however. In the first place, neither the "output" nor the "inputs" of the model are the same. In the fiscal model of presidential elections summarized in Section II, the output consists not in the percent of the total vote but in the percent of the two-party vote going to the incumbent party's candidate. This is the usual dependent variable in presidential election forecasting models.[6] The inputs are fiscal policy (expansionary or cutback), the number of consecutive terms the incumbents have been in office,[7] the incumbents' party (Democrat or Republican), and two measures of economic performance (the growth rate and the number of quarters that the growth rate exceeded a certain value, both measures borrowed from Fair 2002-- see Table 1 and Appendix B). Note that the model dispenses with a measure of presidential popularity. Also, for the purpose of the DEA ranking that follows, the fiscal model is estimated over 30 elections held since 1880, excluding that of 1912.[8] Finally, unlike Berry and Chen, we interpret the DEA efficiency scores not as measures of the effectiveness of election campaigns, which take place over a short period of time, but of the power of presidents to speak and act

6

during the length of their term in the White House in ways that are most conducive to maximizing votes for themselves or their party's candidate at the end-of-term election.

There is a difficulty in applying DEA to the fiscal model of presidential elections presented in Section II, however. This is because it includes two variables, fiscal policy and party, which are not continuous but categorical, each taking one of two possible values. Yet, DEA does not readily incorporate such variables. One solution is to split the set of observations by each of the categorical variables (Cooper, Seiford, and Tone 2000: 194-194). This we do. The thirty presidential terms observed since 1880 (again, excluding the Taft administration) are divided into four categories as displayed in Table 2. The first column consists of presidents of both parties who pursued a cutback policy (20 cases) and the fourth column includes presidents of both parties who implemented an expansionary policy (10 cases). The second and third columns are composed of two subgroups of column one, the fiscal cutback administrations, respectively categorized by Republican presidents (10) and Democratic presidents (10). Unfortunately, we could not subdivide the expansionary administrations by party because of the very small number that would be included in each group.[9] Henceforth, our analysis refers to the data presented in the second, third and fourth columns of Table 2.

. . . .

Table 2 about here

. . . .

The DEA efficiency scores for every administration are shown in Table 2, in order of their relative efficiency. All administrations with a DEA score of 1.0 (after rounding off to two decimal points) are considered "efficient" and all those below 1.0 are rated as relatively

7

"inefficient." This procedure splits the entire group (column 1) evenly, half of the cases in each column rated efficient and the other half, inefficient. Notice that relative efficiency scores for a given administration tend to increase as the comparison group is reduced in size, i.e., moving from the first column to the second or third column. Table 2 shows that the following Republican administrations were efficient: among those which pursued a fiscal cutback policy (column 2), 1884 Garfield/Arthur, 1904 McKinley/TDR, 1908 TDR II, 1924 Harding/Coolidge, and 1972 Nixon I; and among those that implemented an expansionary policy (column 4), 1932 Hoover, 1960 Eisenhower II, 1984 Reagan I, and 1992 GHW Bush. The equivalent sets for the Democrats are both Cleveland administrations (1888 Cleveland I and 1896 Cleveland II), 1916 Wilson I, 1936 FDR I, 1948 FDR/Truman, 1964 JFK/LBJ and 1996 Clinton I in the fiscal cutback category (column 3), and 1944 FDR III and 1952 Truman II in the expansionary group (column 4).[10]

Comparing our findings of efficient vs. inefficient administrations with those of Berry and Chen (1999), five of the six administrations they classified as efficient earn the same rating in ours: 1948 FDR/Truman, 1952 Truman II, 1964 Kennedy/Johnson, 1972 Nixon I, and 1984 Reagan I. The one exception is 1980 Carter. There is less agreement between our respective models when it comes to the inefficient administrations, though. Only four of their seven inefficient administrations are so ranked in our study: 1956 Eisenhower I, 1968 Johnson II, 1976 Nixon/Ford, and 1988 Reagan II. In all, the agreement rate is over two-thirds (9 out of 13). Given our respective findings, we can be fairly confident of the vote efficiency of four post-war presidents, two from each party: Nixon (first term) and Reagan (first term) for the Republicans, and Truman (both terms) and Johnson (first term) for the Democrats. However, for reasons that

8

will become clear presently, Presidents Truman and Johnson are not really the best models for the Democrats. Another president, all but forgotten now, shows more promise.

As well as enabling the researcher to rank cases according to relative efficiency, DEA allows the investigator to compare the inefficient cases with one or more efficient cases which constitute their "peers," or reference points. These are administrations that, with input combinations comparable to those of the inefficient ones, managed to maximize the vote output. Also, DEA allows one to simulate what the vote output of inefficient administrations would have been had they behaved more efficiently, showing what percent of the two-party vote they would have captured had they modeled themselves after a weighted combination of peer administrations. Stated differently, a theoretical "target model" (Ludwin & Guthrie 1989) of ideal, efficient levels for inputs and outputs for each relatively inefficient president can be derived from the DEA application based on a linear combination of the actual operations of the several efficient presidents included in a reference set provided for the inefficient president. The DEA score assigned to an inefficient president by the DEA algorithm suggests that other administrations in the efficient reference set are getting more "bang for the buck," i.e., a larger VOTE2, relative to similar combinations of the political and economic inputs specified in the fiscal model of presidential elections. (See Appendix A for a brief discussion of this line of analysis.) Be it noted, however, that despite its quantitative features, we use this technique simply as a heuristic device, a qualitative tool for refining our set of efficient administrations for the purpose of isolating a smaller number of exceptionally efficient presidents for scholars and presidential advisors to study in search for clues as to what administrations should be taken as models worthy of study and imitation by future presidents facing similar circumstances.[11]

9

. . . .

Table 3 about here

. . . .

Table 3 displays the simulated results for six inefficient administrations, three Republicans and three Democrats. Two from each party are taken from the fiscal cutback administrations (Table 2, columns 2 and 3, respectively) and one each from the expansionary group (Table 2, column 4). We chose these administrations because they rank at or near the bottom within their respective sets and they are all of relatively recent vintage, none having ended any earlier than 1956. Note that the 2000 election, in which the Democrats under-performed according to most forecasts,[12] is included. For each of these six administrations we show the actual vote received, the simulated vote they would have obtained had they behaved more efficiently and, in the far-right column, the linear weighted combination of peer administrations upon which the simulated vote is calculated.

This procedure yields the following results. Taking up the Republicans first, the only one that might have come close to winning by acting efficiently would have been President Ford in 1976. Even then, at most he could have improved his output by a mere 1.1 percent, eking out a draw in the popular vote. That might have been enough to tip the balance in his favor in the Electoral College, which historically has favored the Republicans (see Table 3). When one reflects that the Nixon resignation and pardon were weighing him down, and that he had to fight off a stiff primary challenge from Ronald Reagan, the remarkable thing is that President Ford was able to do as well as he did.

Turning to the Democrats, had they behaved more efficiently it is probable that they would have been returned the White House in 1968, 1980, and 2000. However, for reasons that will be discussed below, neither the 1948 FDR/Truman nor the 1964 JFK/LBJ administration is much help to those inefficient presidencies for which they serve as reference points in a big way, as they do with 2000 Clinton II. So the DEA procedure does not allow us to say much about how President Clinton's second term could have performed more efficiently with the electorate, except that the Democrats might have done a little better by imitating Cleveland's second term. However, it is possible that President Johnson, who took the United States deeper into the Vietnam War, might have done himself or his party a favor had he imitated FDR during *his* third term. Ironically, LBJ viewed himself as continuing FDR's domestic legacy, but what he should have paid more attention to was his mentor's leadership during wartime. The only case for which Table 3 offers much by way of insight has to do with the Carter administration. Of the six cases, this is the one that had the most votes to gain by behaving more efficiently. Note, also, that the most relevant reference point for President Carter's administration is President Cleveland. That *was* a much more realistic reference point than any of the others turning up in the Democratic half of Table 3. More about President Cleveland below.

When the same exercise at simulation is extended to all inefficient administrations, one is able to rank the efficient administrations displayed in Table 2, columns 2-4, by the number of times they turn up as reference points for the inefficient ones. Taking up the fiscal cutback administrations first, for the Democrats the most efficient administrations are 1964 JFK/LBJ (which turned up as a peer for inefficient administrations three times), 1948 FDR/Truman (two times), 1888 Cleveland I (1), 1896 Cleveland II (2), and 1936 FDR I (1). Note that President

Cleveland comes up as a reference point three times in all. For the Republicans, they are 1904 McK/TDR (five times), 1972 Nixon I (3), and 1884 Garfield/Arthur (2), so that the first Teddy Roosevelt administration stands heads and shoulders above the rest. Among the fiscally expansionary administrations, the Republican efficient peers are 1984 Reagan I (4), 1992 Bush (3), and 1932 Hoover (2), whereas the only Democratic one is 1944 FDR III (2). The numbers are too small for us to place much confidence in any apparent pattern, but there is a slight, yet non-trivial suggestion that among fiscally expansionary administrations Republicans are more efficient than Democrats at maximizing votes. Perhaps when it comes to persuading the voters that government spending needs to increase, Republicans do a better job than Democrats.

These findings suggest the following observations. First, the number one Republican and the number one Democratic reference points among fiscal cutback administrations, respectively 1904 McK/TDR and 1964 JFK/LBJ, have one characteristic in common. These are administrations in which a former vice-president who became president following the assassination of his predecessor was seeking election to the White House in his own right. The same goes for another reference point for the Democrats, 1948 FDR/Truman, except that President Roosevelt died of natural causes. Interestingly, although it does not serve as a reference point for the inefficient compeers, the 1924 Harding/Coolidge administration, in which the same condition applied, was an efficient one, too. Also worthy of note is that the Garfield/Arthur administration, in which Arthur succeeded the assassinated Garfield, was efficient, even though Arthur was not re-nominated and the Republicans lost the election (recall that an efficient administration is not necessarily one which concludes with an incumbent victory at the polls). So every case in which a vice-president succeeded a president following the death of his predecessor

12

turns out to be efficient. It is as if the incumbents were able to draw on a reservoir of sympathy or good will on the part of the electorate following the tragedy that befell their compeers. These conditions would not be easy or desirable to replicate.

Second, FDR's third term ended at the peak of World War II, and hence it is probably too unusual to serve as a practical reference point for most presidents. Only LBJ could have profited from it. Nevertheless, next to Lincoln, FDR saw the United States through its biggest crisis. He not only managed to overcome the challenge effectively but did so in a manner that was politically efficient. His administration warrants careful scrutiny for lessons to be learned and applied by future presidents having to wage large-scale war or who confront other critical threats to the United States even as they seek a renewal of their party's lease on the White House. For that very reason, though, neither this administration nor the others offers much guidance to incumbents presiding during more normal times.

That leaves the two Cleveland administrations for the Democrats, and the first Nixon administration and the first Reagan administration for the Republicans. These cases are worth studying by scholars and emulating by future presidents confronting ordinary times for clues as to how to go about maximizing the vote-getting power of incumbents. There could be something about the way these presidents talked and acted, the decisions they made and the way they communicated their vision to the public, that might account for their relatively high efficiency at the polls. President Cleveland, in particular, deserves attention. As the lone Democrat to interrupt a half-century long Republican reign, he could offer insights to the Democrats if they ever happen to find themselves in the political wilderness again.

Turning to the distributions of efficiency scores, a casual glance reveals that there is no relationship between efficiency and party, or between efficiency and victory or defeat in the popular vote for president, or between efficiency and war.[13] These impressions are confirmed by statistical tests.[14] Neither is there a relationship between efficiency and whether or not the president was a candidate for reelection,[15] a finding that is consistent with a previous finding that *when fiscal policy is controlled for* the so-called "incumbency advantage" of a sitting president vanishes (Cuzán and Bundrick 2000; Cuzán, Heggen, and Bundrick 2003). Nor is there a relation between efficiency and Schlesinger's presidential greatness score (Schlesinger 1997).[16] Thus, the relative vote getting efficiency of presidents has yet to be accounted for. It is an unexplained phenomenon. It is hoped that future research will yield one or more variables associated with it.

IV. Conclusions and Recommendations.

Applying DEA analysis to a fiscal model of presidential elections estimated over 30 elections held since 1880 allowed us to separate the efficient from the inefficient vote-getting administrations. Interestingly, when controlling for party and fiscal policy five of the six efficient administrations in Berry and Chen's DEA analysis of post-World War II elections turned up in our list, as well, even though their presidential elections model is different from the one used here. This coincidence in findings increases our confidence that President Truman (two terms), the first Johnson administration (actually, the Kennedy/Johnson administration), the first Nixon administration, and the first Reagan administration were indeed vote-efficient. Four other administrations also turned out to be relatively efficient in our study: both Cleveland administrations, the McKinley/T.D. Roosevelt administration, the second Teddy Roosevelt term, FDR's first and third terms and, surprisingly, the Hoover administration. (Recall that a president

may be efficient, yet still lose the election.) Not all of these are fit for emulation, however. The 1904, 1948, and 1964 efficient victories won by Teddy Roosevelt, Harry Truman, and Lyndon Johnson, respectively, are all attributable, at least in part, to the circumstances under which they were elevated to the highest office in the land. In all probability they were the unwitting beneficiaries of a public indulgence born of the tragedy that befell their immediate predecessors. For their part, President Hoover and President FDR's first term, which spanned the Great Depression, offer examples of what a president can accomplish with the voters under circumstances so adverse than no future occupant of the White House would like to find himself under similar ones. Finally, FDR's third term occurred during such extraordinary times that they are unlikely to be repeated but once per century, if that. Nevertheless, for presidents looking to learn how they can maximize votes under excruciatingly difficult domestic or international constraints, Hoover's single term and FDR's first and third terms are promising cases for study.

For more normal times, that leaves as candidates for emulation the second Teddy Roosevelt administration, the first Nixon administration, and the first Reagan administration among Republicans, and the two Cleveland administrations in the Democratic column. We recommend that Republican presidents and their advisers study the first three for whatever lessons may be learned from the vote-getting efficiency of their partisan forebears. Similarly, we suggest to Democratic presidents and their advisors that they examine President Cleveland's two terms. Recall that he was the only Democrat to interrupt a half-century Republican reign, and he did it twice. Unlike President Wilson, whose first term only was efficient and who did not turn up as a peer, both of Cleveland's were, and both turn up as reference points for inefficient administrations. President Cleveland, then, is a prime candidate for emulation by Democrats.

As to future research, with Berry and Chen we believe that DEA has the potential for raising "new questions" and providing "new measurements that might help integrate the quantitative and the qualitative schools of electoral analysis" (Berry and Chen 1999: 388). Ironically, one of those questions is just what accounts for the vote efficiency of presidents. Our survey of the "usual suspects," that is, war, party, and presidential incumbency, as well as presidential greatness, yielded no relationships. Additionally, DEA yields insights not extracted from previous analysis of presidential election data, allowing us to interpret its quantitative measures in politically meaningful, qualitative terms. These insights have practical applications: studying the words and actions of those presidents we have identified as most efficient may help incumbents make the most, in a vote-getting sense, of the circumstances under which they find themselves. Finally, we believe that more political scientists, particularly students of the presidency, would do well to consider collaborating with other social scientists steeped in DEA analysis for the purpose of evaluating the efficiency or effectiveness of presidents, experimenting with alternative output measures.

APPENDIX A

Data Envelopment Analysis defines the "relative efficiency" of a decision making unit (DMU)as the ratio of the unit's total weighted output to its total weighted input. Conceptually, this can be written as:

$$\text{Efficiency of DMU } k = \sum_{r=1}^{s} U_{rk}Y_{rk} \Big/ \sum_{i=1}^{m} V_{ik}X_{ik}$$

where:

k = the DMU under analysis;

s = number of outputs;

m = number of inputs;

Y_{rk} = amount of output r produced by DMU k, r = 1,...,s;

X_{ik} = amount of input i used by DMU k; i = 1,...,m;

U_{rk} = the unit weight placed on output r by DMU k, r = 1,...,s; and,

V_{ik} = the unit weight placed on input i by DMU k, i = 1,...,m.

This fractional linear program can be transformed into an ordinary linear program and solved using the simplex method (Sexton, 1986). In so doing, the weights U_{rk} and V_{ik} which are to be assigned to each output and each input by the algorithm in this formulation are based on the following: no weight can be negative, each DMU must be allowed to use the same set of weights to evaluate its efficiency and the ratios resulting from each of these separate evaluations must not exceed one (Charnes, Cooper and Rhodes, 1978b; Charnes Cooper and Rhodes, 1981; Sexton, 1986).

A more intuitive way to understand this mathematical process is to approach the algorithm in steps, asking specific questions along the way. Consider the following   Assume that the decision-making units in the group under consideration have each been tasked to produce three Outputs utilizing three specified Inputs. Let us designate these Outputs Y_1, Y_2 and Y_n and Inputs X_1, X_2 and X_n. Assuming we are attempting to analyze the relative efficiency of DMU_1, the first unit in which we have an interest, we ask DMU_1 to perform the following operations to calculate its relative efficiency:

First we ask each unit to choose weights for each Output and each Input that it produces such that the ratio of weighted outputs to weighted inputs is maximized. This can be view as the following ratio:

$$\frac{\text{(weight for output one) x (units of output one) + (weight for output two) x (units of output two) + (weight for output n) x (units of output n)}}{\text{(weight for input one) x (units of input one) + (weight for input two) x (units of input two) + (weight for input n) x (units of input n)}}$$

This ratio of weighted outputs to weighted inputs would tell us nothing about the relative efficiency of DMU_1 because, being competitive, and wishing its efficiency score to be the highest possible, it will choose weights for the outputs and inputs that cause the ratio to be infinitesimally large since we have put no constraints on the outcome. This however can be remedied.

Second, we remedy this situation by simply telling DMU_1 that its ratio of weighted outputs to weighted inputs is constrained to a maximum value of one.   Again, wishing to appear in the best light, it will, of course, choose weights such that the relative efficiency ratio reaches this maximum value, one.

At this point, however, by enforcing one additional, simple, constraint, we can develop relative efficiency scores for this DMU based on the efficiencies of all other DMUs in the group. We simply inform DMU_1 that it must allow each other DMU in the set to apply the weights

DMU$_1$ has chosen, but with the constraint that in so doing, the result for each other DMU cannot exceed the value, one.

Note the effect on the relative efficiency score for the DMU$_1$ when the second DMU has more output with less input: the score of the second DMU moves to the maximum value, one, and since the first DMU is constrained to the same weights as the second DMU, but it has less output with more input than the second DMU, its relative efficiency is reduced, as it properly should be. This step-by-step process provides us with an intuitive understanding of the fundamental concept utilized in DEA analysis to develop relative efficiency scores across different organizational units.   That is, as seen in the mathematical notation given above, the DMU under analysis maximizes its efficiency ratio subject to the stated conditions. The constraints force comparison of the efficiency scores for the DMU under analysis with each other DMU included in the set under analysis using the assigned input and output weights. In order to meet the requirements of the third constraint, that is, that no DMU can have a DEA score greater than 1.00, relatively inefficient DMUs in this comparative process must adjust their weights to the point that their efficiency score moves proportionally below the higher efficiency of the most productive units which do, in fact, score 1.00.

With respect to the "reference set" to which each inefficient DMU is compared, it has been noted elsewhere that when DEA methodology is used to compute the relative efficiency of a set of organizations, coincidentally, the output of the algorithm can also be used to model a hypothetical, perfectly efficient, ideal 'target' organization for each 'inefficient' organization in the analysis. This target model provides guidance to managers in making changes in resource allocation decisions (Tankersley and Tankersley, 1997-98: 58).

In the present case, the "organization" should be understood to refer to the incumbent administration, denoted by the name of the sitting president. Sexton (1986) explains how the dual of the DEA linear program is used as a source of the needed information for this target model. Sexton notes,

. . . whenever a DMU is less than perfectly efficient, DEA indicates a subset of perfectly efficient DMUs (we will call this the efficient reference set) and a set of associated multipliers that can be used to formulate managerial strategies for improvements. [italics in original]

. . . the input and output levels of the hypothetical DMU are linear combinations of the input and output levels of [the DMUs in the reference set]. The question is, what are the coefficients of that linear combination?

The answer lies in the solution to the dual of the linear program...the dual variables identify the efficient reference set for an inefficient DMU and also provide the multipliers needed to produce the input and output levels of the hypothetical DMU. (Sexton 1986: 11, 23)

Data envelopment analysis applications have grown explosively since the concept was initially conceived by Farrell in 1957 and further developed by Charnes, Cooper and Rhodes in 1978a. Following this, a number of variations on the basic model have been developed, improvements have been made and commercial software providing relatively effortless application has been developed.

For a comprehensive discussion of DEA, its applications, limitations, and its continuing refinement, the interested reader is referred to: Ganley and Cubbin (1992), Charnes et. al. (1994),

as well as Cooper, Seiford and Tone (2000). This last text is particularly appropriate for new

users as it is considered to be current, accessible, comprehensive in coverage, and, in general, a

very practical guide to DEA applications.

REFERENCES

Ashby, W. Ross. 1970. Analysis of the System to be Modeled. In Ashby et. al., *The Process of Model Building in the Behavioral Sciences,* pp. 94-114. Ohio State University Press.

Berry, Brian J. L. and Young-Sheng Chen. 1999. Measurement of Campaign Efficiency Using Data Envelopment Analysis. *Electoral Studies*, 18, 379-395.

Charnes, A., W. W. Cooper, A. Y. Lewin, and L. M. Seiford. (Eds.). 1994. *Data Envelopment Analysis: Theory, Methodology and Applications*. Boston: Kluwer Academic.

Charnes, A., W. W. Cooper, & E. Rhodes. 1978a. Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2, 429 - 444.

Charnes, A., W. W. Cooper, & E. Rhodes. 1978b. Evaluating Program and managerial Efficiency: An Application of Data Envelopment Analysis to Program Follow Through. *Management Science*, 27(6), 668-697

Cooper, W.W., L. M. Seiford, & K. Tone. 2000. *Data Envelopment Analysis: A Comprehensive Text with Models, Applications, References and DEA- Solver Software*. Boston: Kluwer Academic.

Cuzán, Alfred G. and Richard J. Heggen. 1984. A Fiscal Model of Presidential Elections in the United States, 1880-1980. *Presidential Studies Quarterly*, XIV (1): 98-108.

Cuzán, Alfred G. and Charles M. Bundrick. 1992. Selected Fiscal and Economic Effects on Presidential Elections. *Presidential Studies Quarterly*, XXII (1): 127-134.

Cuzán, Alfred G. and Charles M. Bundrick. 1999. "Fiscal Policy as a Forecasting Factor in Presidential Elections," *American Politics Quarterly*, 29 (3): 338-353.

Cuzán, Alfred G. and Charles M. Bundrick. 2000. "Fiscal Policy and Presidential Elections: Update and Extension,"*Presidential Studies Quarterly*, 30 (2), 275-289.

Cuzán, Alfred G., Richard J. Heggen, and Charles M. Bundrick. 2003. *Voters and Presidents. A Fiscal Model*. Philadelphia: Xlibris.

Fair, Ray C. 2002. The Effect of Economc Events on Votes for President: 2000 Update. November 1, 2002. Available: http://fairmodel.econ.yale.edu/

Ganley, J. A. & J. S. Cubbin. 1992. *Public sector efficiency measurement: Applications of data envelopment analysis*. Amsterdam: North-Holland.

Katzner, Donald W. 1992. *The Walrasian Vision of the Microeconomy. An Elementary Exposition of the Structure of Modern General Equilibrium Theory*. Ann Arbor: The University of Michigan Press.

Ludwin, W. G. & T. L. Guthrie. 1989. Assessing Productivity with Data Envelopment Analysis. *Public Productivity Review*, XII: 4 (Summer), 361-372.

Schlesinger, Arthur M., Jr. 1997. Rating the Presidents: Washington to Clinton. *Political Science Quarterly*, 112 (2), 179-190.

Sexton, T. R. (1986). The methodology of data envelopment analysis. In R. H. Silkman (Ed.), Measuring efficiency: An assessment of data envelopment analysis (pp. 7 - 29). San Francisco: Jossey-Bass.

Soteriou and Zenios (1998). "Data Envelopment Analysis: An Introduction and an Application to Bank Branch Performance Assessment" in *Modern Methods for business Research: Quantitative Methodology Series*, George A. Marcoulides (Ed.). Mahwah, N. J.: Lawrence Erlbaum Associates.

Tankersley, W. B. & J. E. Tankersley. 1997-98. "The Hypothetical Efficient Organization: Exploring The Diagnostic Value of Data Envelopment Analysis". *Coastal Business Review,* 57-64.

1. We are not suggesting that voters do, in fact, explicitly consider fiscal policy in their voting decision, only that they cast their ballots *as if* they did. The *as if* assumption is commonly made in economics. For example, in discussing the theoretical grounds on which the Walrasian "vision" rests, Katzner explains: "Thus, although there is no guarantee that the consumer is, in fact, a utility maximizer, the model constructed here and the vision from which it emanates explains his behavior *as if* he were" (1992: 46; emphasis added). The use of such an "unrealistic" assumption is whether it yields hypotheses that conform to the observed facts. As Ashby puts it, "test by demonstration is always treated as the ultimate test, let plausibility say what it will. . . . The operational test is the last court of appeal" (1970: 103-104).

2. We borrow Fair's data for two reasons. One is sheer convenience. His data series, periodically updated in light of the most recent U.S. Department of Commerce revisions of income and product data, goes back to 1880. Additionally, the more political scientists work with the same data set, the more *social* our enterprise becomes.

3. For a full explication of the model, its theoretical underpinnings and justification in the choice of variables, see Cuzán, Heggen, and Bundrick (2003), Chapters 2-4.

4. Such advice is nothing new. In *The Prince*, Machiavelli observed that, "if he is prudent [a prince] must not worry about the reputation of miser: because with time he will be considered even more liberal, when it is seen that because of his parsimony his income suffices him, that he can defend himself against whoever makes war on him, and that he can undertake enterprises without weighing down the peoples; by which token he comes to use liberality toward all those from whom he does not take, who are infinite, and miserliness toward all to whom he does not

give, who are few" (1997: 59).

5. The fiscal model identifies administrations by the name of the president (or both if the Vice-President succeeded to the office after the death or resignation of his predecessor), by order of terms (e.g., FDR I, FDR II, etc.), and year the end-of-term election was held (see Cuzán and Bundrick (2000)). We follow that system here. Be it noted, though, that this is different from Berry and Chen's. In their model, the focus is not on the administration, but on the campaign mounted by the incumbent party *candidate*, who may or may not be the president. Thus, they call "Stevenson" what we label 1952 Truman II.

6. See, in addition to Fair (2002), two collections of articles on forecasting, one each for the 1996 and 2000 elections, respectively, published in *American Politics Quarterly*, 24 (4), 1996, and *P.S. Political Science and Politics*, XXXIV (1), 2001. Also, be it noted that we ignore any discrepancy between the popular vote and the Electoral College, which has happened twice since 1880. In 1888 and in 2000 Democrats eked out a narrow majority in the two-party vote but lost in the Electoral College. These discrepancies notwithstanding, we call it a victory for the incumbents when they prevail in the popular vote.

7. Actually, not TERMS but the reciprocal of TERMS. This is because, conceptually, DEA maximizes outputs and minimizes inputs.

8. The administration that concluded with the 1912 election is excluded for the following reason. That year the Republican Party split between followers of the incumbent, President Taft, and that of his predecessor, former President T. D. Roosevelt. Rebuffed at the convention, TDR bolted the party and ran as the Bull Moose candidate. Fair, from whom we borrow vote output as well as economic data, adjusted the Republican share of the 1912 vote by combining the shares of Taft and Roosevelt. This yields an accurate forecast of a counter-factual election

output in Fair's model, but of course the Republicans lost to the Democrat, Woodrow Wilson. This case is so unusual as to warrant exclusion. Also, be it noted that Fair also adjusted the 1924 vote output, assigning 23 percent of the LaFayette vote to President Coolidge and the rest to the Democrats. For the reasons stated in endnote #2, we also follow Fair on this point.

9. This reflects DEA's lack of robustness when the number of inputs and outputs approaches the number of DMUs under analysis. As a matter of fact, Soteriou and Zenios (1998: 135-136) suggest that ". . . the total number of input and output variables will depend on the total number of DMU's to be assessed. . . . An empirical rule of thumb is that the total number of units available for comparison must exceed the product of the number of inputs and outputs."

10. It should be remembered that for reasons given in the previous endnote, in the case of fiscal cutback policy Republicans are compared with Republicans, and Democrats with Democrats. When it comes to the fiscally expansionary administrations, however, both parties are included in the comparison due to the small number of observations.

11. Machiavelli advises princes to "consider the actions of excellent men, see how they have carried themselves in the wars, examine the causes of their victory and losses, to be able to avoid the latter and imitate the former; and above all to do as some excellent man has done in the past, who took up imitating someone before his time who had been lauded and glorified, and always kept his deeds and actions close to him: as is said that Alexander the Great imitated Achilles, Caesar Alexander, Scipio Cyrus. . . . A wise prince must imitate these similar modes and never in peaceful times remain lazy, but capitalize on it with industry, in order to be able to use it in adversity, so that, when fortune changes, it might find him prepared to resist her" (1997: 55-56).

12. "Roundtable on Election Forecasting," presented at the American Political Science Association, August 31, 2000. A summary sheet of the forecasts was kindly faxed to the second

27

author by Thomas Holbrook. Participants at the roundtable, and their respective forecasts, included Profs. Alan Abramowitz (53.2%), James E. Campbell (52.8%), Thomas Holbrook (60.3%), Michael S. Lewis-Beck and Charles Tien (55.4%), Helmut Norpoth (55%), and Christopher Wleizen and Robert S. Erikson (55.2%). The average forecast of their models was 55.3%.

13. The administrations coded for war were, by end-of-term election year, 1900 (Spanish-American War), 1920 (World War I), 1944 (World War II), 1952 (Korean War), 1968 (Vietnam War), 1972 (Vietnam War), and 1992 (Gulf War).

14. For Party, Cramer's V = .082, Lambda = .000, and Fischer's Exact Test = .722; for Victory, Cramer's V = .085, Lambda = .000, and Fischer's Exact Test = .712; and for War, Cramer's V = .032, Lambda = .000, and Fischer's Exact Test = 1.000.

15. Cramer's V = .226, Lambda = .083, and Fischer's Exact Test = .266.

16. Pearson's r = -0.12.