The impact of competition on advertising: the case of political campaign expenditures

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Abstract. This paper uses constituency-level political campaign expenditures to analyse the impact of competition on advertising. A theoretical model, based on expected utility maximization, predicts an uncertain impact of increased competition on campaign spending. The direction of this impact is tested using data from the 1979 and 1980 Canadian federal elections. Competition is found to have a positive effect on spending, and several other plausible hypotheses of expenditure determination are rejected. These include constant spending per voter or per constituency, the random allocation of funds, and spending based on incumbency, ministerial status, or the spending of other political parties.

L'impact de la concurrence sur la publicité: le cas des dépenses électorales. Ce mémoire utilise les données sur les dépenses électorales au niveau des circonscriptions pour analyser l'effet de la concurrence sur la publicité. Un modèle théorique fondé sur la maximisation de l'utilité espérée prédit un impact incertain de la concurrence accrue sur les dépenses electorale. On mesure cet impact à l'aide des données disponibles pour les élections fédérales de 1979 et de 1980 au Canada. Les résultats montrent que la concurrence a un effet positif sur les dépenses électorales et servent à renvoyer un certain nombre d'autres hypothèses plausibles quant aux facteurs qui déterminent le niveau de ces dépenses. Parmi ces hypothèses, on retrouve celles qui présument le niveau de dépenses constant par électeur ou par circonscription, celle qui voudrait que l'allocation des fonds soit aléatoire, et celles qui lient le niveau de dépenses au fait ou non que le candidat cherche à se faire ré-élire dans sa circonscription, au statut ministériel du candidat, ou au niveau de dépenses des autres partis politiques.

INTRODUCTION

There are two schools of thought regarding the effect of advertising on competition. One school views advertising as wasteful, since it manipulates consumer tastes and results in anti-competitive behaviour (Kaldor, 1950; Dixit and Norman, 1978). Alternatively, advertising may be viewed as an efficient means of disseminating information about a product's existence and characteristics and is consequently beneficial (Stigler, 1961, 1968; Telser, 1964; Ferguson, 1974; and Nelson, 1974). In this paper, rather than investigate how advertising affects competition, we reverse the

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causality and examine whether competitive pressures yield an increase in advertising expenditures. A similar question is addressed by Farris and Buzzell (1979) in their study of the determinants of the advertising to sales ratio of a sample of U.S. businesses. As proxies of a firm's competitive position, they use market share and industry concentration ratios. The first of these is found to have a negative, though possibly unstable, relationship with the advertising to sales ratio, the second an insignificant relationship.

The analysis below takes a different approach from Farris and Buzzell's by examining the effect of competition on advertising in a political context (where political parties are in competition for votes). The relationship between political parties and firms is not as obtuse as it may at first seem. The goal of parties, like firms, is to sell a product using a minimum or constrained supply of resources. However, political campaigns have the advantage over product markets of being well-defined contests with easily identifiable competitors. In addition, data on campaign expenditures are readily available and vary considerably across both political parties and constituencies (see table 1).

Though the relationship between the perceived level of competition and political campaign expenditures has been discussed in the political science literature, it has been the subject of few empirical studies, and these have yielded conflicting results. Adamany [1972] reports finding a positive relationship between competition and campaign expenditures for both San Francisco Bay area congressional districts and state legislative districts in Wisconsin. In both cases a district was deemed competitive if the winning candidate received less than 60 per cent of the two-party vote. Using information from a regional pre-election poll to construct a competitiveness proxy for each constituency, Palda (1975) found little evidence of a relationship between the degree of competition and campaign expenditures for the 1973 Manitoba provincial election. Similar results were obtained by Chapman and Palda (1986) using data for Ontario from the 1984 Canadian federal election. On the other hand, Chapman and Palda [1984] and Palda and Palda [1985] found significant evidence that competition increased campaign expenditures in a set of Canadian provincial elections, using a measure of competitiveness similar to that used below.

The present paper augments the existing literature on campaign expenditures in three ways. First, the determination of constituency level campaign expenditures by a political party is modelled as the outcome of an explicit optimization problem. In contrast to the conventional wisdom (Jacobson, 1985; Chapman and Palda, 1984, 1986; and Poole et al., 1987), increased competition does not necessarily have a positive impact on election spending. Second, a continuous competition variable is employed which incorporates the voting preferences of the entire set of voters, but which does not rely on the ex post outcome of the election. Third, the model is estimated for three political parties differing in size and ideology and incorporates data from a national election in Canada, and thus from quite disparate regions. The estimated expenditure equations indicate that there is a positive relationship between a party's competitive position and its campaign spending per voter. In addition, the results reject other plausible hypotheses of expenditure determination such as

uniform spending per voter or per constituency, the random allocation of funds, or spending based on incumbency, ministerial status, or the spending of rival parties. If generalized, these results would imply that firms devote more advertising to those products and those regions in which they are competing most intensively with other firms.

Section 2 sets out the optimization problem describing the allocation of campaign funds by a political party to individual constituencies and discusses the impact of the degree of competition and other factors on constituency level campagn expenditures. In the third and fourth sections the model is estimated using data from the 1979 and 1980 Canadian federal elections and the results are analysed. Brief concluding comments are given in the fifth section.

THE CAMPAIGN EXPENDITURE MODEL

A political party (either the national party or a regional subset of the national party depending on which level has control of campaign funds) is assumed to allocate campaign resources among constituencies as if it were attempting to maximize an expected utility function.[1] It seems reasonable to include in this function both an interest in winning constituencies as well as an interest in participating in elections even though the outcome is likely to be one of defeat (Stigler, 1972). Furthermore, since revenue generating efforts must take place to finance campaign expenditures, we assume that political parties prefer a campaign surplus to a deficit.[2]

In order to generate explicit predictions regarding the determinants of campaign expenditures, the expected utility function of the party is assumed to be additively separable and linear in its arguments. In a multi-party environment with constituencies indexed by $n = 1, \ldots, N$, this function can be specified as

$$\text{EU} = \sum_{n=1}^{N} a_n \cdot P_n(x_n, c_n, \tilde{x}_n, z_n) + \lambda \cdot Y, \tag{1}$$

where, for ease of notation, we have dropped the subscript indicating that these variables are party specific, and where

a_n, λ = constant, non-negative parameters,
$P_n(\cdot)$ = the party's subjective probability function of winning constituency n,
Y = the party's expected campaign surplus (or deficit),
x_n = the party's campaign expenditure per registered voter in constituency n,

1 This implies that a party's spending in a constituency is not determined by contributions to its candidate in that constituency. Chapman and Palda (1986) provide empirical evidence supporting this assumption.

2 Alternative objectives to those assumed here have been proposed. Downs (1957) argues for vote maximization, while Riker (1962) suggests parties seek the minimum size necessary to win. Stigler (1972) argues that political parties try to maximize the difference between the greater influence they gain by winning more seats and the cost of sharing this influence among more members. Differentiating between these objectives is an area for future research.

TABLE 1

Variable names, definitions and summary statistics

Variable	Definition
RV	Registered Voters, V_n
CE	Conservative Campaign Expenses per Registered Voter in dollars in 1980, x_{np}
LE	Liberal Campaign Expenses per Registered Voter in 1980
NE	New Democratic Campaign Expenses per Registered Voter in 1980
CEL	Conservative Campaign Expenses per Registered Voter in the 1979 Canadian Federal Election
LEL	Liberal Campaign Expenses per Registered Voter in 1979
NEL	New Democratic Campaign expenses per Registered Voter in 1979; for the two constituencies in which the New Democrats did not run candidates in 1980, the inverse of this variable is zero
SEL	Social Credit Campaign expenses per Registered Voter in 1979; for the 201 constituencies in which the Social Credit did not run candidates in 1980, the inverse of this variable is zero. If there was no Social Credit candidate in 1979, but one ran in 1980, we defined this variable as the election deposit ($200) per registered voter in 1979.
NCD	New Democratic Candidate Dummy = 1 if the New Democrats ran a candidate in the 1980 election, = 0 otherwise
SCD	Social Credit Candidate Dummy = 1 if the Social Credit ran a candidate in the 1980 election, = 0 otherwise
CC	Conservative Competitiveness Variable, c_{np}
LC	Liberal Competitiveness Variable
NC	New Democratic Competitiveness Variable
CMRD	Conservative Maximum Reimbursement Dummy = 1 if in 1980 $x_{np} \geq x_n^* = \min\{0.25 + 200/V_n, 0.23 + 700/V_n\}$, = 0 otherwise
LMRD	Liberal Maximum Reimbursement Dummy
NMRD	New Democratic Maximum Reimbursement Dummy
CID	Conservative Incumbent Dummy = 1 if the Conservative candidate held the seat immediately prior to the 1980 election, otherwise zero
LID	Liberal Incumbent Dummy
NID	New Democratic Incumbent Dummy
CCMD	Conservative Cabinet Minister Dummy = 1 if the Conservative candidate was a member of the Conservative government's 1980 cabinet, otherwise zero
LCMD	Liberal Cabinet Minister Dummy = 1 if the Liberal candidate was a member of the Liberal government's 1979 cabinet, otherwise zero
QUE	Quebec Dummy = 1 if the candidate ran in a Quebec constituency, otherwise zero
ATL	Atlantic Dummy = 1 if the candidate ran in a Prince Edward Island, Newfoundland, Nova Scotia, or New Brunswick constituency, otherwise zero
PRA	Prairie Dummy = 1 if the candidate ran in a Manitoba, Saskatchewan, or Alberta constituency, otherwise zero
BC	British Columbia Dummy = 1 if the candidate ran in a British Columbia constituency, otherwise zero
TERR	Territories Dummy = 1 if the candidate ran in either a Northwest Territories or a Yukon constituency, otherwise zero

Summary statistics

Variable	Mean	Standard deviation	Minimum	Maximum
RV	56374	13199	8558	108620
CE	0.3821	0.1905	0.0028	1.289
LE	0.4055	0.1495	0.0759	1.276
NE	0.2066	0.1875	0	1.138

TABLE 1 *(concluded)*
Summary statistics

Variable	Mean	Standard deviation	Minimum	Maximum
CEL	0.4200	0.1670	0.0031	1.345
LEL	0.4297	0.1398	0.1035	1.363
NEL	0.1952	0.1879	0.0024	1.073
SEL	0.0337	0.0898	0	0.4804
NCD	0.9929	0.0842	0	1
SCD	0.2847	0.4521	0	1
CC	6.574	45.88	0.3481	740.55
LC	6.774	44.40	0.3340	711.39
NC	2.551	4.90	0.4350	47.47
CMRD	0.7972	0.4028	0	1
LMRD	0.8968	0.3048	0	1
NMRD	0.4271	0.4955	0	1
CID	0.4555	0.4989	0	1
LID	0.3879	0.4881	0	1
NID	0.0925	0.2903	0	1
CCMD	0.0996	0.3001	0	1
LCMD	0.0641	0.2453	0	1
QUE	0.2634	0.4412	0	1
ATL	0.1139	0.3182	0	1
PRA	0.1744	0.3801	0	1
BC	0.0996	0.3001	0	1
TERR	0.0107	0.1030	0	1

c_n = a measure of the party's perception of how competitive its candidate is in constituency n (with larger values representing more competitive (close) contests),
$\tilde{x}_n$ = a vector of spending by other parties in constituency n,
z_n = a vector of other variables which affect the subjective probability of success (e.g., incumbency and ministerial status).

This objective function has several useful properties. First, letting a_n vary across constituencies allows political parties to place different weights on different constituencies (e.g., a party may put more weight on electing high-profile candidates, since they are more visible representatives of its policies). Second, this specification places some weight on constituencies for which the probability of winning is small, since a party may gain some political goodwill by simply participating in an election even if it has little chance of success.[3] Third, by allowing λ to vary between political parties we capture the effect of variations in the difficulty of revenue generation.

In many countries political parties receive publicly funded reimbursements (or subsidies) for campaign expenditures that are contingent on capturing more than a specific percentage of the votes cast. If this condition is satisfied, the party receives a subsidy $s_n \cdot V_n$, where s_n is the party's subsidy per registered voter, usually a function

3 This may proxy a longer-term strategy of gradually building support over several elections.

of the number of registered voters as well as the party's expenditure per voter, and V_n is the number of registered voters.[4]

Letting B represent the subset of the party's campaign budget which is independent of constituency level campaign expenditures and reimbursements and $R_n(\cdot)$ the party's subjective probability of meeting the necessary condition for a subsidy, the expected campaign surplus is

$$Y = B - \sum_{n=1}^{N} [x_n \cdot V_n - R_n(x_n, c_n, \bar{x}_n, z_n) \cdot s_n(x_n, V_n) \cdot V_n]. \tag{2}$$

The assumption that the party's two subjective probability functions, $P_n(\cdot)$ and $R_n(\cdot)$, depend only upon x_n, c_n, $\bar{x}_n$, and z_n implies that they are independent of factors in other constituencies. This is consistent with the existing empirical literature (Chapman and Palda, 1984, 1986) and recognizes that, with a large number of constituencies (282 in Canada), spending in any one constituency is unlikely to have a large impact on the outcome in other constituencies. This assumption is impossible to test empirically because of the potentially large number of cross constituency effects.

For any party, the optimal distribution of campaign expenditures among constituencies can be found by selecting $x_1 \ldots x_N$ to maximize expected utility, equation (1), subject to equation (2), taking as given c_n, z_n, V_n, B, and $\bar{x}_n$. The assumption that political parties have Cournot-Nash conjectures with respect to their opponents' expenditures, and thus take $\bar{x}_n$ as given, is also used by Chapman and Palda (1984) and is common in the advertising literature (Scherer 1980).

The solution to this problem yields first-order conditions determining the optimum level of a party's campaign expenditures in each constituency:

$$a_n(\partial P_n(\cdot)/\partial x_n) - \lambda[1 - s_n(\cdot)/(\partial R_n(\cdot)/\partial x_n) - R_n(\cdot)(\partial s_n(\cdot)/\partial x_n)] \cdot V_n = 0, \tag{3}$$

for $n = 1, \ldots, N$.[5] This first order condition can be implicitly solved for a function describing the optimal choice of x_n:[6]

$$x_n = x_n(\overset{?}{c}_n, \overset{?}{\bar{x}}_n, \overset{?}{z}_n, \overset{+}{V}_n, \overset{0}{B}), \qquad n = 1, \ldots, N. \tag{4}$$

The symbols above equation (4) give the model's predictions of the signs of the partial derivatives associated with each independent variable. The ambiguity of the first three follows from their dependence on second-order cross-partial derivatives of $P_n(\cdot)$ and $R_n(\cdot)$ or, in other words, upon the effect of each independent variable on the *marginal* impact of x_n on the subjective probabilities. These are not known a priori and cannot be determined by making assumptions about the first derivatives of the subjective probability functions. This ambiguity is contrary to the standard view

4 While the $s_n(\cdot)$ function can take a variety of forms, in the Canadian example considered below, $s_n(\cdot)$ is non-decreasing and concave in x_n, non-increasing in V_n, and $\partial^2 S_n/\partial x_n \partial V_n$ is zero.

5 A maximum will be ensured if $a_n(\partial^2 P_n/\partial x_n^2) + \lambda[s_n(\partial^2 R_n/\partial x_n^2) + 2(\partial R_n/\partial x_n)(\partial S_n/\partial x_n) + R_n(\partial^2 s_n/\partial x_n^2)]V_n < 0$, for $n = 1, \ldots, N$.

6 This requires that $P_n(\cdot)$ and $R_n(\cdot)$ be monotonically increasing in x_n. This assumption is supported by the empirical evidence (Palda, 1975; Jacobson, 1980; Chapman and Palda, 1984) and seems intuitively reasonable.

(e.g., Jacobson, 1985; Chapman and Palda, 1984, 1986; and Poole et al., 1987 all hypothesize that the more competitive a constituency, the more a party will spend) and implies that even in a simple theoretical model little can be predicted about advertising behaviour.

The partial derivative of (4) with respect to V_n does not depend upon cross-partial derivatives of the subjective probability functions and can be signed by using the first- and second-order conditions for a maximum in conjunction with the restrictions imposed on $s_n(\cdot)$ by the subsidy scheme actually used in Canada. The negative relationship between expenditure per registered voter and the number of registered voters results from two factors. First, since the model is defined in terms of expenditure per registered voter, the marginal cost of x_n rises in proportion to any increase in V_n. Second, the formula in Canada determining the public subsidy per registered voter in each constituency is non-increasing in the number of registered voters, and, as a result, an increase in V_n will at best leave this subsidy unchanged. (The inverse relationship between the number of registered voters and campaign expenditures per registered voter is also consistent with the existence of economies of scale in campaign spending).

Constituency level campaign spending is unaffected by B because this component of a party's budget does not interact with or depend upon x_n. As a result, it has no impact on the marginal benefit or marginal cost of campaign expenditures.

CAMPAIGN EXPENDITURES IN THE 1980 CANADIAN FEDERAL ELECTION

Equation (4) describes optimal campaign expenditures per registered voter in each constituency by a particular party as a function of a competition variable, spending by rival parties, the number of registered voters, and a vector of additional factors z_n. The particular form of this equation depends upon the unknown subjective probability distributions $P_n(\cdot)$ and $R_n(\cdot)$ (as well as on how a_n varies across constituencies). For empirical purposes, it was approximated by a reciprocal function of the explanatory variables.

The reciprocal form was chosen in order to proxy the impact of legislated spending limits on campaign expenditures. Limits on election spending by candidates in each constituency were imposed by section 61.1 of the Canada Elections Act.[7] To what extent these limits actually constrained expenditure decisions is unclear. The act stated neither whether or not it was an offence to exceed the limit nor what penalty would be imposed if the ceiling were exceeded. Only one candidate in the 1980 Canadian federal election exceeded the limit, four others spent exactly the limit, and only 13 per cent of the candidates of the three major political parties (Conservative, Liberal, and New Democratic) spent 95 per cent or more of the limit (Hamel, 1981).

7 In 1980, the act specified the spending limit in dollars as $F \cdot \min\{V_n, 7500 + 0.5V_n, 13750 + 0.25V_n\}$, where F is a scalar based on the Consumer Price Index. For constituencies with less than ten voters per square kilometre, parties were allowed an extra 15 cents per square kilometre, but this addition could not exceed 25 per cent of the limit calculated in the normal way.

According to Seidle and Paltiel (1981), however, the limit did cause candidates to constrain their spending. The choice of the reciprocal functional form is consistent with this observation, since it implies that the dependent variable will be less responsive to an explanatory variable the larger the explanatory variable.

Two major empirical difficulties must be overcome in order for the campaign expenditure equation to be estimated. First, it is necessary to obtain data on the degree of competition perceived by each party in each constituency. Either opinion polls taken just prior to the election or past voting behaviour may be useful for this purpose. However, the first of these is subject to the usual problems of surveys and is, in particular, usually too thin in coverage for our purposes, while the second generally yields a poor measure of competition because of the long time interval between elections. During this interval constituency boundaries, candidates, and the general public's perception of the various parties and issues may change. The second major difficulty is that campaign expenditures are only one of an array of demand-inducing expenditures at the disposal of each political party and, thus, may not be strongly related to the determinants of total demand-inducing expenditure (Wright, 1974; Munro, 1975; and Blake 1976).

The use of data from the 1979 and 1980 Canadian federal elections reduces the significance of both problems. The 1979 election preceded the 1980 election by less than a year and led to a change in government and a minority government.[8] During the period between the two elections, it is unlikely that any party would have had time to use the government purse to enhance their public image. As a result, campaign expenditures in the 1980 election are likely to have been a good proxy for total demand-inducing expenditures. In addition, constituency boundaries were the same in the two elections, no new enumeration of voters occurred in 1980, and many of the candidates were the same (96 per cent of incumbents ran in 1980). These factors and the proximity in time of the 1979 and 1980 elections make it reasonable to use the results of the 1979 election to create an ex ante observable competition variable which measures the competitiveness of individual constituencies in the 1980 election from the viewpoint of individual candidates.

There exist several possible specifications for this competition variable. A number of authors have used zero-one dummy variables to represent competitiveness. For example, Shannon (1968) specifies a congressional seat as competitive if the Republican vote was between 45 and 55 per cent of the votes cast, while Adamany (1972) defines a seat as competitive if the winner receives less than 60 per cent of the two-party vote. Other authors have proposed continuous measures of the degree of competition. Wright (1974) measures competition for each state as the absolute difference between 0.5 and the 'predicted' Democratic share in the 1932 presidential election (where the prediction was obtained by fitting a linear trend to the Democratic share over the 1892 to 1932 period). Alternatively, Lovink (1973) has developed an

8 After sixteen years in office the Liberal party lost the general election of 22 May 1979. It was succeeded by a Conservative minority government which lost a vote of no-confidence on 14 December 1979 and called an election for 18 February 1980.

index of safety, later employed by Blake (1976), based on the percentage of the vote separating the winner and his nearest rival.

The measure of competitiveness we chose is similar to both a measure of market share and the measure proposed by Lovink, and, being continuous, it uses more of the information available than the discrete measures employed in the studies referred to above. For party p in constituency n, this competitiveness variable is

$$c_{np} = \frac{(1/N) \sum_{n=1}^{N} (V^{nw} - \min\{V^{ns}, V^{np}\})/V^{n}}{(V^{nw} - \min\{V^{ns}, V^{np}\})/V^{n}}, \tag{5}$$

where V^n is the number of votes cast in constituency n during the 1979 election, while V^{np}, V^{nw}, and V^{ns}, are the votes cast for party p, the winning party and the second-place party in constituency n, respectively.[9] The denominator of (5) gives the percentage of the votes cast which must be changed in favour of party p (or the second-place party) for party p to win (or lose) the seat and, thus, provides an indication of the extent of competition faced by party p in constituency n. The numerator provides an indication of the average level of competition party p faces throughout the country. As c_{np} rises, constituency n becomes more competitive (the election becomes closer) from the perspective of party p.[10] (The 1979 election data used to calculate c_{np} are given in Hamel, 1980a.)

The campaign expenditures model described above includes a relationship between one party's campaign expenditures and those of its competitors. Since it would be difficult for one party to estimate precisely the expenditures of other parties during the course of a campaign, we assume that each party uses expenditure data from the 1979 election as an estimate of its rivals' 1980 campaign expenditures.[11] (Data for these variables (CEL, LEL, NEL and SEL) can be found in Hamel, 1980c.)

In 1980 the New Democratic party and the Social Credit party did not contest two and 201 constituencies, respectively. In the constituencies in which they did not run candidates, these two parties are assumed to have had no impact on the campaign spending by the other parties, and therefore they were excluded from the set of explanatory variables determining the other parties' expenditures. To capture possible variation in the intercept due to participation in the election by New Democratic and Social Credit candidates, we employ two dummy variables, NCD and SCD, as defined in table 1.

9 Chapman and Palda (1984, 1986) use a similar measure of competitiveness but calculate it using actual votes cast in the elections under study. This utilizes information unavailable when spending decisions were made.

10 The variable defined by (5) does not depend on whether the party won or lost constituency n. It may be that parties behave differently in response to competitive pressures in constituencies they hold than in those they are trying to acquire. Preliminary estimates using two competition variables, one for seats won in the 1979 election and one for seats lost, did not yield significantly different results.

11 It follows from this assumption that we are not forcing the model's equilibrium for the 1980 election to be a long-run equilibrium in which expectations are correct. The estimates do not change significantly if actual campaign expenses are used, rather than lagged expenditures, in combination with an instrumental variables estimation procedure.

In Canada, publicly funded subsidies for campaign expenses are paid if a party captures 15 per cent or more of the votes cast in a constituency. These subsidies are a significant source of funds for the three major Parties (Seidle and Paltiel, 1981) and, in 1980, were determined by the formula (section 63.1 of the Canada Elections Act):[12]

$$s_n V_n = \min\{x_n, 0.25 + 200/V_n, 0.23 + 700/V_n\}V_n, \tag{6}$$

which incorporates the return of the $200 deposit for participation in the election as well as the public subsidy. Campaign expenditures per registered voter that lie below $\min\{0.25 + 200/V_n, 0.23 + 700/V_n\}$ were fully reimbursed; that is, the ad valorem subsidy was 100 per cent. For larger expenditures, the party received a *lump sum* subsidy that depended on the number of registered voters in the constituency.

Since the reimbursement formula switches from an ad valorem to a lump sum subsidy at $x_n = x_n^* \equiv \min(0.25 + 200/V_n, 0.23 + 700/V_n)$, the marginal benefit function of campaign expenditures is characterized by a discontinuity at this point. (In equation (3). $\partial s_n(\cdot)/\partial x_n$ switches from one to zero.) It follows that the comparative static results will depend on the location of the original equilibrium relative to this discontinuity. This is likely to be particularly important when the impact of a change in the number of registered voters on campaign spending is considered. In this case, as V_n increases, both the maximum reimbursement for campaign expenses per registered voter as well as the marginal benefit of these expenses decline. To capture the effect of the discontinuity in the marginal benefit function, we include in our expenditure equation a dichotomous variable that indicates whether or not party p in constituency n is receiving the maximum reimbursement. For each party this variable (CMRD, LMRD, and NMRD in table 1) is unity if $x_n \geq x_n^*$ and zero otherwise. (Hamel, 1981, reports the maximum reimbursement for each constituency.) Since the theoretical model predicts that the largest impact of this discontinuity is likely to be associated with the number of registered voters, the interaction effect between the maximum reimbursement dummy and V_n was also included in the campaign expenditure equation.[13] While this interaction effect does not alter the predicted sign of the impact of V_n on campaign expenditures, whether or not it increases or decreases this effect is uncertain, since it involves both a change in the slope and a shift in the marginal benefit schedule.

Political scientists have often argued, and some have provided empirical evidence, that incumbents frequently spend less on their campaigns than other candidates because they are already highly visible (Palda, 1975; Jacobson, 1980; Jacobson and Kernell, 1981; and Jacobson, 1983). In the model developed above, incumbency could affect campaign spending by influencing both the subjective probability of victory and the weight a party places on a particular constituency. However, the

12 This formula is not exact for constituencies with small population densities. For these constituencies, the subsidy is partially based on the number of registered voters per square kilometre.

13 The maximum reimbursement dummy was not interacted with all the explanatory variables, as the theoretical model would suggest, because CMRD, LMRD, and NMRD do not differ enough from the constant term for half of the equations estimated to provide sufficient degrees of freedom for the identification of separate effects. The interaction effect with V_n was not included in several equations for the same reason.

direction of this effect is uncertain, since it depends upon the impact of incumbency on the marginal effect of campaign expenditures on the probability of victory. To investigate empirically the effect of incumbency on campaign expenditures, we define an incumbency dummy for each political party that takes on a value of unity if the party's candidate in a constituency is an incumbent and zero otherwise. (Incumbency is determined using Hamel, 1980a, 1980b).

Cabinet membership of a candidate may alter the allocation of funds to a constituency by all parties in the contest for three reasons. First, cabinet ministers generally have a high profile relative to other candidates. Second, if a cabinet minister loses his seat, the political image of the party may be damaged, since ministers are more visible representatives of party policy and, finally, cabinet ministers are frequently absent from their constituencies during a campaign. As with incumbency, the theoretical prediction of the direction of the effect of cabinet membership on campaign spending is ambiguous. To determine whether there is a significant effect a dummy variable for cabinet membership was included in the campaign expenditures equation. Though they were in opposition at the time of the 1980 election, eighteen Liberal party candidates had been cabinet ministers less than a year before, and, as a consequence, a dummy variable was included for them as well as for the Conservative ministers. (These variables were derived using information in Normandin, 1978, 1979; Hamel, 1980b.)

Table 1 lists the variables used to estimate campaign expenditure equations for each of the three major political parties (Conservative, Liberal and New Democratic). The specific functional form of the estimating equation describing Liberal party expenditures in constituency n is

$$\begin{aligned} \mathrm{LE}_n = {} & \alpha_0 + \alpha_1/\mathrm{LC}_n + \alpha_2/\mathrm{CEL}_n + \alpha_3/\mathrm{NEL}_n + \alpha_4/\mathrm{SEL}_n + \alpha_5/\mathrm{RV}_n + \alpha_6\mathrm{LMRD}_n/\mathrm{RV}_n \\ & + \alpha_7\mathrm{LMRD}_n + \alpha_8\mathrm{NCD}_n + \alpha_9\mathrm{SCD}_n + \alpha_{10}\mathrm{CCMD}_n \\ & + \alpha_{11}\mathrm{LCMD}_n + \alpha_{12}\mathrm{LID}_n + \varepsilon_n. \end{aligned} \tag{7}$$

Similar equations were specified for the New Democratic and Conservative parties. Expenditure equations estimated using data for Canada or Canada less Quebec also included regional dummy variables.

Campaign expenditure data for each political party by constituency for the 1980 Canadian federal election are published by the chief electoral officer (Hamel, 1981). Campaign expenses include spending between the time when the election was called and the day of the election 'for the purpose of promoting or opposing, directly and during an election, a particular registered party, or the election of a particular candidate.'[14] This expenditure data do not capture the opportunity cost of volunteer time or the value of partisan reporting by the media.

14 See section 2(1) of the Canada Elections Act prevailing in 1980. In this act election expenses means (a) amounts paid; (b) liabilities incurred; (c) the commercial value of goods and services donated or provided, other than volunteer labour; and (d) amounts that represent the differences between amounts paid and liabilities incurred for goods and services, other than volunteer labour, and the commercial value thereof where they are provided at less than their commercial value. These expenses include broadcasting and published advertising; cost of meeting space, refreshments and mailing objects of promotional nature; cost of government provided goods, etc. In addition, the $200 deposit required to participate in the election was included as an expense.

ESTIMATES OF THE CAMPAIGN EXPENDITURE MODEL

Estimates of campaign expenditure equations for each of Canada's three major political parties are summarized in tables 2 to 4.[15] For each party ordinary least squares was used to estimate the expenditure equations using data for Canada, Canada less Quebec, and the five regions of Canada (Atlantic, Quebec, Ontario, Prairies, and British Columbia).[16] Campaign expenditures per registered voter, rather than total expenditures, is used as the dependent variable to reduce the possibility of heteroscedasticity.

As already noted, the theoretical model could not generate unambiguous predictions with respect to the effect of increased competition on campaign spending. However, the estimates in tables 2 to 4 are strongly supportive of the view that increased competition leads to larger expenditures per registered voter. (The reciprocal model's coefficients are opposite in sign to those of a model in levels). Sixteen of the twenty-one coefficients on the competitiveness variable indicate a positive relationship between competition and spending and are significant at the 5 per cent level. The remaining five have the same sign but are statistically insignificant at the 5 per cent level (though two are significant at 10 per cent).[17]

As an example of the meaning of the estimated competition coefficients, consider an average-size constituency (Scarborough East) which the Conservatives won in 1979. If 2,000 of the Conservative's 1979 votes had actually been split evenly between the Liberals and New Democrats, the constituency would have been deemed more competitive by all three parties. If this had been the case, the model predicts that the Conservatives would have spent 2.3 per cent more per voter in this constituency than they actually did, the Liberals 3.6 per cent more, and the New Democrats 14.2 per cent more. This is consistent with the overall Canadian results, which show that the New Democrats, the weakest player both politically and financially, are much

15 Our results are based on 281 constituencies, instead of 282, because of the exclusion of Frontenac constituency in Quebec. In this constituency the election was postponed until 10 March 1980, and the campaign spending limits were raised by 50 per cent, because a candidate died during the regular election campaign. Furthermore, although we report the results for only the three major political parties, we did estimate an equation for the Social Credit party. In spite of their substantially lower participation rate (they did not run in 201 constituencies), the results were not very different from those of the other parties.

16 Using a test developed in MacKinnon et al. (1983), the null hypothesis of a reciprocal model was tested against the alternative hyothesis of a logarithmic specification. Since in only one of the fifteen regional equations could this alternative reject the null, and then just barely, we have only reported results using the reciprocal model. The coefficient estimates of the logarithmic version tend to have the same signs but are generally less significant. Ordinary least squares on each equation, rather than a seemingly unrelated regression procedure, was employed because the hypothesis of a diagonal covariance matrix could not be rejected using a test described in Breusch and Pagan (1980).

17 The competitiveness variable is a proxy for the information candidates use to determine the closeness of a political contest, and thus the estimates reported could be subject to errors in variables bias. A Hausman (1978) test was used to examine this possibility in the fifteen regional equations, and it found that the independence assumption could be rejected only for the Liberal Quebec equation. An instrumental variables estimate of this equation yielded coefficient estimates of the same sign and magnitude as those reported in column IV of table 2.

more sensitive to competitive pressures. (See the description of NDP strategy in Seidle and Paltiel, 1981).

The estimated competition coefficients indicate that the Liberal party most consistently responded to competitive pressures. The coefficient on the competition variable is significant (at 95 per cent) in all five regional Liberal expenditure equations, while it is significant in only three of those of the New Democrats and two of those of the Conservatives. In particular, this coefficient is insignificant in the Conservative and New Democratic party equations for Quebec, where both parties were extremely weak, and the Conservative equation for its stronghold of the Prairies. While this behaviour does not seem to be 'rational' (Seidle and Paltiel, 1981), it is consistent with a longer-term strategy of new firms advertising to break into a market and a dominant firm advertising to maintain customer loyalty. It is interesting to note, however, that despite being extremely dominant in Quebec the Liberal party allocated expenditures in that province in a manner that was sensitive to competitive pressures. All three parties were sensitive to competition when determining the distribution of their expenditures in Ontario which tends to be the most politically volatile region.

Overall, the degree of sensitivity of campaign expenditures to the level of competition was by far greatest for the New Democrats, the weakest of the three parties. Across regions the Liberals had the largest statistically significant response to competition in their weakest areas (British Columbia and the Prairies). The New Democrats, on the other hand, were most sensitive to competitive pressures in their target regions of Ontario and the Prairies. The fact that the Liberal party seems to have taken the extent of competition into account more than the other two major parties may indicate the more efficient nature of the Liberal national campaign committee for English Canada as opposed to the more decentralized, provincially based committees of the Conservatives and New Democrats (see Seidle and Paltiel, 1981).

The model predicts an inverse relationship between the number of registered voters and campaign expenditures per registered voter whether or not this variable interacts with the maximum reimbursement dummy (though the sign on the interaction effect is ambiguous). The estimated coefficient on the number of registered voters is statistically significant and consistent with the theory in nineteen of twenty-one equations estimated. The coefficient on the number of registered voters in column IV of table 2 is statistically significant and has a sign inconsistent with the theory. This result could be caused by the small number of observations for which the maximum reimbursement dummy is zero in this case (only six of seventy-four observations had LMRD = 0). In any event, the sum of this coefficient and the interaction coefficient has the hypothesized sign.

For all three parties, the largest (in absolute value) elasticities of per capita campaign expenditures with respect to the number of registered voters are in Quebec and the prairie provinces while the smallest are in Ontario. However, even in Ontario the estimated coefficients indicate considerable economies of scale in campaign spending. If the number of registered voters in the average Ontario constituency increased by 10 per cent, the model predicts that per voter spending by the Liberals,

TABLE 2

Liberal party expenditure equations, dependent variable: LE

Variable	I Canada	II Canada less Que	III ATL	IV QUE	V ONT	VI PRA	VII BC
LC^{-1}	−0.0501	−0.0603	−0.0460	−0.0360	−0.0463	−0.0805	−0.1077
	(9.28)	(7.52)	(3.64)	(2.45)	(3.16)	(4.71)	(5.26)
CEL^{-1}	−0.0003	0.0070	0.0150	−0.0003	−0.0047	0.0194	0.0268
	(3.45)	(1.32)	(3.13)	(3.56)	(0.57)	(0.86)	(0.94)
NEL^{-1}	0.00005	0.0002	0.0001	0.00002	0.0012	0.0002	0.0165
	(0.95)	(2.21)	(0.86)	(0.35)	(1.47)	(2.85)	(5.96)
$LSEL^{-1}$	−0.0001	−0.0001		−0.00001	−0.0001	−0.0002	−0.0001
	(1.15)	(1.87)		(0.09)	(0.65)	(1.28)	(1.06)
RV^{-1}	4982.8	5266.2	17433.0	−23122.0	15142.0	8560.3	11668.0
	(11.87)	(11.23)	(22.20)	(4.80)	(9.97)	(3.05)	(3.20)
RV^{-1}* NMRD	11330.0	11545.0		40717.0		7942.4	3549.1
	(28.09)	(24.50)		(7.48)		(2.63)	(0.72)
LMRD	−0.0114	−0.0147		−0.5673		0.0487	0.0821
	(0.80)	(0.87)		(5.83)		(0.72)	(1.05)
NCD	0.0524			0.0792			
	(0.56)			(1.17)			
SCD	0.0085	0.0283		0.0033	0.0314	0.0310	0.0292
	(0.67)	(1.63)		(0.17)	(1.83)	(1.26)	(0.88)
Constant	0.1290	0.1639	0.1283	0.6401	0.1893	0.0764	−0.0033
	(1.34)	(7.22)	(5.58)	(5.66)	(4.82)	(0.68)	(0.03)
CCMD	−0.0019	−0.0064	0.0158	0.0762	−0.0174	−0.0221	−0.0131
	(0.15)	(0.48)	(0.91)	(1.85)	(0.99)	(0.52)	(0.77)
LCMD	0.0225	0.0139	0.0556	0.0144	0.0169		
	(1.92)	(1.05)	(2.40)	(0.63)	(0.89)		
LID	−0.0174	−0.0191	−0.0341	−0.0252	−0.0104	−0.0020	
	(2.25)	(2.12)	(2.36)	(1.14)	(0.84)	(0.07)	

TABLE 2 *(concluded)*

Variable	I Canada	II Canada less Que	III ATL	IV QUE	V ONT	VI PRA	VII BC
QUE	0.0162						
	(1.07)						
ATL	0.0254	0.0243					
	(2.78)	(2.59)					
PRA	−0.0228	−0.0221					
	(1.82)	(1.66)					
BC	−0.0276	0.0240					
	(2.11)	(1.84)					
TERR	−0.0407	−0.0573					
	(1.09)	(1.43)					
R^2	0.870	0.904	0.963	0.699	0.615	0.839	0.848
Koenker	74.27	37.20	8.63	23.55	15.01	21.56	15.55
χ^2 test (d.o.f.)	(23)	(21)**	(11)*	(18)*	(14)*	(16)*	(14)*
Number of observations	281	207	32	74	95	49	28
Limits for							
LMRD = 1	252	184	32	68	94	34	22
CCMD = 1	28	25	5	3	11	5	3
LCMD = 1	18	10	3	8	6	1	0
LID = 1	109	44	11	65	30	2	1
SCD = 1	80	26	0	54	5	16	5
NCD = 1	279	207	32	72	95	49	28

NOTES

The numbers in brackets are the absolute values of the *t*-statistics. These have been adjusted for heteroscedasticity of unknown form using the method proposed by White (1980). The levels of the explanatory variables and their squares were employed in the artificial regression required by the Koenker (1981) test for heteroscedasticity.

* Could not reject the hypothesis of homoscedasticity at a 95 per cent confidence level.

** Could not reject the hypothesis of homoscedasticity at a 99 per cent confidence level.

TABLE 3

Conservative party expenditure equation, dependent variable: CE

Variable	I Canada	II Canada less Que	III ATL	IV QUE	V ONT	VI PRA	VII BC
CC^{-1}	−0.0339	−0.0515	−0.0994	−0.0149	−0.0389	−0.0218	−0.0825
	(3.28)	(4.51)	(2.31)	(0.55)	(2.33)	(0.82)	(1.92)
LEL^{-1}	0.0006	0.0046	0.0035	0.0364	0.0097	0.0005	0.0105
	(0.11)	(0.86)	(0.06)	(1.26)	(0.72)	(0.07)	(1.06)
NEL^{-1}	−0.00001	0.00002	0.0004	0.0001	−0.0007	−0.0002	0.0050
	(0.08)	(0.15)	(1.35)	(0.70)	(0.65)	(1.59)	(1.03)
SEL^{-1}	−0.00004	0.00004		−0.0003	0.0001	−0.0002	0.0001
	(0.52)	(0.43)		(3.38)	(0.89)	(1.25)	(0.67)
RV^{-1}	426.14	−706.51	18327	3144.8	31022.0	4670.3	16616.0
	(0.55)	(1.05)	(7.01)	(0.73)	(6.25)	(1.27)	(4.45)
RV^{-1}* CMRD	15838.0	17365.0		13183.0	−18174.0	13238.0	
	(20.92)	(25.43)		(1.78)	(3.15)	(2.97)	
CMRD	0.0052	−0.1366		0.1108	0.5386	−0.0550	
	(0.20)	(4.46)		(0.83)	(4.96)	(0.66)	
NCD	0.0309			0.0624			
	(0.58)			(2.17)			
SCD	−0.0011	0.0020		0.0030	−0.0210	0.0344	0.0192
	(0.07)	(0.11)		(0.13)	(0.92)	(1.41)	(0.53)
Constant	0.1148	0.2761	0.1654	−0.0962	−0.3548	0.2001	0.1073
	(1.88)	(8.60)	(1.06)	(0.76)	(3.67)	(2.62)	(1.57)
CCMD	−0.0084	−0.0079	−0.0257	0.0935	−0.0126	0.0342	0.0281
	(0.71)	(0.64)	(0.63)	(3.63)	(0.73)	(1.31)	(1.12)
LCMD	0.0139	−0.0040	−0.0355	0.0230	0.0207		
	(0.68)	(0.17)	(1.00)	(0.67)	(1.11)		

TABLE 3 *(concluded)*

Variable	I Canada	II Canada less Que	III ATL	IV QUE	V ONT	VI PRA	VII BC
CID	0.0065	0.0109	0.0111	−0.0442	0.0255	−0.0507	0.0105
	(0.72)	(1.26)	(0.51)	(1.06)	(2.13)	(2.36)	(0.29)
QUE	0.0122						
	(0.61)						
ATL	0.0338	0.0367					
	(2.71)	(3.13)					
PRA	0.0147	0.0051					
	(1.29)	(0.48)					
BC	0.0055	−0.0006					
	(0.47)	(0.05)					
TERR	0.0330	0.0231					
	(0.52)	(0.38)					
R^2	0.887	0.869	0.893	0.863	0.586	0.835	0.479
Koenker	59.76	40.55	27.65	20.59	30.92	19.90	19.83
χ^2 test (d.o.f.)	(23)	(21)	(11)	(18)*	(16)**	(16)*	(12)*
Number of observations	281	207	32	74	95	49	28
Limits for							
CMRD = 1	224	197	31	27	93	44	27
CID = 1	128	126	18	2	55	33	18

See notes to table 2.

TABLE 4

New democratic party expenditure equation, dependent variable: NE

Variable	I Canada	II Canada less Que	III ATL	IV QUE	V ONT	VI PRA	VII BC
NC^{-1}	−0.1289	−0.1613	−0.1181	−0.0078	−0.1891	−0.1429	−0.0717
	(12.30)	(14.93)	(3.76)	(0.71)	(10.24)	(8.29)	(1.70)
LEL^{-1}	0.0047	0.0044	−0.0173	0.0092	0.0039	0.0029	0.0082
	(1.51)	(1.42)	(0.51)	(1.24)	(0.36)	(0.90)	(0.89)
CEL^{-1}	0.0001	0.0036	−0.0018	−0.00001	0.0089	−0.0092	−0.0035
	(2.67)	(0.66)	(0.21)	(0.47)	(1.28)	(0.95)	(0.19)
SEL^{-1}	−0.00001	−0.0001		0.00002	−0.0003	−0.0001	0.0001
	(0.27)	(1.94)		(0.29)	(2.12)	(1.43)	(0.96)
RV^{-1}	2803.4	3400.7	−1471.7	149.66	6242.9	5650.4	33964.0
	(2.86)	(3.59)	(0.71)	(0.09)	(2.24)	(2.49)	(2.45)
RV^{-1}* NMRD	7341.8	7123.7	11984.0	53958.0	2547.8	7817.0	−20900.0
	(6.03)	(6.91)	(3.16)	(16.77)	(0.76)	(2.33)	(1.47)
NMRD	0.0248	0.0076	−0.0904	−0.6812	0.0724	0.0012	0.5822
	(1.02)	(0.35)	(1.23)	(11.71)	(1.27)	(0.02)	(1.97)
SCD	−0.0198	0.0062		−0.0059	0.0271	0.0014	−0.0408
	(2.13)	(0.44)		(0.94)	(1.12)	(0.09)	(2.70)
Constant	0.2003	0.2174	0.3278	0.0097	0.1855	0.2248	−0.4170
	(8.45)	(7.81)	(2.73)	(0.27)	(3.26)	(5.13)	(1.42)
CCMD	−0.0173	−0.0081	0.0102	−0.0132	0.0093	−0.0430	0.0120
	(1.41)	(0.59)	(0.42)	(2.33)	(0.53)	(1.74)	(0.16)
LCMD	0.0157	0.0028	0.0238	−0.0077	−0.0145		
	(1.28)	(0.14)	(0.77)	(1.54)	(0.53)		
NID	0.0075	0.0001	−0.0322		0.0107	0.0097	0.0086
	(0.61)	(0.01)	(0.79)		(0.33)	(0.55)	(0.37)

TABLE 4 *(concluded)*

Variable	I Canada	II Canada less Que	III ATL	IV QUE	V ONT	VI PRA	VII BC
QUE	−0.0231 (1.87)						
ATL	−0.0189 (1.51)	−0.0188 (1.51)					
PRA	0.0324 (3.06)	0.0359 (3.45)					
BC	0.0217 (1.80)	0.0216 (1.77)					
TERR	0.3366 (5.14)	0.2844 (4.45)					
R^2	0.925	0.905	0.799	0.783	0.859	0.963	0.786
Koenker	59.46	39.99	18.56	8.86	10.50	16.31	25.83
χ^2 test (d.o.f.)	(22)	(21)	(14)*	(15)*	(17)*	(15)*	(16)*
Number of observations	281	207	32	74	95	49	28
Limits for NMRD = 1	120	118	11	2	54	27	25
NID = 1	26	26	2	0	6	9	8

See notes to table 2.

Conservatives, and New Democrats would fall by 5.3, 4.6, and 5.1 per cent, respectively.

As mentioned above, political scientists have argued that incumbency may affect campaign expenditures. Indeed, Jacobson (1980) has observed an inverse relation between incumbency and these expenditures. We do not find much support for this hypothesis. Only five of the nineteen coefficients on the incumbency dummies are statistically significant at the 5 per cent level. Of these, four have negative signs and one is positive.[18] To capture the presence of 'high profile incumbents,' the estimated equations also included dummy variables for cabinet ministers in the last Liberal and Conservative governments. Again the results in tables 2 to 4 give little support to the hypothesis that these variables are important determinants of campaign expenditures, since they are statistically significant in only three cases (Chapman and Palda, 1984, 1986, find similar results). Thus, while Krashinsky and Milne (1983, 1985, 1986) find incumbency to have a significant effect on votes garnered by a party, this is not reflected in their campaign expenditures.

Tables 2 to 4 also provide estimates of how each party responded to the amount of campaign spending by its rivals. In all cases, spending by other parties had a small and generally insignificant effect. For example, one of the larger and significant coefficients is that on Conservative spending in the Liberal equation for the Atlantic region. However, even here a 10 per cent increase in Conservative spending would increase Liberal spending only by 0.5 per cent. (Chapman and Palda, 1984, and Brams and Davis, 1973, cite reasons for this result). Therefore, the assumption of zero conjectures does not seem to conflict with the empirical evidence.

Each estimated equation was tested for heteroscedasticity using a generalization of the White test developed by Koenker (1981). This test may also be interpreted as a general test for misspecification (White, 1980). There is evidence of heteroscedasticity or misspecification of the campaign expenditure model when it is applied to Canada as a whole or Canada less Quebec, but not for the regional estimates (other than in the Conservative equation for the Atlantic region).

A heteroscedasticity consistent test for the equality of the parameters across the five regions, as suggested by White (1980), was carried out in order to determine whether the imposition of the identical parameters restriction might be causing the 'heteroscedasticity' result. The hypothesis of parameter constancy across regions (including as well as excluding Quebec) was decisively rejected for all three parties (see table 5). Thus, while the signs of the parameters tend to be the same across regions, their magnitudes differ significantly.

There are two explanations for this result. First, Canada's political parties are regionally based (see the regional distribution of incumbents in tables 2, 3, and 4), and, as a result, they are likely to be perceived differently by voters in different

18 The campaign expenditure model was re-estimated using an alternative incumbency dummy which was unity if the candidate in the 1980 election had won the constituency in the two prior elections (1974 and 1979). The inclusion of this dummy did not alter the statistical significance of any variable or equation, and its estimated coefficients were not significantly different from those of the less restrictive incumbency dummy.

TABLE 5

Tests of parameter constraints

1. White χ^2-test for parameter constancy across regions (d.o.f.)

Party	Canada	Canada less QUE
Liberal	298.25 (35)[a]	171.94 (25)[a]
Conservative	940.68 (38)[a]	288.22 (28)[a]
New Democratic	1204.19 (37)[a]	121.68 (28)[a]

2. F-test that all coefficients are zero except the constant (d.o.f.)

Party	ATL	QUE	ONT	PRA	BC
Liberal	89.74 (7,24)	11.97 (12,61)	15.06 (9,85)	19.78 (10,38)	11.14 (9,18)
Conservative	334.71[b] (7)	31.87 (12,61)	10.67 (11,83)	19.25 (10,38)	2.18 (8,19)[c]
New Democratic	9.71 (9,22)	22.69 (10,63)	45.84 (11,83)	98.07 (10,38)	6.25 (10,17)

3. F-test that all coefficients are zero except that on RV (d.o.f.)

Party	ATL	QUE	ONT	PRA	BC
Liberal	9.14 (7,24)	7.72 (12,61)	7.52 (9,85)	19.82 (10,38)	7.92 (9,18)
Conservative	36.9[b] (7)	28.28 (12,61)	13.00 (11,83)	9.17 (10,38)	1.38 (8,19)[c]
New Democratic	18.26 (9,22)	22.99 (10,63)	37.71 (11,83)	61.57 (10,38)	6.19 (10,17)

a Rejected the hypothesis of parameter constancy across regions at a 95 per cent confidence level.
b White χ^2 heteroscedasticity consistent test (White, 1980).
c Could not reject the zero restriction at a 5 per cent confidence level.

regions. As a result, the sensitivity of campaign expenditures to the competitiveness variable, as well as the other explanatory variables, should also differ across regions. Second, the campaigns of Canada's political parties, particularly the Conservatives and New Democrats, were directed from the regional rather than the national level (see Seidle and Paltiel, 1981). Neither of these two explanations is inconsistent with the theoretical model developed above, since it can be applied on a national or regional basis. In fact, this result, along with the estimates of tables 2 to 4, implies that in very different political settings increased competition generally leads to increased promotional effort.

The results in tables 2 to 4 cast doubt on several alternative hypotheses of campaign expenditure determination. First, a random allocation of expenditures

across constituencies, requiring that all coefficients be statistically insignificant, is not supported by the data. Second, the hypothesis of constant expenditures per registered voter requires that all coefficients other than the constant term be zero. In fourteen of the fifteen regional expenditure equations this restriction is rejected (see table 5). Finally, the allocation of campaign expenditures equally across constituencies would imply that the coefficients on all variables, other than the inverse of the number of registered voters, be zero. This restriction is also rejected by the data in fourteen of the fifteen regional expenditure equations estimated (see table 5).[19]

CONCLUSION

In this paper, a model of the determination of political campaign expenditures is developed based on the principle of expected utility maximization. Unlike the conventional view, this model indicates that the degree of competitiveness, the spending of other parties, and other factors, such as incumbency and ministerial status, have an uncertain impact on campaign spending. Only the number of registered voters in a constituency can be unambiguously predicted to have a negative effect on spending per registered voter. As a consequence, the impact of competition and other factors on campaign expenditures is primarily an empirical question.

Evidence from the 1980 Canadian federal election indicates that the degree of competition faced by a party and the number of registered voters in a constituency are the principal determinants of campaign spending per registered voter. The results imply that political parties devote more campaign resources to competitive constituencies than to either safe or hopeless ones, and that spending per registered voter falls as the number of registered voters in a constituency rises. This second result could follow from either a reduction in the marginal benefit of campaign expenditures as the number of registered voters increases (i.e., because the subsidy per voter declines) or, alternatively, to economies of scale in campaign spending.

Alternative hypotheses of constant spending per registered voter, constant spending per constituency, or the random allocation of funds among constituencies are rejected. It was also found that incumbency and ministerial status were not important. Finally, the assumption that parties do not alter their spending in response

19 Another competing hypothesis is that constituency level campaign expenditures depend only upon contributions to candidates. The campaign contributions data available in Hamel (1981) include all contributions to a candidate's campaign, including those from higher-level party organizations. If our model is correct, these higher-level party contributions will be determined in part by the degree of competition. Thus, a model based on total contributions will indirectly incorporate the effects of competition and, as a result, be difficult to distinguish empirically from our model. (Ideally what is required is data on contributions to each candidate net of all strategic intraparty transfers). While recognizing this problem with the data, we did attempt to compare statistically the two models using the non-nested hypothesis test (*J*-test) of Davidson and MacKinnon (1981) and the available contributions data. The results of this test were inconclusive, though somewhat in favour of our model. (Chapman and Palda, 1986, provide empirical evidence which indicates that campaign expenditures are not determined by contributions). In any case, the addition of per voter contributions to our model did not change the sign of the competitiveness variable in any regression.

to the spending of other parties could not be rejected. Thus, the assumption of zero conjectures does not seem unreasonable.

This paper examines the impact of competition on advertising effort in the political market place. The advantage of using this market, as opposed to a more standard product market, is that data are readily available and competitors are easy to identify. In other ways the differences between this and a standard market are not that great. Consumers (voters) purchase a product (a political platform) using their endowment (vote) from one of a set of firms (Political parties). These firms try to attract customers through advertising. Given their resources are limited, there is an optimal distribution of advertising expenditures across submarkets. The empirical results presented above indicate that this distribution will depend to a large extent on the competitive position of the firm in each submarket. The more intense the competition, the more the firm will spend on advertising. These results are robust over diverse regions and participants in the market.

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