Impact of Electoral Competition, Swing Voters and Interest Groups on Equilibrium Policy Platforms: Exploring the Strategic Forces at Work

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Abstract

The paper analyzes how the equilibrium electoral policy platforms change in a probabilistic model of electoral competition between two purely opportunistic and corrupt candidates in the presence of exogenously given interest groups. The economic policy of interest in this model is the tax to fund the public good provision. We derive equilibrium tax platforms for three different specifications of the model: benchmark (no swing voters and no lobbies), pure-swing and swing-voter plus interest groups. It is found that the equilibrium tax platform of an electoral candidate under benchmark scenario is greater than or equal to the same under the pure swing voter case because the presence of swing-voters in the economy dilutes the intensity of economic policy preferences of each group and therefore the choice of (tax) policy. Furthermore, it is found that, an increase in the honesty parameter of the candidate results in greater donations by the interest group towards that candidate. Additionally, two significant effects have been found to be at work in driving the comparative static results, namely the relative swing voter effect and the relative organizational strength of lobbies effect. Based on which of these two effects is stronger, we find that the equilibrium policy platforms of candidates (tax platform) sway in favour of the more dominant voter group.

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1. Introduction

The analysis of theoretical models of electoral competition ultimately leads to a discussion on equilibrium policy platforms of electoral candidates in question. Candidates during electoral competition are expected to move their policy platforms so as to maximize their vote-share and hence their chances of winning the election. Real world politics majorly involves a great deal of interaction between three separate aspects, that is, policy and ideological preferences of voters, role of special interest groups and electoral objectives of candidates. Now, there are various forces at work which make the candidates choose different policy positions which have been dealt with in the existing literature on political economy models. For instance, in the standard Downsian model where no special interest groups exist and in which the two candidates are purely opportunistic; a candidate located, say, to the left of her competitor always has the incentive to approach her competitor's location because all the voters with ideal policies to her left will always vote for her. Thus, this player unambiguously raises her vote-share by approaching her competitor's policy position. This holds true for both the candidates and, hence, there occurs complete convergence to the median voter policy position in the Downsian model of electoral competition. The intuition behind the policy convergence rests on the existence of centripetal forces which lead political parties (or candidates) to advocate centrist or median voter policies (Cox, 1990). Theoretically, several studies have recognized another opposing force at work, that is, the centrifugal force (also coined by Cox, 1990) which helps explain the incomplete policy convergence and/or policy divergence phenomenon. For example, when an extremist candidate moves towards the median policy, it unambiguously results in a loss in the vote-share of voters who have extreme policy preferences. Hence, these centrifugal incentives lead to the advocacy of, more or less, extreme policy positions by the candidate. This happens if electoral platforms systematically favor certain organized groups, those groups will also adapt their campaign contributions accordingly.

The belief that the political process only serves the interests of the median voter does not ring true under a real-world scenario. Lobbies or special interest groups are said to have a crucial role in the elections because of their contribution to political parties, endorsement of electoral candidates, and provision of information to the public. Broadly speaking, the interest groups seem to have two motives while contributing to politicians and/or political parties.[1] First, there is the electoral motive wherein the lobbies tend to promote the electoral prospects of their preferred candidates. The second is the influence motive that aims to influence the politician's policy pronouncements (Grossman and Helpman, 1996). As Grossman and Helpman (1996) have explained in their paper that the political candidates have two strategic tools to influence their vote shares: they can sway informed voters by their choice of policies as in the standard Downsian theory, and they can influence uninformed voters by the amount of money they can raise for their election campaigns. And this is the trade-off that external interest groups can exploit because they can make offers of campaign contributions which are conditioned on policy platforms chosen by political candidates, which the latter are willing to accept. Hence, it is quite apparent from the above discussion that the strategic interactions between policymakers (or political candidates) and interest groups cannot be ignored while developing a theoretical model to study lobbying and electoral policy outcomes.

In this paper, we illustrate how electorally motivated lobbying may influence policy and explore the different strategic forces at work, namely the swing-voter effect and the relative organizational strength of lobbies effect apart from the conventional centripetal force (traditionally known as the median voter effect), which shape the policy choices of political candidates. Our basic model structure follows the combined lobbying and probabilistic voting model of Persson and Tabellini (2002), which is extended further by incorporating respective parameters to capture corruption and effectiveness of campaign spending expenditure of the electoral candidates. The probabilistic nature of the model helps in focusing on the ideological differences across voters and hence segregates the impact of swing voters on the electoral outcomes. We derive equilibrium expressions for policy platforms of the two electoral candidates under three different specifications of the model, namely, the benchmark case (with no swing voters and no lobbies), the pure-swing voter case and the case with the presence of both interest groups and swing-voters. We also solve for equilibrium campaign contributions by interest groups and derive comparative statics results with respect to various parameters of the model which helps gain additional insights about the effectiveness of the interest groups and their campaign donations.

Specifically, we go beyond benchmark Persson and Tabellini (2002) model by providing a comparison of the equilibrium policy platforms of the political candidates across different specifications of the theoretical framework. In addition to this, we

[1] The two motivations are not necessarily mutually exclusive. It is a methodological issue.

also derive several comparative statics results describing how the policy platforms of the politicians adjust to a change in different factors like honesty (or corruption) parameter, a measure of election payoff, popularity shock parameter, effectiveness of campaign expenditure etc. To the best of our knowledge, an explicit comparison of different policy equilibria across distinct specifications of the model (mentioned above) have not been attempted in any other related study and are a novelty of our paper. Furthermore, the paper makes a significant contribution to the existing literature in that it identifies the important channels through which the policy platforms adapt and respond to variations in the numerous political and economic parameters of the model (via the relative swing voter effect, the relative organizational strength of lobbies effect and the inherent median voter (in this model the mean voter) or the centripetal effect).

The rest of the paper is organized as follows. Section 2 provides a brief review of existing literature. Section 3 outlines the basic structure of the model and the stages of the game. Section 4 lays out the characterization of equilibrium for different specifications of the model. This is followed by a comparison of policy platforms in different equilibrium specifications of the model in Section 5. Section 6 deals with the comparative statics and provides intuitive explanation for the results derived from it. Finally, Section 7 concludes.

2. Literature

A vast body of literature is present on pure electoral competition models as well as models with both electoral competition and lobbying. Our survey of theoretical literature on models of two-party electoral competition and policy convergence (or divergence) inevitably has to start with the pioneering work done in this field by Hotelling (1929). He had stated that if two political parties compete for the votes of citizens along a one-dimensional policy space, then they will converge on the policy preferred by the voter who has a median position in the policy dimension. Downs (1957) and Black (1958) formally built upon the Hotelling's idea and analyzed an election that determined who will get to hold a particular political office. And his chief finding was that, in equilibrium, the parties will announce identical centrist policies implying total convergence of the policy platforms. Enelow and Hinich (1984), Ledyard (1984), McKelvey and Ordeshook (1985), and Tovey (2010) are a few other papers supporting the policy convergence result in this context. The standard Downsian finding rests on the numerous specific assumptions like the parties/ candidates are motivated solely by office seeking and that voters choose solely on the basis of their policy proximity to candidates' positions, single policy dimension etc. When one or more of these assumptions is violated, the usual convergence result can often be expected to disappear (Grofman, 2004). Adams et al. (2005) states that apart from centripetal forces, one cannot ignore the impact of centrifugal forces while forming a model of political competition.

One way to incorporate the impact of centrifugal forces is by stepping away from the popular Downsian assumption of opportunistic parties/ candidates towards partisan parties/ candidates, that is, those who care about winning in order to be able to implement their preferred policy. Hibbs (1977), Holler (1978), Cox (1984), Hansson and Stuart(1984), Chappell and Keech (1986) and Wittman (1973, 1977, 1983), Roemer (1994, 1997) among others have modeled two-party competition as one in which parties (or candidates), rather than merely seeking a vote-maximizing location as in the classical Hotelling-Downs framework, trade off the probability of their winning an election against the achievement of personally or collectively desired policy goals. Wittman (1990) provides a thorough review of this formal modeling work up through the 1980s. He shows that assuming candidate and party policy preferences gives us much more realistic expectations about likely policy divergence. In contrast, Calvert (1985) notes that if the median voter preference is known and parties' policy preferences are on the opposite sides with respect to the median voter, then perfect convergence to the median voter's preferred policy occurs, even if the parties are policy-motivated. But again, if the interplay between the two motives of office and policy are considered then complete policy convergence, in general, does not come out to be the electoral equilibrium (Wittman, 1983; Calvert, 1985).

The introduction of special interest groups accounts for another type of centrifugal force in the existing models of electoral competition. Grossman and Helpman (1996) model lobbying as a "menu-auction" while studying a Downsian model of electoral competition where candidates choose policies to maximize their probability of winning the elections. In their common agency setting, lobbying induces candidates to select policies that constitute a compromise between the policy preferences of voters and the lobbies. Other papers addressing the issue of campaign contributions affecting electoral outcomes include papers by Austen-Smith (1987), Coughlin et al. (1990), Morton and Myerson (1992), Baron (1994), Groseclose and Snyder (1996), Besley and Coate (1997, 2001), Persson and Helpman (1998), Prat (2002), Persson and Tabellini (2002) among others.

3. Theoretical Framework

The mathematical model in this essay is based on the probabilistic voting model of Persson and Tabellini (2002) which deals with electoral competition between two opportunistic candidates. The former model is extended to incorporate the electorally motivated nature of political candidates along with the presence of lobbies formed by voters. The framework of the model is as follows.

3.1 The Economy

The initial economic framework employed in this essay has been derived from Redoano (2010). There is an economy with population size n. Residents consume a private good c and a local public good g. Output y is produced from labour which is inelastically supplied by each individual in an amount equal to unity. The production technology is assumed to be linear in total labour inputs, and without loss of generality, units are normalized so that the wage rate w is unity. Output y is used for private consumption and for the provision of the public good. The marginal rate of transformation between private consumption good and the public good in production is assumed to be unity. The provision of the public good is funded by an income tax levied on every individual at a common rate t and the government budget constraint is $g = tn$. The level of private good consumption for an individual is $c = w - t$, where since $w = 1$, it implies that $c = (1 - t)$ and public good provision is $g = tn$. From this, it can be shown that $y = n$ as follows:

$$y = nc + g,$$

which implies that, $$y = nc + nt,$$
or, $$y = n(c + t),$$
and using the fact that $c = (1 - t)$, it results in

$$y = n. \tag{1}$$

The above expression depicts that the total output in our stylized economy equals the total population of the economy. This is because one individual in the economy is endowed with one unit of labour and hence produces one unit of output given that production technology is linear in total labour inputs.

3.2 Electoral Candidates

There are two opportunistic candidates X and Y engaging in electoral competition. These candidates are electorally motivated (corrupt) in the sense that when they receive some amount of campaign contributions from lobbies, they spend only a fraction of that money on voters in the form of campaign advertisements and keep the rest for private use. The fraction of money spent on voters by candidate X is denoted by β_X and that by candidate Y is denoted by β_Y. This spending of money on campaign advertisements increases the popularity of the candidates amongst voters. In addition to this, if a candidate (say X) wins the election, she receives a payoff R but if she loses, she receives Q, where, $R > Q$. Therefore candidate X maximizes the following objective function:

$$p_X[(1-\beta_X)C^X + R] + (1-p_X)[(1-\beta_X)C^X + Q]. \tag{2}$$

where, p_X is the probability of winning of candidate X, $(1-p_X)$ is the probability of winning of candidate Y, $(1-\beta_X)$ is the proportion of contributions kept for private use by candidate X and C^X are the aggregate campaign contributions received by candidate X.

3.3 Voters

Following Redoano (2010), we assume that each citizen (or voter) of type j has quasi-linear preferences over private consumption:

$$u_j(g) = c_j - \frac{1}{2}(g - \theta_j - \frac{1}{n})^2; \quad \theta_j \,\epsilon\, \mathbb{R}. \tag{3}$$

Citizens with a higher θ's have higher valuations of the public good:

$$u_j(t) = (1-t) - \frac{1}{2}(tn - \theta_j - \frac{1}{n})^2; \quad \theta_j \,\epsilon\, \mathbb{R}. \tag{4}$$

Citizens are divided into two different types, namely, Low preference type (L) and High preference type (H), according to their public good preferences. Thus $\theta_j \,\epsilon\, \{\theta_L, \theta_H\}$; where, $\theta_L < \theta_H$. Also, the share of population in each group is η_j, where $j \,\epsilon\, \{L, H\}$. It can be easily seen that the tax that maximizes equation (4) is $t = \frac{\theta_j}{n}$. This represents the first-best solution for tax policy where each individual in the economy pays tax in proportion to θ_j, that is, their most preferred level of public good provision.

The term $\frac{1}{n}$ in the utility function represents adjustment of the bliss point of a voter in group j. For instance, a higher n implies a lower adjustment of θ_j and a lower value of n indicates a higher adjustment of θ_j. This means that for any individual of type j in the economy, the disutility due to a deviation of the actual level of public good provision from her bliss point (θ_j) is enhanced with the presence of the term $\frac{1}{n}$. This implies that as the size of the economy increases, the disutility reduces by a smaller amount. Moreover, if the size of the economy reduces, the disutility of an individual still reduces, but by a larger amount.

Apart from this, the voters in each group can also differ along some other dimension unrelated to economic policy variable (t) which will be referred to as an ideological bias from hereon. This ideological dimension cannot be modified as part of the electoral platform. In this model, σ_j^i denotes the ideological bias of a voter i in group j and it has a group specific uniform distribution on $[\frac{-1}{2\phi_j}, \frac{1}{2\phi_j}]$, where ϕ_j is the ideological density of group j and each group has members inherently biased towards one or the other candidate. Moreover, when $\sigma_j^i = 0$, the voter is considered to be ideologically neutral; when $\sigma_j^i < 0$, the voter is closer to candidate X and when $\sigma_j^i > 0$, voter is closer to candidate Y. Also since ϕ_j is ideological density of a group, therefore, $\phi_j \in [0, 1]$. In this respect, the structure of our model is similar to Persson and Tabellini (2002) in an opportunistic model framework.

Furthermore, a parameter $\widetilde{\alpha}$ represents candidate Y's average (relative) popularity in the population as a whole before elections and follows a uniform distribution over the range $[\frac{-1}{2\psi}, \frac{1}{2\psi}]$. It should be noted that $\widetilde{\alpha}$ can be positive or negative. If $\widetilde{\alpha} > 0$, then candidate Y is assumed to be relatively more popular than X and if $\widetilde{\alpha} < 0$, then candidate X is assumed to be more popular relative to Y.

3.4 Interest Groups

It is assumed that some exogenously given proportion of citizens of type L and H get organized to form their respective lobbies (again named L and H) and offer contributions for campaign expenditure to the two electoral candidates to sway the candidates towards their respective preferred policy points, that is, the amount of public good provision in the economy. Since the amount of public good provision depends upon the amount of tax imposed on the citizens, thus, these lobbies indirectly try to influence the electoral candidate X and Y's tax platforms, t_X and t_Y, respectively. We do not model the lobby formation process in this essay and assume that all lobby groups are exogenous. The interest groups in this model have an influence motive for donating to the candidates, that is, lobbies, if formed, are only concerned about the policy which would be implemented and not about who wins the election. More specifically, if a class j is organized as an interest group where $j \epsilon \{L, H\}$, then they are able to contribute to political candidates which in turn is used to influence voters via campaign spending. It should also be mentioned here that while solving the model, it is assumed that the lobbies concentrate their efforts on securing a policy outcome (on which their interests are aligned) that is to the group's liking, while ignoring the fixed-policy outcome, that is, the ideological and/or popularity outcomes (on which their interests are disparate). Voters from the organized class are assumed to be immune to campaign spending. On the other hand, if a voter belongs to an unorganized class, then overall campaign spending will affect the ideological component of her utility function in a way that is linear with respect to the difference between candidate's total spending. Specifically, we use $O_j \in [0, 1]$ as a parameter to denote the organizational strength of the lobby groups where if,

$$O_j = 1, \text{class j is completely organized,}$$

$$O_j = 0, \text{ class j is completely unorganized.}$$

3.5 Stages of the Game

Now, the stages of the game are as follows:
1) *Policy Announcement Stage*: Two candidates, X and Y simultaneously announce their electoral policy platforms, t_X and t_Y respectively, for any potential lobby formation.
2) *Lobbying Stage*: Lobbies offer contributions to the electoral candidates in order to move the policy choice towards the lobby's preferred choice.
3) *Voting Stage*: Stochastic factors that affect voter's preferences about electoral candidates like σ_j^i and $\widetilde{\alpha}$, are realized and all uncertainty is resolved. Elections are held and voters vote for one of the two candidates.

The model is solved using backward-induction technique for three different specifications of electoral competition which are explained as following:

Case 1: The Benchmark Case
In the benchmark case, we assume that no lobbies exist and that the ideological density is uniform across all groups of voters, that is, $\phi_j = \widetilde{\phi}$ where $j \in \{L, H\}$.

Case 2: The Swing-Voter Case
In the swing-voter case, again no lobbies exist but ideological density (ϕ_j) is not

uniform across both groups of voters where $j \in \{L, H\}$..

Case 3: Electoral Competition with Interest Groups and Swing-Voters
In this case, besides the voter groups having differing ideological densities, the interest groups are also present to influence the electoral candidates with their donations.

Since the first two cases are special cases of the third case, we first solve for the third case and then derive the policy equilibria for the first two cases by utilizing its outcomes.

4. Characterizing the Equilibria

For solving the model, we start with the last stage of the game in which $\widetilde{\alpha}$ and σ_j^i are realized. In the last stage, there is a probabilistic voting setting in which the candidates are uncertain about voter's preferences. Thus, given the policy platforms t_X and t_Y of the two candidates, a voter i in group j would vote for the candidate X if

$$u_j(t_X) > u_j(t_Y) + \sigma_j^i + \alpha.$$

And similarly, a voter i in group j would vote for the candidate Y if

$$u_j(t_X) < u_j(t_Y) + \sigma_j^i + \alpha.$$

where,

$$\alpha = \widetilde{\alpha} + h(1 - O_j)[\beta_Y C^Y - \beta_X C^X].$$

which measures the popularity of candidate X relative to Y and comprises of a stochastic element $\widetilde{\alpha}$, the difference between campaign spending of the two candidates which is used to influence those voters who are not organized as interest groups and h denotes the effectiveness of that campaign spending.

Furthermore, there are the swing voters who after considering the policy platform and average popularity are indifferent between voting for X or Y. This voter group is relevant because a small change in the policy platform is sufficient to gain their vote in the probabilistic voting Nash equilibrium, where the office-seeking political candidates are only interested in power. So, the swing voters in group j can be defined as:

$$\sigma_j = u_j(t_X) - u_j(t_Y) - \alpha. \tag{5}$$

From the above expressions, it can be inferred that everybody with $\sigma_j^i < \sigma_j$ will vote for candidate X. Thus, the vote share of candidate X in group j can be expressed as:

$$\pi_j^X = \phi_j(\sigma_j + \frac{1}{2\phi_j}).$$

Or, using equation (5), it can be written that,

$$\pi_j^X(t_X, t_Y) = \frac{1}{2} + \phi_j[u_j(t_X) - u_j(t_Y) + h(1 - O_j)(\beta_X C^X - \beta_Y C^Y) - \widetilde{\alpha}].$$

Candidate $X's$ aggregate vote share can be found by summing the above expression over group j. So, we have,

$$\pi^X(t_X, t_Y) = \sum_j \eta_j.\pi_{Xj}(t_X, t_Y).$$

Or,

$$\pi^X(t_X, t_Y) = \frac{1}{2} + \sum_j \eta_j.\phi_j[u_j(t_X) - u_j(t_Y) + h(1 - O_j)(\beta_X C^X - \beta_Y C^Y)] - \widetilde{\alpha}\phi.$$

where, $\phi = \sum_j \eta_j.\phi_j$ is the average ideology of the population.
Or,

$$\pi^X(t_X, t_Y) = \frac{1}{2} + [u(t_X) - u(t_Y) + h\delta(\beta_X C^X - \beta_Y C^Y)] - \widetilde{\alpha}\phi, \tag{6}$$

where, $u(t_X) = \sum_j \eta_j.\phi_j u_j(t_X)$, $u(t_Y) = \sum_j \eta_j.\phi_j u_j(t_Y)$ and $\delta = \sum_j \eta_j.\phi_j(1 - O_j)$ represents the proportion of population that is not organized as interest groups and therefore is influenced by campaign expenditure. We can think of voters not organized as akin to uninformed voters who can be influenced by electoral candidates through greater campaign expenditures, while those who manage to organize themselves can be termed as informed voters on whom there is no effect of candidate's campaign spending. Now candidate X will win when $\pi^X(t_X, t_Y) > \frac{1}{2}$. This implies that,

$$\widetilde{\alpha} < \frac{[u(t_X) - u(t_Y) + h\delta(\beta_X C^X - \beta_Y C^Y)]}{\phi} = \underline{\widetilde{\alpha}}(t_X, t_Y),$$

where, $\underline{\widetilde{\alpha}}(t_X, t_Y)$ is some threshold level of popularity which conveys that candidate X shall win if her policy choice provides relatively greater utility to the voters as well as her campaign spending is greater than that of Y's spending thus moving more number of voters in her favour.

Since the candidates do not know α, they will set the policy platform to maximize the probability of winning the election as:

$$Pr[\pi^X(t_X, t_Y) > \frac{1}{2}] = Pr[\alpha < \underline{\widetilde{\alpha}}(t_X, t_Y)] = \frac{1}{2} + \psi\underline{\widetilde{\alpha}}(t_X, t_Y),$$

or,

$$Pr[\pi^X(t_X,t_Y) > \frac{1}{2}] = p_X(t_X,t_Y) = \frac{1}{2} + \frac{\psi[u(t_X) - u(t_Y) + h\delta(\beta_X C^X - \beta_Y C^Y)]}{\phi}. \tag{7}$$

And, since candidate Y wins with probability $p_Y(t_X,t_Y) = (1 - p_X(t_X,t_Y))$, we have,

$$p_Y(t_X,t_Y) = \frac{1}{2} - \frac{\psi[u(t_X) - u(t_Y) + h\delta(\beta_X C^X - \beta_Y C^Y)]}{\phi}. \tag{8}$$

These probabilities form the objective functions of the political candidates. It can be seen from the above that as both individual utility and the distribution of ideological preferences are continuous functions, the probability of winning also becomes a continuous function of the distance between the two electoral platforms. Now, since these probabilities depend on the amount of total campaign spending by the candidates, we need to focus on the next stage, that is, the lobbying stage which will determine the aggregate contributions to political candidates. But before solving for donations by interest groups, we will deal with the benchmark case and the swing-voter case since donations by lobbies in both these cases will be zero.

4.1 The Benchmark Equilibrium

Here, we assume that all voters have identical ideological bias and there exist no lobbies. In light of these assumptions, the donations to electoral candidates will be zero, that is, $C^X = C^Y = 0$. and $\phi_j = \widetilde{\phi}$. Therefore, equation (7) implies that,

$$p_X = \frac{1}{2} + \frac{\psi \sum_j \eta_j.\widetilde{\phi}[u_j(t_X) - u_j(t_Y)]}{\widetilde{\phi}}. \tag{9}$$

And, using equation (4),

$$p_X = \frac{1}{2} + \frac{\psi\widetilde{\phi}\sum_j \eta_j[(1-t_X) - \frac{1}{2}(t_X n - \theta_j - \frac{1}{n})^2 - (1-t_Y) + \frac{1}{2}(t_Y n - \theta_j - \frac{1}{n})^2]}{\widetilde{\phi}}. \tag{10}$$

By utilizing equation (2), it can be deduced that in the absence of interest groups and their donations, candidate X will choose t_X to maximize the following:

$$\text{Max}_{t_X}\ [p_X R + (1-p_X)Q].$$

where, p_X is given by equation (10). Differentiating this expression with respect to t_X, results in the following first-order condition:

$$\frac{(R-Q)\psi\widetilde{\phi}\sum_j \eta_j[-1 - n(t_X n - \theta_j - \frac{1}{n})]}{\widetilde{\phi}} = 0.$$

Solving the above results in:

$$t_X^* = \frac{1}{n}.\sum_j \eta_j \theta_j. \tag{11}$$

Symmetric expressions of equilibrium tax platform can also be derived for candidate Y in a similar manner by utilizing her probability of winning, that is, p_Y. Therefore, we can write,

$$t_Y^* = \frac{1}{n}.\sum_j \eta_j \theta_j = t_X^*.$$

The above expression suggests that the policy platforms of the two electoral candidates X and Y converge to each other. Furthermore, the policy announcements of both candidates in this case are a weighted average of the policy bliss points of each voter group (θ_j) with the weights being the proportion of population in each group (η_j) hence corresponding to the policy preference of the mean voter of the economy. This means that given the preferences of each group in the economy, the tax platform will sway towards the group with a greater number of people and hence, a greater number of voters. That is, in order to win the election, each candidate being opportunistic in nature, tries to tweak her respective policy platform in favour of the group having a greater share of population thus resulting in full policy convergence.

Moreover, because the government's budget constraint is balanced, therefore, we can write the optimal choice of the public good g of the two electoral candidates under the benchmark equilibrium as following:

$$nt_X^* = g_X^* = \sum_j \eta_j \theta_j = nt_Y^* = g_Y^*.$$

It can be seen from the above expressions that the policy equilibrium under the benchmark case represents an equilibrium akin to a socially optimal equilibrium because of the absence of interest groups and homogeneous ideological density across voter groups. The reason is that when $\phi_j = \widetilde{\phi}$, that is, when the number of swing voters is the same, all groups get equal weight in the candidate's decision, which makes them maximize the average voter's utility.

4.2 The Pure Swing-Voter Equilibrium

Generally, groups differ in how easily their votes can be swayed and therefore office-seeking candidates do not give them equal weight. Thus we look at the second case, that is, the swing-voter equilibrium where ϕ_j is variable across the voter groups.

When no interest groups exist and the ideological density across the voter groups is not uniform, we can write:

$$p_X = \frac{1}{2} + \frac{\psi \sum_j \eta_j.\phi_j[(1-t_X) - \frac{1}{2}(t_X n - \theta_j - \frac{1}{n})^2 - (1-t_Y) + \frac{1}{2}(t_Y n - \theta_j - \frac{1}{n})^2]}{\phi}.$$

Again, candidate X will maximize the following objective function:

$$\text{Max}_{t_X}\ [p_X R + (1-p_X)Q].$$

where, p_X is given by the above equation. Maximization with respect to t_X results in the following first-order condition:

$$\frac{(R-Q)\psi \sum_j \eta_j.\phi_j[-1 - n(t_X n - \theta_j - \frac{1}{n})]}{\phi} = 0.$$

Solving the above results in:

$$t_X^s = \frac{1}{n}.\sum_j \eta_j \phi_j \theta_j. \tag{12}$$

Similarly symmetric equilibrium expression for candidate Y can also be derived, where,

$$t_Y^s = \frac{1}{n}.\sum_j \eta_j \phi_j \theta_j = t_X^s.$$

Again, by utilizing the assumption of balanced budget constraint of the government and rearranging equation (12), leads to the optimal choice of the public good g under swing-voter equilibrium:

$$n t_X^s = g_X^s = \sum_j \eta_j \phi_j \theta_j = n t_Y^s = g_Y^s.$$

Equation (12) denotes the swing voter equilibrium. And since the two candidates have symmetric objective functions, therefore, the maximization of candidate Y's probability of winning also results in an identical tax being chosen by Y. It can be noted that now the choice of the tax depends on the weighted average of the policy preference parameter (θ_j) with the weights being η_j and ϕ_j, that is, the proportion of voters and the ideological density in each group type j respectively. These densities symbolize how responsive the voters are in each group to economic policy, that is, how each group rewards policy with votes at the elections. In other words, it measures how many voters are gained in that group per marginal increase in economic welfare in the group. If ϕ_j is high in a voter group j, the group has a greater ideological density thereby implying that the voters in that group have similar ideology and hence can be considered homogeneous. This indicates that the voter group has a large number of swing voters which makes the group attractive for the candidates. In contrast, if ϕ_j is low, then the group is considered ideologically more heterogeneous, implying that there are lesser number of swing voters in that group. Thus in the swing-voter equilibrium, apart from the proportion of people in a group, the ideological density of a group also plays a crucial role in determining the policy (tax) platform chosen by the electoral candidates to win the election. This result is similar to that advocated in the probabilistic voting model of Persson and Tabellini (2002).

Moving further, we can also analyze the impact on swing-equilibrium tax platforms of candidates when ϕ_L and ϕ_H tend to extreme values 0 or 1. When ϕ_L tends to 0, this means that all voters in group L are different in terms of ideology, that is, are ideologically heterogeneous, implying that there are no swing voters in group L. Thus the tax platform of an electoral candidate would therefore be strongly dependent on the number of swing-voters in the other group H. This is because, for an office-seeking political candidate the number of swing-voters are of paramount significance in winning elections, therefore the candidate can be said to assign a zero weight to group L in this case while deciding the tax platform due to the absence of relevant number of swing-voters in group L. In a similar manner, we can arrive at the intuition for the case when ϕ_H tends to 0 wherein the candidate will now assign a weight of zero to group H and her tax policy will be more inclined towards the preferences of group L. In contrast, when ϕ_L tends to 1, the importance of group L increases in a candidate's decision of choosing a tax platform. Intuitively speaking, as ϕ_L tends to 1, the group L becomes more ideologically homogeneous, that is, the number of swing-voters in L increase. Thus, the importance of group L also rises relative to the other voters in the economy and hence, the candidate assigns a higher weight to group L relative to other groups. A similar line of reasoning can be employed to obtain results for the case when ϕ_H tends to 1. Now, in case when both ϕ_L and ϕ_H tend to 1, then both the groups become equally important for the candidate because the number of swing-voters in each group rises and the candidate's chance of winning the election rises along with it. However, in this case the candidate has to identify the group in which the number of swing-voters is relatively greater which in turn will be dependent on the proportion of voters in each group (η_L and η_H). If say, H type voters are greater in number, then the tax platform would be biased towards them, while if L type voters are more in number then the candidate's tax platform will be biased towards the public good preferences of L group. All these results will hold for both electoral candidates, X and Y.

A comparison of the swing voter equilibrium with the benchmark equilibrium leads to the first finding of our analysis:

Proposition 1: *The swing-voter equilibrium tax platform (or the level of public good provision) of an office-seeking electoral candidate is always lower than or equal to the equilibrium tax platform (or the level of public good provision) of the same candidate in the case where the ideological density across voter-groups is uniform and no interest groups exist. Similar results hold for the other electoral candidate as well.*

This can be explained by mathematically comparing the benchmark equilibrium tax with swing-voter equilibrium tax. In the benchmark case, the weights (as denoted by the ideological density of each voter groups) assigned to the bliss points of each voter group are equal, that is, each weight takes on some constant value which makes all of the groups identical in terms of number of swing voters such that the candidate in order to exploit the maximum share of votes, has to depend upon the proportion of voter population in each group. In contrast, in the swing-voter case, the ideological weights can vary across groups and can take any value ranging from $[0,1]$ such that the tax platform in this case will tilt towards the bliss point of the voter group with a greater proportion of swing voters. So, given η_j and θ_j, we can write,

$$\sum_j \eta_j \phi_j \theta_j \leq \sum_j \eta_j \theta_j,$$

Or,

$$\eta_L \phi_L \theta_L + \eta_H \phi_H \theta_H < \eta_L \theta_L + \eta_H \theta_H.$$

Rearranging, we get,

$$\frac{(\phi_L - 1)}{(1 - \phi_H)} < \frac{\eta_H \theta_H}{\eta_L \theta_L}.$$

Given that $\theta_H > \theta_L > 0$ and that ϕ is a parameter of ideological density, therefore the LHS of the above inequality should always be less than the RHS. Utilizing this, we can postulate that,

$$\frac{(\phi_L - 1)}{(1 - \phi_H)} < 0 < \frac{\eta_H \theta_H}{\eta_L \theta_L}.$$

Intuitively, we can say that the swing-voter equilibrium tax is always lower than (or equal to) the benchmark tax because in the benchmark case the ideological density across groups is uniform and hence the electoral candidate gives equal weights (a value of 1) to each voter group since each voter in this case is identical for her. However, in a realistic scenario, voters are not identical to each other. In fact, they have their own ideological and economic policy preferences and hence the electoral candidates consider each voter group to be distinct and assign different weights to them which are characterized by both the ideological density parameter and the proportion of individuals in each group. Here, the candidate assigns a higher weight to the group which has a greater number of swing voters (or more ideologically homogeneous population) and a lower weight to the groups with lesser number of swing-voters (with more ideologically heterogeneous population) to increase her chances of winning the election. This can be seen from the equation (12). For instance, say ϕ_L increases, then the weight assigned to group L also increases and hence the tax (or policy) platform tilts more heavily towards the bliss point of group L (θ_L). The presence of swing-voters in the economy dilutes the intensity of economic policy (or public good provision in this analysis) preferences of each group and therefore the choice of tax platform and the corresponding level of public good provision is reduced relative to the benchmark scenario. Thus, the economic preferences of the voter-groups in effect lose some of their significance in the policy decision of the office-seeking candidate during electoral competition in the presence of swing voters in the economy. In other words, the opportunism of the political candidates becomes more prevalent in the swing voter equilibrium relative to the benchmark case. Note that, equilibrium swing-voter tax will be less than the benchmark equilibrium only when the ideological density parameters vary across the groups, that is, when $\phi_H \neq \phi_L$. When $\phi_H = \phi_L$, the tax in the swing-voter equilibrium collapses to the benchmark case because in this case, all the voters become swing voters and hence are treated as identical by the electoral candidate. Similar results hold for the other political candidate as well.

4.3 Equilibrium Solution for Campaign Contributions

Next, we move on to the solution of the lobbying stage, there are two groups of voters $j = L, H$ who may organize and form lobbies in order to influence the electoral candidates. As explained before, $O_j \in [0, 1]$ is the fraction which represents the organizational strength of interest groups so formed, where $O_j = 1$ describes perfect organization within a group of voters, that is, no free-riding amongst the voters in that group, whereas $O_j = 0$ describes no organization between a voters within a group, that is, a situation of everyone free-riding on each other. If a class j gets organized into a lobby, then any member of this lobby can make a contribution C_j^P which is a payment to electoral candidate P, where, $P = X, Y$, and is constrained to be positive. These contributions can be interpreted both in cash and in kind. Thus, the total contributions to a candidate P can be written as:

$$C^P = \sum_j O_j \eta_j C_j^P. \tag{13}$$

In order to calculate group j's contribution to candidate P (C_j^P), the interest group's problem has to be considered. An organized class's utility depends on the implemented policy as well as on the amount of resources spent on political contributions. It is assumed to take the following form:

$$p_X u_j(t_X) + (1 - p_X)u_j(t_Y) - \frac{1}{2}[(C_j^X)^2 + (C_j^Y)^2]. \tag{14}$$

The quadratic form of the cost function models the fact that contributions typically involve not only a monetary transfer, but also a personal involvement of organized voters. It should also be noted here that σ_j and $\widetilde{\alpha}$ are realized after contribution decisions are taken and have zero expected value and members of organized class are not influenced by campaign spending. Therefore, an organized class j will maximize its expected utility which is given by:

$$E(v_j) = \mathrm{Max}_{C_j^X, C_j^Y}\ p_X u_j(t_X) + (1 - p_X)u_j(t_Y) - \frac{1}{2}[(C_j^X)^2 + (C_j^Y)^2], \tag{15}$$

$$\text{subject to } C_j^X, C_j^Y > 0,$$

where, p_X is given by equation (7).

Thus, the first-order condition with respect to C_j^X is as follows:

$$\frac{\partial p_X}{\partial C_j^X}[u_j(t_X) - u_j(t_Y)] - C_j^X \leq 0.$$

Now, using equations (7) and (13), it can be written that:

$$\frac{\partial p_X}{\partial C_j^X} = \frac{h\psi\delta\beta_X O_j \eta_j}{\phi}.$$

Therefore, using the above, the solution for aggregate contributions to candidate X can be presented as:

$$C_j^X = \mathrm{Max}\left\{0, \frac{h\psi\delta\beta_X O_j \eta_j [u_j(t_X) - u_j(t_Y)]}{\phi}\right\}. \tag{16}$$

Similarly, the solution for aggregate contributions to candidate Y can be presented as:

$$C_j^Y = \text{Max}\left\{0, \frac{h\psi\delta\beta_Y O_j\eta_j[u_j(t_Y) - u_j(t_X)]}{\phi}\right\}. \tag{17}$$

From the above, it can be deduced that the lobby group only contributes to the candidate whose policy platform gives the group the highest utility and never to more than one.[2] Now, before solving the first stage of the game for equilibrium tax platforms, we will discuss some results based on the aggregate donations of interest groups to political candidates.

Proposition 2: *Given that an interest group $j \in \{L, H\}$ derives a greater utility from candidate X's policy platform relative to Y's, an increase in the honesty parameter of candidate X, that is, β_X results in greater donations by the interest group to X.*

This can be explained mathematically as follows. Since,

$$C_j^X = \text{Max}\left\{0, \frac{h\psi\delta\beta_X O_j\eta_j[u_j(t_X) - u_j(t_Y)]}{\phi}\right\}.$$

Therefore,

$$\frac{dC_j^X}{d\beta_X} = \frac{h\psi\delta O_j\eta_j[u_j(t_X) - u_j(t_Y)]}{\phi} > 0.$$

Intuitively, a higher β_X implies that an electoral candidate is more honest with respect to the spending of the contribution money for electoral campaigning, and there is lesser diversion of money for private use by the candidate. This leads the interest group to raise their donations to the candidate because they provide money to an electoral candidate for the purpose of campaign spending which in turn is used to influence voters and hence win elections. If the candidate is spending a greater proportion of the money on election campaigns, the marginal benefit derived by the interest group would be greater due to lesser leakage of money. In conclusion, if $[u_j(t_X) - u_j(t_Y)] > 0$, then greater the value of β_X, greater will be the contributions to candidate X since now money is more effectively used by the electoral candidate

[2] The result that a lobby group will only make financial contribution to one political party is fairly standard. It has been pointed out and discussed in Austen-Smith (1987), Baron (1988), Persson and Tabellini (2002), Hall and Deardorff (2006) and Le and Yalcin (2018) despite using different modelling frameworks. In particular, according to Baron (1988), there exists empirical evidence showing that most political action committees contribute to only one candidate.

X. Similar results hold for candidate Y.[3]

Proposition 3: *Given that an interest group $j \in \{L, H\}$ derives a greater utility from candidate X's policy platform relative to Y's, an increase in the efficiency of campaign spending (h), results in greater donations to political candidate X by a lobby j.*

This can be explained mathematically from the following calculation:

$$\frac{dC_j^X}{dh} = \frac{\psi\delta\beta_X O_j \eta_j [u_j(t_X) - u_j(t_Y)]}{\phi} > 0.$$

The intuitive explanation for this result is fairly straightforward. When the interest groups perceive that the expenditure on election campaigning by a candidate exerts a greater influence on unorganized voters which in turn results in the candidate garnering a greater vote-share and winning the election, their willingness to donate to that candidate eventually increases since they know that they can now be more successful in lobbying for their preferred policy by providing campaign money to the electoral candidate.

Proposition 4: *Given that an interest group $j \in \{L, H\}$ derives a greater utility from candidate X's policy platform relative to Y's, a voter group with a more homogeneous ideological preferences (that is, a higher ϕ_j) contributes less to the candidate X in equilibrium.*

By differentiating the solution for aggregate contributions by ϕ_j, we get,

$$\frac{dC_j^X}{d\phi_j} = -\frac{h\psi\delta\beta_X O_j \eta_j^2 [u_j(t_X) - u_j(t_Y)]}{\phi^2} < 0.$$

A rise in ideological density within a group indicates a greater number of swing-voters in that group. And, a greater number of swing-voters reduces the incentive of the lobby groups to make campaign contributions to political candidates because now the electoral candidates do not need much campaign money to woo voters and hence the effectiveness of campaign expenditure as a channel to sway voters reduces, in turn reducing the campaign contributions from interest groups. This means that

[3]This result is in contrast with the result proposed by Le and Yalcin (2018) where they state that the higher degrees of misappropriation of campaign contributions will result in a less favourable position for the lobby group and that the lobby group is required to pay higher contributions to the parties and the parties divert a greater proportion of these contributions for their personal use.

for the interest groups the marginal cost of donations exceeds the marginal benefit from donations when swing voter proportion increases in the economy.

Proposition 5: *Given that an interest group $j \in \{L, H\}$ derives a greater utility from candidate X's policy platform relative to Y's, a rise in the proportion of uninformed (or unorganized) voters (δ) in the economy results in the lobby group j increasing their campaign contributions to candidate X.*

Mathematically we can write,

$$\frac{dC_j^X}{d\delta} = \frac{h\psi\beta_X O_j\eta_j[u_j(t_X) - u_j(t_Y)]}{\phi} > 0.$$

Intuitively, this implies that greater the proportion of uninformed voters in the economy, that is, those voters who are not a part of any lobby, greater is the campaign spending required to influence them to vote for a certain candidate. This in turn requires more money to be donated to the candidates by the interest groups because with a rise in the proportion of people who can be swayed by campaign spending, the effectiveness of money as a tool to attract voters also increases.

Proposition 6: *Given that an interest group $j \in \{L, H\}$ derives a greater utility from candidate X's policy platform relative to Y's, an increase in organizational ability of a voter-group j, denoted by O_j has an ambiguous impact on the campaign contributions by the lobby group j to candidate X.*

This can be explained mathematically as follows. Since,

$$C_j^X = \text{Max}\left\{0, \frac{h\psi\delta\beta_X O_j\eta_j[u_j(t_X) - u_j(t_Y)]}{\phi}\right\}.$$

We will first derive this result for group L. Therefore, for $j = L$, the aggregate contributions by this group to candidate X can be written as follows:

$$C_L^X = \frac{h\psi\delta\beta_X[u_L(t_X) - u_L(t_Y)]}{\phi} O_L\eta_L. \sum_j \eta_j\phi_j(1 - O_j),$$

where $\sum_j \eta_j\phi_j(1 - O_j) = \delta$. Now differentiating C_L^X with respect to O_L, we get,

$$\frac{dC_j^X}{dO_L} = \frac{h\psi\beta_X[u_L(t_X) - u_L(t_Y)]}{\phi}.\eta_L\{\delta - \eta_L\phi_L O_L\}.$$

From the above, it can be deduced that, $\frac{dC_j^X}{dO_L} > 0$ if $\delta > \eta_L\phi_L O_L$. Intuitively, this means that when the organizational strength of a voter-group L rises, it may not

unambiguously lead to higher donations to an electoral candidate. This happens due to two opposing effects at work here:
i) Uninformed (or unorganized) voter effect (δ);
ii) Direct organizational effect of lobby L ($\eta_L \phi_L O_L$).

Firstly, if there is a greater proportion uninformed voters in the economy who can be swayed by campaign spending (δ) relative to the proportion of voters who belong to lobby L, then an increase in the organizational strength of L (O_L), results in greater contributions to the electoral candidate (here X). In contrast, if lobby L is already very strong in terms of its organizational capability relative to the total proportion of uninformed voters in the economy, the lobby members need not put that much effort or provide more donation money to candidate X. This is because X uses the contribution money to sway uninformed (or unorganized) voters in her favour and if these are lesser in number, these contributions cannot be used as an effective tool for raising vote share of X. Therefore, if the direct organizational effect of the lobby dominates the uninformed voter effect, a rise in the organizational ability of the same lobby group would result in less resources being transferred to the electoral candidate in the form of donations for campaign expenditure. On the other hand, if the uninformed (or unorganized) voter effect outweighs the direct organizational effect, then an increase in the organizational strength of the lobby in question will lead to an increase in campaign contributions to the electoral candidate. A similar result can be derived for lobby (or voter) group H as well.

4.4 Policy Equilibrium under Electoral Competition in the presence of both Interest Groups and Swing-Voters

Now, to focus on the third case, that is, to solve for the policy platform of the political candidates under electoral competition in the presence of both interest groups and swing-voters, we focus on the solution for the first stage of the game. In this stage, each electoral candidate maximizes her expected payoff she receives from engaging in electoral competition. Using equation (2), the objective function of candidate X can be written as following:

$$\text{Max}_{t_X}\ p_X[(1-\beta_X)C^X + R] + (1-p_X)[(1-\beta_X)C^X + Q].$$

The above can also be expressed as:

$$\text{Max}_{t_X}\ p_X(R-Q) + (1-\beta_X)C^X + Q, \quad \text{suject to} \quad 0 \leq t_X \leq y.$$

Using equation (13) and (16), it can be written that:

$$C^X = \frac{h\psi\delta\beta_X \sum_j O_j^2\eta_j^2[u_j(t_X) - u_j(t_Y)]}{\phi}.$$

Hence, using the above expression, it can be derived that,

$$(\beta_X C^X - \beta_Y C^Y) = \frac{h\psi\delta\beta_X^2 \sum_j O_j^2\eta_j^2[u_j(t_X) - u_j(t_Y)]}{\phi}.$$

Using equation (7) and substituting the above expression into it, the objective function for candidate X can be written as:

$$\begin{aligned}\text{Max}_{t_X} &\left[\frac{1}{2} + \frac{\psi}{\phi}[u(t_X) - u(t_Y) + \frac{\psi}{\phi}h^2\delta^2\beta_X^2 \sum_j O_j^2\eta_j^2(u_j(t_X) - u_j(t_Y))]\right].(R-Q) \\ &+(1-\beta_X)\frac{\psi}{\phi}h\delta\beta_X \sum_j O_j^2\eta_j^2[u_j(t_X) - u_j(t_Y)] + Q.\end{aligned}$$

Now using equation (4) and differentiating the above with respect to t_X derives the first-order condition as follows:

$$[-nt_X\phi + \sum_j \eta_j\phi_j\theta_j + \frac{\psi}{\phi}h^2\delta^2\beta_X^2 \sum_j O_j^2\eta_j^2(\theta_j - nt_X)].(R-Q) + (1-\beta_X)\frac{\psi}{\phi}h\delta\beta_X \sum_j O_j^2\eta_j^2(\theta_j - nt_X) = 0.$$

Rearranging the above and using equation (12) results in the following expression for candidate X's optimal tax platform under electoral competition in the presence of lobbying activities:

$$t_X^e = \frac{(R-Q)[t_X^s + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}] + [(1-\beta_X)\beta_X h\delta\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}]}{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]}. \quad (18)$$

Similarly by maximizing candidate Y's objective function results in the following expression for the choice of optimal tax platform of candidate Y under electoral competition in the presence of lobbying activities:

$$t_Y^e = \frac{(R-Q)[t_Y^s + \frac{\psi}{\phi}h^2\delta^2\beta_Y^2\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}] + [(1-\beta_Y)\beta_Y h\delta\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}]}{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_Y^2\sum_j O_j^2\eta_j^2] + [(1-\beta_Y)\beta_Y h\delta\sum_j O_j^2\eta_j^2]}. \quad (19)$$

where, t_X^s and t_Y^s are the socially optimal tax platforms of candidates X and Y respectively in the absence of lobbies and is given by equation (12).

As can be seen from the above, the tax platforms of the two candidates do not converge to the median voter's preferred tax platform but the mean voter's tax platform. Also, as long as $\beta_X \neq \beta_Y$, the tax platforms of the two candidates do not converge to each other. Now, we move on to compare the tax platforms in benchmark case (t_X^*) to that in electoral competition with interest groups and swing-voters (t_X^e).

5. A Comparison of Policy Platforms Across Different Equilibria

In this section, we first compare the tax platforms of the electoral candidates in the benchmark case and in the pure swing-voter case. The following proposition presents the finding of our analysis.

Proposition 7: *The equilibrium tax chosen by candidate X under electoral competition in the presence of swing voters and interest groups (t^e_X) will be more than the equilibrium tax in the benchmark case (t^*_X) if the following conditions hold: $\frac{(\phi_H-\phi)}{(\phi-\phi_L)} > \frac{\eta_L\theta_L}{\eta_H\theta_H}$ and $O^2_H\eta_H > O^2_L\eta_L$. On the other hand, if $\frac{(\phi_H-\phi)}{(\phi-\phi_L)} < \frac{\eta_L\theta_L}{\eta_H\theta_H}$ and $O^2_H\eta_H < O^2_L\eta_L$, then $t^e_X < t^*_X$. Similar results hold for Y as well.*

Using equations (11) and (18), we can write:

$$t^e_X - t^*_X = \frac{(R-Q)[t^s_X + \frac{\psi}{\phi}h^2\delta^2\beta^2_X\frac{\sum_j O^2_j\eta^2_j\theta_j}{n}] + [(1-\beta_X)\beta_X h\delta\frac{\sum_j O^2_j\eta^2_j\theta_j}{n}]}{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta^2_X\sum_j O^2_j\eta^2_j] + [(1-\beta_X)\beta_X h\delta\sum_j O^2_j\eta^2_j]} - t^*_X,$$

or,

$$t^e_X - t^*_X = \frac{(R-Q)[t^s_X - \phi t^*_X] + [(R-Q)\frac{\psi}{\phi}h\delta\beta_X + (1-\beta_X)](\beta_X h\delta)[\frac{\sum_j O^2_j\eta^2_j\theta_j}{n} - t^*_X\sum_j O^2_j\eta^2_j]}{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta^2_X\sum_j O^2_j\eta^2_j] + [(1-\beta_X)\beta_X h\delta\sum_j O^2_j\eta^2_j]}.$$

Given that $R > Q$ and $0 \leq \beta_X \leq 1$, it can be perceived from the above that the sign of L.H.S. depends upon the sign of two terms in the R.H.S., that is, $[t^s_X - \phi t^*_X]$ and $[\frac{\sum_j O^2_j\eta^2_j\theta_j}{n} - t^*_X\sum_j O^2_j\eta^2_j]$. Now we will individually work out these terms in more detail. Firstly, let us consider the term $[t^s_X - \phi t^*_X]$. Using equation (11), we can write this term as:

$$[\frac{(\eta_L\phi_L\theta_L}{n} + \frac{\eta_H\phi_H\theta_H)}{n} - \phi\frac{(\eta_L\theta_L + \eta_H\theta_H)}{n}],$$

or,

$$\frac{[\eta_L\theta_L(\phi_L-\phi) + \eta_H\theta_H(\phi_H-\phi)]}{n}. \tag{20}$$

Therefore, for $t^e_X > t^*_X$, the above term should be greater than zero which implies that the following should hold:

$$\frac{(\phi_H-\phi)}{(\phi-\phi_L)} > \frac{\eta_L\theta_L}{\eta_H\theta_H}.$$

And for, $t_X^e < t_X^*$, the following should hold:

$$\frac{(\phi_H - \phi)}{(\phi - \phi_L)} < \frac{\eta_L \theta_L}{\eta_H \theta_H}.$$

The R.H.S. of the above expressions depicts relative economic preferences of voter groups while the L.H.S. denotes the relative deviations of the ideological preferences of voter groups from the average ideology of the population.

Now consider the second term. Expanding the summation across voter groups L and H, we have:

$$\frac{O_L^2 \eta_L^2 \theta_L}{n} + \frac{O_H^2 \eta_H^2 \theta_H}{n} - t_X^*(O_L^2 \eta_L^2 + O_H^2 \eta_H^2).$$

Using equation (11) in the above, we get:

$$O_L^2 \eta_L^2 [\frac{\theta_L}{n} - \frac{\eta_L \theta_L}{n} - \frac{\eta_H \theta_H}{n}] + O_H^2 \eta_H^2 [\frac{\theta_H}{n} - \frac{\eta_L \theta_L}{n} - \frac{\eta_H \theta_H}{n}].$$

This can be further simplified to the following expression:

$$O_L^2 \eta_L^2 [\frac{\theta_L}{n}(1 - \eta_L) - \frac{\eta_H \theta_H}{n}] + O_H^2 \eta_H^2 [\frac{\theta_H}{n}(1 - \eta_H) - \frac{\eta_L \theta_L}{n}].$$

Since we have assumed that only two groups L and H exist, therefore, we can write $(1 - \eta_H) = \eta_L$ and $(1 - \eta_L) = \eta_H$. Substituting this, and simplifying, we get:

$$\frac{\eta_L \eta_H}{n} [\theta_H - \theta_L][O_H^2 \eta_H - O_L^2 \eta_L]. \tag{21}$$

Given that $\theta_H > \theta_L$, the above term is positive if $O_H^2 \eta_H > O_L^2 \eta_L$ and negative if $O_H^2 \eta_H < O_L^2 \eta_L$. Now, we can infer from equations (20) and (21), the sign of $t_X^e - t_X^*$.

If $\frac{(\phi_H - \phi)}{(\phi - \phi_L)} > \frac{\eta_L \theta_L}{\eta_H \theta_H}$ and $O_H^2 \eta_H > O_L^2 \eta_L$, then $t_X^e > t_X^*$. Intuitively, this implies that the amount of public good provision (and hence the tax policy) rises while moving from the benchmark case towards a scenario involving both swing voters and interest groups. In this case, H group becomes more important to the candidate both as a voter-group and as a lobby group. This is because from the first condition, the swing-voter effect in group H outweighs the swing-voter effect in group L, that is, compared to average ideology of the population, the ideological density of group H is relatively higher than the ideological density of group L implying a greater number of swing voters in H group. Hence, the swing-voter effect makes the candidate tilt towards the preferences of the H type of voters. Moreover, the second condition apparently shows that the lobby group H is also stronger relative to lobby group L whether be it in terms of proportion of people (η) or in terms of organizational strength (O_j). This clearly sways the electoral candidate in favour of group H since interest groups are a source of campaign money, therefore a stronger lobby group develops into a source of secure funding for the political candidate in question. The opposite results will hold true if the two conditions are reversed, that is, the presence of greater number of swing voters in group L and a stronger interest group L will reduce the tax platform in equilibrium relative to the benchmark scenario.

Next, we compare the equilibrium tax platform announced by electoral candidate X in the pure swing-voter case (equation (12) and the case in which both swing voters and interest groups (see equation (18) are present. The following proposition presents our finding more formally. It should be noted that a similar result will hold for the Y candidate also.

Proposition 8: *Under electoral competition, if $\frac{\theta_H}{n} > \frac{\theta_L}{n} > t^s_X$, then the equilibrium tax platform (or the amount of public good provision) chosen by an opportunistic electoral candidate (X or Y) in the presence of both interest groups and voters with differing ideological densities is greater than the choice of the tax platform (or the amount of public good provision) in case of the swing-voter equilibrium. Also, when $t^s_X > \frac{\theta_H}{n} > \frac{\theta_L}{n}$, then it results in a lowering of t^e_X and if $\frac{\theta_H}{n} > t^s_X > \frac{\theta_L}{n}$, the equilibrium level of tax platform and hence the level of public good provision depends on which lobby dominates.*

We will show the mathematical derivation of the above proposition for candidate X. The result for candidate Y will follow in a similar manner. Now, to compare t^e_X with t^s_X, we use equation (18) to write:

$$(t^e_X - t^s_X) = \frac{(R-Q)[t^s_X + \frac{\psi}{\phi}h^2\delta^2\beta^2_X \frac{\sum_j O^2_j\eta^2_j\theta_j}{n}] + [(1-\beta_X)\beta_X h\delta \frac{\sum_j O^2_j\eta^2_j\theta_j}{n}]}{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta^2_X \sum_j O^2_j\eta^2_j] + [(1-\beta_X)\beta_X h\delta \sum_j O^2_j\eta^2_j]} - t^s_X,$$

or, the RHS can be expressed as:

$$\frac{(R-Q)[t^s_X + \frac{\psi}{\phi}h^2\delta^2\beta^2_X \frac{\sum_j O^2_j\eta^2_j\theta_j}{n}] + [(1-\beta_X)\beta_X h\delta \frac{\sum_j O^2_j\eta^2_j\theta_j}{n}] - (R-Q)\phi.t^s_X - (R-Q).t^s_X[\frac{\psi}{\phi}h^2\delta^2\beta^2_X \sum_j O^2_j\eta^2_j]}{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta^2_X \sum_j O^2_j\eta^2_j] + [(1-\beta_X)\beta_X h\delta \sum_j O^2_j\eta^2_j]}$$
$$-\frac{[(1-\beta_X)\beta_X h\delta \sum_j O^2_j\eta^2_j].t^s_X}{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta^2_X \sum_j O^2_j\eta^2_j] + [(1-\beta_X)\beta_X h\delta \sum_j O^2_j\eta^2_j]}.$$

Since, $(R-Q) > 0$, therefore, we will only focus on the terms in the numerator, which when rearranged gives us the following:

$$(R-Q)t^s_X[1-\phi] + (R-Q)\frac{\psi}{\phi}h^2\delta^2\beta^2_X[\frac{\sum_j O^2_j\eta^2_j\theta_j}{n} - t^s_X.\sum_j O^2_j\eta^2_j] + (1-\beta_X)\beta_X h\delta[\frac{\sum_j O^2_j\eta^2_j\theta_j}{n} - t^s_X.\sum_j O^2_j\eta^2_j].$$

where, ϕ is the average ideology of the population as discussed before. Now $(t^e_X - t^s_X) > 0$ if $(1-\phi) > 0$ and $[\frac{\sum_j O_j^2 \eta_j^2 \theta_j}{n} - t^s_X . \sum_j O_j^2 \eta_j^2] > 0$.

Firstly, since $\phi = \sum_j \eta_j \phi_j$ is the average ideology of the population where $j = L, H$, and $\eta_j \in [0,1]$ and $\phi_j \in [0,1]$, therefore $(1-\phi)$ is always positive. Next, we expand the second term as follows:

$$\frac{O_L^2 \eta_L^2 \theta_L}{n} + \frac{O_H^2 \eta_H^2 \theta_H}{n} - t^s_X (O_L^2 \eta_L^2 + O_H^2 \eta_H^2),$$

or,

$$O_L^2 \eta_L^2 [\frac{\theta_L}{n} - t^s_X] + O_H^2 \eta_H^2 [\frac{\theta_H}{n} - t^s_X]. \tag{22}$$

In the above expression, $\frac{\theta_H}{n}$ and $\frac{\theta_L}{n}$ are nothing but first-best solutions for tax policy for the H and L voters respectively. As mentioned before, these can be derived by maximizing the utility function given in equation (4). Now, a pure swing-voter equilibrium solution provides a tax policy equal to t^s_X given in the above expression where the electoral candidate only takes into account the proportion of swing voters across groups. But while moving from the pure swing voter equilibrium to the one involving both swing and interest groups results in formulation of other effects at work. These effects correspond with the presence of two different lobby groups comprising of voters from different groups L and H. These interest groups want their first-best tax to be implemented as a final policy choice by the winner of the election and therefore organize as lobbies to influence the electoral candidates. By using equation (12) in equation (22), we can write:

$$O_L^2 \eta_L^2 [\frac{\theta_L}{n} - \frac{\eta_L \phi_L \theta_L}{n} - \frac{\eta_H \phi_H \theta_H}{n}] + O_H^2 \eta_H^2 [\frac{\theta_H}{n} - \frac{\eta_L \phi_L \theta_L}{n} - \frac{\eta_H \phi_H \theta_H}{n}].$$

It can be seen that in the above expression, the first term in the first square bracket denotes the first-best solution of tax which interest group L wants to lobby for and this multiplied by $O_L^2 \eta_L^2$ represents the organizational strength of group L in the economy. Following this, the second and third terms depict the reduction in organizational strength of group L due to the presence of swing voters in voter groups L as well as H. Greater proportion of swing voters in the economy reduce the effectiveness of lobby groups as a strong organized group hence creating more scope for a deviation from the first-best solution from the point of view of that lobby group. Similarly, the first term in the second square bracket denotes the first-best solution for group H which when multiplied by the measure of its organizational strength $O_H^2 \eta_H^2$ depicts the strength of lobby group H in the economy. Again its strength is lowered due to the presence of swing voters in entire voter group H as well as other voter groups hence causing a deviation from the first-best solution for group H.

Equation (22) can be further modified by utilizing the balanced budget of the government where $nt_X = g_X$ and can be written as follows:

$$O_L^2\eta_L^2[\frac{\theta_L - g_X^s}{n}] + O_H^2\eta_H^2[\frac{\theta_H - g_X^s}{n}].$$

Now we can derive some important results using the above expression. If $\theta_H > \theta_L > g_X^s$, then $t_X^e > t_X^s$. Intuitively, this means that the amount of public good provided (and hence the level of tax) under the swing-voter equilibrium is way less than the bliss points of all voter groups, therefore, a transition from a pure swing-voter case to a case of electoral competition with swing-voters as well as interest groups (comprising of voters from groups L and H) results in a greater competition for a higher level of public good provision and hence a higher level of tax. This effect gets enhanced with both ϕ_L and ϕ_H tending to zero which implies that with no swing-voters present in any voter group, the lobbying effect will dominate with both interest groups lobbying for a greater public good provision relative to the swing-voter case. Additionally, if $g_X^s > \theta_H > \theta_L$, then there will be a downward pressure on the tax platform of the candidate in the presence of interest groups. And, if this negative effect overpowers the swing-voter effect, then $t_X^e < t_X^s$. The economic explanation for this is as follows. If the relative level of public good provision is very high under pure swing-voter case, then lobby group L who wants a lower tax and hence public good will lobby harder relative to lobby H who wants greater amount of public good and hence does not mind being taxed more. And because the swing-voter public good provision exceeds the bliss point of group H also, therefore, they also end up lobbying to reduce the tax platform and hence the level of public good provision. The degree of success of this lobbying activity will eventually depend on the voter's ideological preferences, that is, the total proportion of swing-voters in the economy.

Furthermore, if $\theta_H > g_X^s > \theta_L$, then the two interest groups land at cross-purposes to each other. That is, interest group H lobbies to increase the public good provision while interest group L lobbies to reduce the level of public good provision. Now, if lobby H is stronger than lobby L, then t_X^e exceeds t_X^S and if lobby L dominates lobby H, then t_X^e falls below t_X^s. As a special case, it can be seen that, when $\eta_L = \eta_H = 0.5$ and $\phi_L = \phi_H = 1$, then $(1 - \phi) = 0$. And, by using equation

(12), $[\frac{\sum_j O_j^2\eta_j^2\theta_j}{n} - t_X^s.\sum_j O_j^2\eta_j^2]$ can be written as follows:

$$0.25O_L^2[\frac{\theta_L}{n} - 0.5(\frac{\theta_L}{n} + \frac{\theta_H}{n})] + 0.25O_H^2[\frac{\theta_H}{n} - 0.5(\frac{\theta_L}{n} + \frac{\theta_H}{n})].$$

Now, since by assumption, $\theta_H > \theta_L$, therefore, we can say that, $\frac{\theta_H}{n} > \frac{\theta_L}{n}$. Or, $\frac{\theta_H}{n} = \frac{\theta_L}{n} + \epsilon$, where, $\epsilon > 0$. Substituting this in the above expression, we get,

$$0.25O_L^2[\frac{\theta_L}{n} - 0.5(\frac{2\theta_L}{n}) - 0.5\epsilon] + 0.25O_H^2[\frac{\theta_H}{n} - 0.5(2\frac{\theta_H}{n}) + 0.5\epsilon],$$

which can be simplified and expressed as:

$$0.125\epsilon[O_H^2 - O_L^2].$$

From this, one can note that, the equilibrium level of tax platform and hence public good provision depends on the organizational strength of the two lobby groups L and H. If lobby L is stronger, then it manages to reduce the tax platform in its favour (that is, $t_X^e < t_X^s$) while if lobby H is stronger, then it succeeds in raising the tax platform in its favour (that is, $t_X^e > t_X^s$). Furthermore, the extent of digression of tax platform from the pure swing-voter case also depends on the magnitude of variation in economic policy preferences across voter groups (that is, ϵ). In other words, this term actually captures the distinct nature of economic policy preferences of different voter groups. And, greater the magnitude of this variation (whether it be negative or positive), greater will be the digression from the swing-voter equilibrium tax platform. Note that all these results hold for the Y candidate as well.

6. Comparative Statics

This section deals with the changes in tax platforms of electoral candidates with respect to various parameters, namely, the difference between payoff received with winning and losing an election $(R - Q)$, the effectiveness of campaign spending (h), the K candidate's corruption parameter (β_K), the policy preference parameter (θ_j), the popularity shock parameter (ψ), the proportion of people influenced by campaign spending (δ) and ideological density of a group j (ϕ_j). The results of comparative statics are explained as following.

Proposition 9: *Under the case of electoral competition with swing voters and interest groups, the amount of public good provision (and hence the amount of tax) in equilibrium rises (falls) with an increase in the payoff of winning the election as denoted by $(R - Q)$ provided the following condition holds: $O_L^2\eta_L^2 > O_H^2\eta_H^2$ $(O_L^2\eta_L^2 < O_H^2\eta_H^2)$.*

We focus first on mathematical derivations for electoral candidate X. Using similar logic, same results can also be obtained for candidate Y. Differentiating equation (18) with respect to $(R-Q)$, we get,

$$\frac{dt_X^e}{d(R-Q)} = \frac{[(1-\beta_X)\beta_X h\delta][t_X^s \sum_j O_j^2\eta_j^2 - \phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n})]}{\{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]\}^2}.$$

As can be seen from the above, the sign of the derivative depends upon the sign of the following term: $(t_X^s \sum_j O_j^2\eta_j^2 - \phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n})$. Now by using equation (12) to expand this term, we get,

$$(t_X^s \sum_j O_j^2\eta_j^2 - \phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}) = \frac{(\theta_H-\theta_L)}{n}(O_L^2\eta_L^2\eta_H\phi_H) - (O_H^2\eta_H^2\eta_L\phi_L)\frac{(\theta_H-\theta_L)}{n},$$

or,

$$(t_X^s \sum_j O_j^2\eta_j^2 - \phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}) = \frac{(\theta_H-\theta_L)}{n}[O_L^2\eta_L^2\eta_H\phi_H - O_H^2\eta_H^2\eta_L\phi_L].$$

Given our assumption that $\theta_H > \theta_L$, the above term is positive if $\frac{O_L^2\eta_L}{O_H^2\eta_H} > \frac{\phi_L}{\phi_H}$ or, if $\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2} > \frac{\eta_L\phi_L}{\eta_H\phi_H}$. And this term is negative if $\frac{O_L^2\eta_L}{O_H^2\eta_H} < \frac{\phi_L}{\phi_H}$, or if, $\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2} < \frac{\eta_L\phi_L}{\eta_H\phi_H}$.

Thus from the above discussion, we can say that if $\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2} > \frac{\eta_L\phi_L}{\eta_H\phi_H}$, then $\frac{dt_X^e}{d(R-Q)} > 0$ and if $\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2} < \frac{\eta_L\phi_L}{\eta_H\phi_H}$ then $\frac{dt_X^e}{d(R-Q)} < 0$.

Intuitively speaking, we can define $\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2}$ as the relative organizational strength of interest group L and $\frac{\eta_L\phi_L}{\eta_H\phi_H}$ as the relative proportion of swing voters in group L. Now when the payoff from winning the elections rises, it gives the electoral candidate an incentive to change the tax platform in favour of the voter group with a larger number of swing voters and /or in favour of the strongly organized interest group. From the first condition we can see that even if the L interest group is relatively better organized than the H group, the tax platform chosen by the electoral candidate rises (that is, moves in favour of the H group). This is because a better organized lobby group signifies that a lower proportion of swing voters exist in that specific voter group. Here, since the tax platform of an electoral candidate rises along with an increase in $(R-Q)$, therefore it indicates that the relative swing-voter effect dominates the relative organizational effect of lobby group L. This means that in an economy with two economically distinct voter groups, the policy platform of an electoral candidate moves in favour of the group with the larger proportion of swing voters as the payoff from winning the election increases. For instance, the first condition shows that tax platform will rise with a rise in $(R-Q)$, that is, in favour of group H even if organizational strength of lobby group L is much greater relative to lobby group H. But this also means that group L has relatively lower number of swing voters than group H and the electoral candidate being purely opportunistic moves her policy position in favour of the group with a greater proportion of swing voters to garner as many votes as possible to win the election. Similarly the tax platform will fall with a rise in election payoff $(R-Q)$ if there are greater number of swing voters in group L irrespective of whichever lobby group is stronger in terms of organizational strength.

Proposition 10: *As the effectiveness of campaign contributions (denoted by h) increases, the tax platform moves closer to the preferences of the group which has relatively greater organizational strength and lesser number of swing voters.*

This can be explained mathematically as follows. We show the result for electoral candidate X. The result can be replicated for candidate Y. Differentiating equation (18) with respect to h, we get,

$$\frac{dt_X^e}{dh} = \frac{(R-Q)\beta_X\delta[2(R-Q)\frac{\psi}{\phi}h\beta_X\delta + (1-\beta_X)][\phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n} - t_X^s\sum_j O_j^2\eta_j^2]}{\{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]\}^2}.$$

Given that $R > Q$ and that $0 \le \beta_X \le 1$, the sign of $\frac{dt_X^e}{dh}$ will depend upon the sign of the term $[\phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n} - t_X^s\sum_j O_j^2\eta_j^2]$. Using equation (12) to expand the above term, we get,

$$[\phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n} - t_X^s\sum_j O_j^2\eta_j^2] = \frac{(\theta_H-\theta_L)}{n}[O_H^2\eta_H^2\eta_L\phi_L - O_L^2\eta_L^2\eta_H\phi_H].$$

Since, $\theta_H > \theta_L$, $\frac{dt_X^e}{dh} > 0$ if $\frac{O_H^2\eta_H^2}{O_L^2\eta_L^2} > \frac{\eta_H\phi_H}{\eta_L\phi_L}$ and $\frac{dt_X^e}{dh} < 0$ if $\frac{O_H^2\eta_H^2}{O_L^2\eta_L^2} < \frac{\eta_H\phi_H}{\eta_L\phi_L}$. Intuitively speaking, the electoral candidate will raise her tax platform in favour of voter group H if the interest group H has a greater organizational strength relative to interest group L. This is in turn also implies that voter group H has relatively lesser number of swing voters as compared to voter group L and because of a rise in efficiency of campaign donations which are provided to the electoral candidate by non other than interest groups, it increases the importance attached to the interest group by the electoral candidate. Thus the candidate sways her policy position in favour of the stronger effect at work which is the effect of relative organizational strength of interest groups.

Proposition 11: *If an electoral candidate is relatively more corrupt, then she is more inclined to sway her policy platform in favour of the interest group which is comparatively stronger in terms of organizational strength.*

This can be explained mathematically by differentiating equation (18) with respect to β_X:

$$\frac{dt_X^e}{d\beta_X} = \frac{[(R-Q)h\delta][2(R-Q)\frac{\psi}{\phi}h\beta_X\delta + (1-2\beta_X)][\phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n} - t_X^s\sum_j O_j^2\eta_j^2]}{\{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]\}^2}.$$

Further expanding the above expression using the equilibrium swing voter tax solution from equation (12), we get,

$$\frac{dt_X^e}{d\beta_X} = \frac{[(R-Q)h\delta][2(R-Q)\frac{\psi}{\phi}h\beta_X\delta + (1-2\beta_X)](\theta_H - \theta_L)[O_H^2\eta_H^2\theta_L\phi_L - O_L^2\eta_L^2\eta_H\phi_H]}{n\{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]\}^2}.$$

Therefore given that $R > Q$, it can be deduced from the above that,

$$\frac{dt_X^e}{d\beta_X} > 0 \text{ if } \frac{O_H^2\eta_H^2}{O_L^2\eta_L^2} > \frac{\eta_H\phi_H}{\eta_L\phi_L} \text{ and } \beta_X \leq \frac{1}{2}.$$

And,

$$\frac{dt_X^e}{d\beta_X} < 0 \text{ if } \frac{O_H^2\eta_H^2}{O_L^2\eta_L^2} < \frac{\eta_H\phi_H}{\eta_L\phi_L} \text{ and } \beta_X \leq \frac{1}{2}.$$

The intuition for this result is as follows. Here, $\beta_X = \frac{1}{2}$ denotes the degree of honesty of electoral candidate X and indicates that half of the contribution money received by the electoral candidate is spent on campaign advertisements to woo voters and the other half is kept for her private use. Therefore, a value of β_X less than 0.5 implies that X keeps a greater proportion of the donation money for her private use and spends a lower proportion on voters, thereby signalling the corrupt nature of the politician. On the other hand, β_X greater than 0.5 implies that X keeps a lesser proportion of the donation money for her private use and spends a higher proportion on voters, thereby indicating the honest nature of the politician. Thus, a relatively corrupt politician, that is, in the case when $\beta_X < 0.5$, the electoral candidate is more inclined to move her policy point (tax and hence public good provision) towards that of the the better organized or stronger lobby group. In other words, as the candidate becomes more corrupt, the lobby organizational effect dominates the swing-voter effect. If the lobby group H is better organized then public good provision will increase in conformity with the former's public good preferences. In contrast, if lobby group L is stronger, then the tax platform of the candidate will reduce implying a sway towards the L group's preferences for public good provision. Similar result can be derived by differentiating equation (19) with respect to β_Y.

Proposition 12: *As the preference intensity parameter for public good provision (denoted by θ_j) rises (falls), then an electoral candidate also raises (lowers) her tax platform in response to it. Similar result holds for the other candidate as well.*

To prove this result, we differentiate equation (18) with respect to θ_j, to get,

$$\frac{dt_X^e}{d\theta_j} = \frac{(R-Q)[\eta_j\phi_j + \frac{\psi}{\phi}h^2\beta_X^2\delta^2 O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta O_j^2\eta_j^2]}{n(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]}.$$

Thus, given that $R > Q$ and $0 \leq \beta_X \leq 1$, $\frac{dt_X^e}{d\theta_j} > 0$. Intuitively this means that if the voters in the economy have a stronger preference for public good (and hence tax), it results a higher tax platform being chosen by the electoral candidate in an equilibrium involving the presence of swing-voters and interest groups. This is because the electoral candidates in our model are purely office-seeking and have no economic preferences of their own. Hence, they move their respective policy platforms in favour of the economic preferences of the voter groups. If all voters prefer a higher level of public good provision, then the tax will be higher so that a greater public good could be provided. In contrast, if majority of voters prefer a lower level of public good, then the corresponding tax platform promised by the electoral candidates would be also be lower. This holds true for both X and Y.

Proposition 13: *As the popularity density of a candidate (denoted by ψ) increases, the candidate gives into the stronger lobby's efforts and irrespective of which voter group has a greater number of swing voters, leans the policy choice towards that of the stronger lobby.*

This can be explained mathematically as follows. We differentiate equation (18) with respect to ψ to get,

$$\frac{dt_X^e}{d\psi} = \frac{(R-Q)^2\frac{h^2}{\phi}\beta_X^2\delta^2[\phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n} - t_X^s\sum_j O_j^2\eta_j^2]}{\{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]\}^2}.$$

Now, $\frac{dt^e_X}{d\psi} > 0$ if $[\phi \frac{\sum_j O_j^2 \eta_j^2 \theta_j}{n} - t^s_X \sum_j O_j^2 \eta_j^2] > 0$ and $\frac{dt^e_X}{d\psi} < 0$ if $[\phi \frac{\sum_j O_j^2 \eta_j^2 \theta_j}{n} - t^s_X \sum_j O_j^2 \eta_j^2] < 0$. That is, $\frac{dt^e_X}{d\psi} > 0$ if:

$$\frac{(\theta_H - \theta_L)}{n}[O_H^2 \eta_H^2 \theta_L \phi_L - O_L^2 \eta_L^2 \eta_H \phi_H] > 0,$$

or, $\frac{O_H^2 \eta_H^2}{O_L^2 \eta_L^2} > \frac{\eta_H \phi_H}{\eta_L \phi_L}$ because $\theta_H > \theta_L$. In contrast, if $\frac{O_H^2 \eta_H^2}{O_L^2 \eta_L^2} < \frac{\eta_H \phi_H}{\eta_L \phi_L}$ then $\frac{dt^e_X}{d\psi} < 0$. Intuitively speaking, as an electoral candidate gets more popular, it helps her to garner more support from the interest groups via their campaign money without worrying about the loss in vote share she will face. This is because being more popular among the voters lets the candidate move her policy point closer to the stronger lobby group as now the loss in vote share from one group (with greater number of swing voters) won't be significant as compared to the gain in vote share she will get from the other voter group. In this case, the candidate can use the donations received from the stronger lobby group to again sway other voters in her favour so that she still wins the election. Therefore in this case also the effect of relative organizational strength of lobby groups outweighs the swing voter effect. This result holds true for both X and Y.

Proposition 14: *An increase in the proportion of uninformed (or unorganized) voters in the economy (depicted by δ) lead the electoral candidate to tilt her tax platform in favour of the interest group with a relatively greater organizational strength.*

This can be explained mathematically as follows. By differentiating equation (18) with respect to δ, we get,

$$\frac{dt^e_X}{d\delta} = \frac{(R-Q)\beta_X h[2(R-Q)\frac{\psi}{\phi}h\beta_X\delta + (1-\beta_X)][\phi \frac{\sum_j O_j^2 \eta_j^2 \theta_j}{n} - t^s_X \sum_j O_j^2 \eta_j^2]}{\{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2 \sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta \sum_j O_j^2 \eta_j^2]\}^2}.$$

Again expanding the term $[\phi \frac{\sum_j O_j^2 \eta_j^2 \theta_j}{n} - t^s_X \sum_j O_j^2 \eta_j^2]$ by using equation (12), we get,

$$[\phi \frac{\sum_j O_j^2 \eta_j^2 \theta_j}{n} - t^s_X \sum_j O_j^2 \eta_j^2] = \frac{(\theta_H - \theta_L)}{n}[O_H^2 \eta_H^2 \theta_L \phi_L - O_L^2 \eta_L^2 \eta_H \phi_H].$$

Therefore, given that $R > Q$ and $\theta_H > \theta_L$, we can say that $\frac{dt^e_X}{d\delta} > 0$ if $\frac{O_H^2 \eta_H^2}{O_L^2 \eta_L^2} > \frac{\eta_H \phi_H}{\eta_L \phi_L}$ and $\frac{dt^e_X}{d\delta} < 0$ if $\frac{O_H^2 \eta_H^2}{O_L^2 \eta_L^2} < \frac{\eta_H \phi_H}{\eta_L \phi_L}$. The intuition for this result is as follows. As the proportion of uninformed (or unorganized) voters in the economy rises, the tax platform of the electoral candidate tilts towards the interest group with greater organizational strength. This is because the uninformed voters can be swayed by the electoral candidate through campaign expenditures financed by donations from interest groups. Therefore, the candidate can capture higher vote share by following a strategy of deviating her policy platform in favour of the stronger lobby group, thus getting donation money in return and then spending it on the uninformed voters (whose proportion has relatively increased in the economy). Hence, in this case the lobby's relative organizational strength effect dominates the swing-voter effect. This result holds true for both X and Y.

Proposition 15: *An increase in the ideological density of a voter group (say L) leads to a change in the electoral candidate's tax platform towards the L group's preferred policy point if the following condition holds:* $\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2} < \frac{\eta_L\phi_L}{\eta_H\phi_H} < \frac{(\frac{\theta_H}{n}-\theta_L)}{(\theta_L-\frac{\theta_L}{n})}$.

This can be explained mathematically for electoral candidate X by differentiating equation (18) with respect to t_X^e. We get the following expression:

$$\frac{dt_X^e}{d\phi_j} = \frac{(R-Q)^2\eta_j[\phi\theta_j - t_X^s] + [\theta_j\sum_j O_j^2\eta_j^2 - \frac{\sum_j O_j^2\eta_j^2\theta_j}{n}][(R-Q)^2\eta_j\frac{\psi}{\phi}h^2\beta_X^2\delta^2 + (R-Q)[(1-\beta_X)\beta_X h\delta\eta_j]}{\{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]\}^2}$$
$$+\frac{(R-Q)^2[\frac{\psi}{\phi^2}\eta_j h^2\beta_X^2\delta^2][t_X^s\sum_j O_j^2\eta_j^2 - \phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}]}{\{(R-Q)[\phi + \frac{\psi}{\phi}h^2\delta^2\beta_X^2\sum_j O_j^2\eta_j^2] + [(1-\beta_X)\beta_X h\delta\sum_j O_j^2\eta_j^2]\}^2}.$$

Therefore from the above expression, the sign of $\frac{dt_X^e}{d\phi_j}$ depends upon the terms $[\phi\theta_j - t_X^s]$, $[\theta_j\sum_j O_j^2\eta_j^2 - \frac{\sum_j O_j^2\eta_j^2\theta_j}{n}]$ and $[t_X^s\sum_j O_j^2\eta_j^2 - \phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}]$. To further analyze these terms, we focus on the ideological density variable for the L voter group, that is, ϕ_L. Now, using the definition of average ideology discussed earlier in the chapter and equation (12) and expanding the first term, we get,

$$[\phi\theta_L - t_X^s] = [\theta_L(\eta_L\phi_L + \eta_H\phi_H) - \frac{\eta_L\phi_L\theta_L}{n} - \frac{\eta_H\phi_H\theta_H}{n}],$$
$$[\phi\theta_L - t_X^s] = [\eta_L\phi_L(\theta_L - \frac{\theta_L}{n}) + \eta_H\phi_H(\theta_L - \frac{\theta_H}{n})]. \tag{23}$$

Now as for the second term, we can write,

$$[\theta_j\sum_j O_j^2\eta_j^2 - \frac{\sum_j O_j^2\eta_j^2\theta_j}{n}] = [\theta_L(O_L^2\eta_L^2 + O_H^2\eta_H^2) - \frac{O_L^2\eta_L^2\theta_L}{n} - \frac{O_H^2\eta_H^2\theta_H}{n}],$$

or,

$$[\theta_j\sum_j O_j^2\eta_j^2 - \frac{\sum_j O_j^2\eta_j^2\theta_j}{n}] = [O_L^2\eta_L^2(\theta_L - \frac{\theta_L}{n}) + O_H^2\eta_H^2(\theta_L - \frac{\theta_H}{n})]. \tag{24}$$

And finally the third term can be expanded by using equation (12):

$$[t^s_X \sum_j O_j^2\eta_j^2 - \phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}] = [(\frac{\eta_L\phi_L\theta_L}{n}+\frac{\eta_H\phi_H\theta_H}{n})(O_L^2\eta_L^2+O_H^2\eta_H^2)-(\eta_L\phi_L+\eta_H\phi_H)(\frac{O_L^2\eta_L^2\theta_L}{n}+\frac{O_H^2\eta_H^2\theta_H}{n})].$$

On simplification, we get,

$$[t^s_X \sum_j O_j^2\eta_j^2 - \phi\frac{\sum_j O_j^2\eta_j^2\theta_j}{n}] = \frac{(\theta_H-\theta_L)}{n}\eta_L\eta_H[O_L^2\eta_L\phi_H - O_H^2\eta_H\phi_L]. \tag{25}$$

Now from these expressions we can find out the sign of $\frac{dt^e_X}{d\phi_L}$. From equations (23), (24) and (25), we get that $\frac{dt^e_X}{d\phi_L} < 0$ if the following respective sufficiency conditions hold:

$$\frac{\eta_L\phi_L}{\eta_H\phi_H} < \frac{(\frac{\theta_H}{n}-\theta_L)}{(\theta_L-\frac{\theta_L}{n})},$$

and,

$$\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2} < \frac{(\frac{\theta_H}{n}-\theta_L)}{(\theta_L-\frac{\theta_L}{n})},$$

and,

$$\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2} < \frac{\eta_L\phi_L}{\eta_H\phi_H}.$$

These three conditions can be combined to get the following result:

$$\frac{dt^e_X}{d\phi_L} < 0 \text{ if } \frac{O_L^2\eta_L^2}{O_H^2\eta_H^2} < \frac{\eta_L\phi_L}{\eta_H\phi_H} < \frac{(\frac{\theta_H}{n}-\theta_L)}{(\theta_L-\frac{\theta_L}{n})}.$$

This means that that as the ideological density of group L increases, the policy platform (tax and hence the level of public good provision) is lowered if the above condition holds, that is, the tax platform moves closer to the economic preferences of group L. Intuitively speaking, we can define $\frac{O_L^2\eta_L^2}{O_H^2\eta_H^2}$ as the relative organizational strength of group L; $\frac{\eta_L\phi_L}{\eta_H\phi_H}$ as the proportion of swing voters in group L relative to group H and $\frac{(\frac{\theta_H}{n}-\theta_L)}{(\theta_L-\frac{\theta_L}{n})}$ can be defined as the deviation of the first-best tax solution $(\frac{\theta_H}{n})$ for group H from the L group's bliss point relative to the deviation of the bliss point of the L group from its first-best tax solution $(\frac{\theta_L}{n})$. Now, as ϕ_L rises, the L voter group contains more swing voters and hence the strength of lobby group L becomes relatively weaker than that of lobby group H. Given well-defined policy preferences of the voter groups, that is when the voter groups are distinct from each other in terms of their respective economic preferences, the electoral candidate's tax platform would deviate towards that of group L with an increase in ideological density of group

L only when the candidate is able to recover her loss of vote share from group H through a gain in vote share from group L resulting from a reduction in tax plaform. This is because even though group H has a stronger lobby with stronger economic policy preferences, an increase in ϕ_L leads the candidate to choose a policy closer to the bliss point of group L to attract swing voters in her favour. The increase in the proportion of swing voters in voter group L reduces the strength of economic policy preferences of that group (θ_L) thereby reducing the strength of the lobby L. The electoral candidate compensates her loss in vote share from policy deviation from the gain in swing vote share from voter group L.

7. Conclusion

The paper analyzes a model of electoral competition between two office-seeking and corrupt candidates, swing voters and interest groups (that is, the proportion of organized voter groups) to derive equilibrium policy (tax) platforms for three different specifications of the model–benchmark, pure swing-voter and swing-voter plus interest groups. It is found that the equilibrium tax platform of an electoral candidate under benchmark scenario is greater than or equal to the same under the pure swing voter case. This is because in the pure swing voter case, the candidate assigns a higher weight to the group with a greater number of swing voters since they are an attractive target for opportunistic politicians while in the benchmark case, no swing voters exist and therefore the candidates treat them identically in terms of ideology. Thus, the presence of swing-voters in the economy dilutes the intensity of economic policy preferences of each group and therefore the choice of tax platform and the corresponding level of public good provision is reduced relative to the benchmark scenario. Furthermore, it is found that, an increase in the honesty parameter of the candidate results in greater donations by the interest group towards that candidate since in this case the marginal benefit derived by the interest group is greater due to lesser leakage of donation money towards private use of the candidate. Additionally, the comparative static results have been derived for different parameters like the difference between payoff received with winning and losing an election ($R - Q$), the effectiveness of campaign spending (h), the K candidate's corruption parameter (β_K), the policy preference parameter (θ_j), the popularity shock parameter (ψ), the proportion of people influenced by campaign spending (δ) and ideological density of a group j (ϕ_j). Two significant effects have been found to be at work in driving these results, namely the relative swing voter effect and the relative organizational strength of lobbies effect. The first effect depicts the share of swing voters in one voter group relative to another while the second effect represents the relative strength of interest groups in terms of the voter group having a greater proportion of individuals who are well-organized as compared to the voter group with lesser organized population. Our comparative static results indicate that the equilibrium policy platforms of candidates (tax platform) sway in favour of the voter group with the more dominant effect.

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