The Effect of Voters' Benefit Misperceptions on the Tax Policy Making in a General Probabilistic Voting Framework

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Abstract
We attempt to examine the effect of benefit misperception on tax policy making in a more general probabilistic voting framework. In a representative democracy, candidates are thought to be judged by voters on the basis of both policy and non-policy or random policy characteristics in voters' voting decision. We include misperceived benefit levels as a random policy variable which is separate from tax policy. We suppose that taxes and benefits are separate in relation, and voters have asymmetric perception about tax and benefit policies proposed by candidates. Thus, voters may have misperception, or inaccurate perception, of the benefits from public services because of its invisibility. By employ 'probabilistic linkage' between tax and benefit policies, we first examine the effect of benefit misperception on tax policy making in a general probabilistic voting framework. Then, we extend our earlier paper to include the benefit misperception degree, policy salience, and tax administration costs, and examine their effects on the political opposition from taxation.

Key words: Probabilistic voting, Party competition, Misperceived benefits, Probabilistic linkage.

JEL Classification: D72; D78; H22

1. Introduction
In a representative democracy, candidates are generally thought to be judged by voters on the basis of both proposed 'policy' and 'non-policy characteristics'. This implies that candidates are something more than simply policy surrogates; that is, in addition to policy platforms, candidates have non-policy characteristics which are important in voters' voting decision. In contrast, in a direct democracy, only
policies matter in voter choices.

Tax policies are easily observable and very salient in an election, suggesting that voters can exercise substantial control over these policies. In contrast, expenditure decisions involve innumerable details that would require time and expertise to judge well. As a result, these expenditure decisions that offer benefits to voters are often misperceived by voters. Thus, we will start with the idea that taxes and benefits are separate in the sense that voters perceive them as distinct policies, and that voters have asymmetric perceptions about tax and benefit policies proposed by candidates. That is, tax policy is visible and directly observed by voters, while benefit policy is less visible and hidden to the voters. As a consequence, benefit policy is often related to the voters' perceptions, and so voters may have misperceptions, or at least inaccurate perceptions, of the benefits from public services proposed by political parties.

Like most of the standard spatial election models, Hettich and Winer (1988, 1997) suppose that voters care only about policy platforms announced by the two candidates. However, candidates or parties may also differ in some other dimension unrelated to the policy issue. This is usually referred to as 'non-policy characteristics or attributes' of candidates which include ideology or party identification, candidates' personal characteristics, race or religion, and so on. In particular, Enelow et al. (1986) examined the relevance of non-policy candidate characteristics in voting in their empirical model, and showed that the model including both policy and non-policy variables is better in predicting voter choices than models excluding non-policy variables.

Instead of employing the concept of non-policy characteristics, we will include what might be termed a *misperceived policy attributes* which depends on the voters' perceptions. Then, we will examine the effect of candidates' uncertainty about this misperceived benefit on tax policy making.

We incorporate the 'misperceived policy characteristics' into a probabilistic voting model. More specifically, we construct a model incorporating the candidate uncertainty regarding voters' qualitative policy preferences into a probabilistic voting framework. In addition, our model is based on a general probabilistic voting model in the sense that both voters and candidates face uncertainties: candidates have uncertainty about voters' choices and voters have uncertainty about candidates' benefit policies.

Each candidate seeks to maximize his expected numbers of votes, which is a function of both the measurable difference in policy-related utilities between two candidates and the distribution of an unobserved variable. This unobservable variable represents the non-policy or random policy attributes of candidates. While Enelow and Hinich (1982, 1989) and Lindbeck and Weibull (1987) include non-policy attributes in their probabilistic voting model, we include the 'qualitative policy element' in the voter's assessment which is defined as the misperceived benefit levels by voters. In our model, differences in the misperceived benefits are treated by candidates as random variables which are independent of tax policy issues.

In this study, we aim to examine the probabilistic connection of benefit misperception to tax policy making. Benefits are hidden or less visible, and thus, voters are not aware of the benefits they perceive from public services. By contrast, taxes are direct and more visible to voters. Thus, the relation between taxes and
benefits is separated and asymmetric. Thus, to connect these two variables and to examine the effect of benefit misperception on tax policy making, we employ 'probabilistic connection or linkage' between tax policy and benefit policy. This linkage is achieved by assigning a probability distribution to the differential in benefit misperception between candidates or parties. In short, this is a mechanism connecting perceived taxes and misperceived benefits in an indirect way.

We will focus on the candidates’ selection of tax policy, but differences in voters’ perceptions concerning the less visible benefits the two candidates offer may have a significant effect on the outcome of tax policy making, and on candidate competition for votes. In section 2, we assume the separation and asymmetric perception relations between taxes and benefits, and then, in section 3, we introduce a basic model based on a general probabilistic voting framework. In particular, we assume that voters judge the candidates both on the basis of tax policy and misperceived benefits, and incorporate both policy and misperceived policy issues into the voters’ utility function. After showing the effect of misperceived benefit policy on the political tax policy making, then we characterize the political equilibrium tax structure with and without candidate bias considering. In addition, we examine the effect of candidate bias on the political opposition and voter differentiation. Finally, we show that there will be a stabilizing election outcome if the concavity condition is satisfied.

In section 4, we extend the basic model to examine the effects on the political opposition from taxation of the benefit misperception degree, policy salience, and tax administration costs. In section 5, we summarize main results we have examined.

2. Benefit Misperception and Probabilistic Voting Model

Before introducing the model formally, we will explain briefly the policy features, general probabilistic voting and probabilistic linkage.

First, we will consider the following two important policy features related to the tax and benefit policy: that is, there are separation relation and asymmetric perception between taxes and benefits. First, we assume a policy separation between two policy variables: that is, there exists a separation relation between tax and benefit policies. There is a significant difference between transactions in the private sector and in the public sector. In the private sector, almost all transactions are made on a quid pro quo basis, whereas in the public sector benefits are usually separated from the taxes that make them possible. For example, whenever a citizen receives a private benefit, he pays for it directly and individually. But there is no such direct link between taxes and benefits in the budget policy, particularly at the individual level. Taxes are not necessarily allocated to individuals on the basis of benefits received, but on some other basis, usually ‘ability to pay’. Thus, the benefits of a given budget policy to any individual may have no connection with tax payment by that individual. For instance, when a voter pays his income tax or the sales tax on his new car, he can not link these acts of paying taxes to specific benefits received. Thus, this separation of benefits from tax payment for them makes it difficult to balance the taxes and benefits of a given government budget policy. Second, we suppose an

1 In the private sector, benefits are provided only to those who pay for them. But most modern democracies have elected to provide their poorest citizens with more benefits than those citizens can afford individually. Thus, for both technical and ethical reasons, the ‘benefit principle’ prevailing in the private sector is largely abandoned in the public sector. Thus, a separation relation existing in between tax
asymmetry in policy perception (i.e., voters have an asymmetry in policy perception): that is, there is an asymmetric policy perception from voters between taxes and benefits. As described, benefits are often hidden, obscure or less visible to voters, whereas taxes are direct or visible. Thus, voters perceive tax policy accurately, but misperceive benefits. For example, each individual will know, with reasonable precision, how much income tax he pays, but may have only a very vague idea of the benefits received via expenditures on, say, defense policy, transport policy, etc.. Thus, rational taxpayers may know that they receive benefits in return for taxes, but the hidden nature of many such benefits prevents voters from balancing between taxes and benefits and from connecting them as well\(^2\). Thus, an asymmetric policy perception between taxes and benefits prevents voters from connecting taxes to benefits.

In summary, a major portion of government benefits is less visible in character compared with taxes. When voters are either ‘rationally ignorant’ or suffer ‘fiscal illusion’, they fail to realize the government benefits they are receiving. However, they are well aware of the taxes they pay. Because of this imbalance and asymmetry, the governing party can not spend much money on producing obscure benefits. Every fund raised by taxation will cost votes which must be compensated for by votes won through public spending. But, when the spending produces benefits that are not appreciated by voters, no compensating votes result.

These two assumptions are useful to analyze our probabilistic linkage model between tax and benefits. The separation assumption will help us analyze a unidimensional policy which most of probabilistic voting models assume. The asymmetric perception assumption will serve to analyze our model in a probabilistic framework.

Second, we will base our model on the general and behaviorally reasonable probabilistic voting framework. There are always unobservable variables that affect voters’ voting choice. Furthermore, policy issues or positions of candidates are measured with error by voters. We will consider uncertainties of both candidates and voters. First, the voter’s uncertainty about the candidates may arise from several sources. Candidates’ policy proposals may be imperfectly perceived by voters or may be perceived as a random variable\(^3\). Second, a candidate may face the uncertainty of never knowing all the factors that affect voters’ voting decisions. Even when voters are rational, informed, and have clearly defined views on policy issues, the candidate still cannot be certain about how the votes will be cast. The standard probabilistic voting models take only the candidate uncertainty into account.

Both considerations suggest the need for a ‘behaviorally reasonable theory’ of voting which incorporates the two essential uncertainties that candidates have about voters’ choices and voters have about candidates’ policies. Thus, we construct a model based on the behaviorally reasonable voting theory\(^4\) of two-candidate competition which is designed to re-

\(^2\) That is, taxpayers may have rational ignorance on the benefits, but have no rational ignorance on the taxes. Alternatively, voters have larger fiscal illusion on the benefits than that on the taxes.

\(^3\) Alternatively, uncertainty about new issues and future events may also complicate the voter’s decision problem. A voter who is future oriented may face this inescapable uncertainty, even if he is confident that he knows the candidates’ policies on current policy issues.

\(^4\) This concept was developed by Enelow (1989).
flect electoral uncertainties by both voters and candidates. Each candidate seeks to maximize his expected vote, which is a function of both the measurable difference in policy-related utilities between two candidates and the distribution of an unobserved variable. This unobservable variable may represent the difference in non-policy or random policy attributes between two candidates and is distributed independently of policy difference. As in Enelow and Hinich (1982, 1989) and Lindbeck and Weibull (1987), we include the 'random element' in the voter's assessment as the difference in the misperceived benefits that is treated as a random variable and independent of tax policy. This random element serves to represent factors which are probabilistically modeled.

We suppose that political parties have their own policy programs, and that parties' policy programs may consist of tax policy and benefit policy. We will treat tax policy as a deterministic choice variable by candidates and benefit policy as a random variable: the former is visible and direct to the voters, while the latter is less visible and hidden to the voters, and so voters may have misperception of the benefits from public services proposed by political parties\(^5\). We focus on the candidates' selection of tax policy. However, differences in misperceptions between the two candidates concerning 'less visible benefit policy' may have a significant effect on the outcome of tax policy making and candidate competition for votes.

Finally, we will employ probabilistic linkage method by assuming in our model that there is an 'indirect or implicit linkage' between taxation and benefit policy. In particular, we assume that voters have benefit misperception which is treated by candidates as a random variable and thus assigned by candidates to a probability distribution. Thus, to examine the effect of benefit misperception on tax policy making, we develop and employ a 'probabilistic connection or linkage' between tax policy and benefit misperception. Now, we examine a mechanism connecting well-perceived taxes and misperceived benefits implicitly via a probabilistic linkage. Theoretically, individual voters can consider both their direct benefits from a particular spending program and the direct tax costs that they are likely to pay in higher taxes for that benefit. But, since voters have misperceptions on the benefits from public services, but have accurate perceptions on the tax policy, it is reasonable to connect them by means of an implicit and probabilistic linkage.

The relationship between taxation and benefits has been divided into two extreme trends in the literature: that is, there are complete linkage and complete separation. First, the British Social Attitude (BSA) survey (1996) uses a complete and explicit linkage method which connects explicitly taxation to public services. For instance, an increase in public spending leads to an increase in tax. Second, Hettich and Winer (1988, 1997) employ a complete separation method. That is, they assume that taxation is completely independent of public services, although they choose tax and public services simultaneously. However, we adopt a compromise method which links indirectly and implicitly taxation to public services. Thus, we call this an 'implicit or probabilistic linkage method'. This implies that taxes and benefits are separate, but that tax policy is implicitly affected by benefit level which is misperceived by voters. This method utilizes the fact that

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\(^5\) In other words, voters have 'complete information' on the tax policy, but have 'incomplete information' on the benefit policy.
the utility function is additively separable, and composed of both indirect utility from taxation and utility from misperceived benefits.

3. A Basic Model

Now, we turn to build up our model formally. We consider a basic model dealing with two-candidate electoral competition in which policy pronouncements are made in terms of tax policies by the two candidates. Both candidates simultaneously announce their tax policy proposals. There are \( n \) voters, indexed by \( i \), \( i = 1, 2, \ldots, n \). Voters all vote sincerely and thus, there is no abstention in voting. Before the election, the two candidates, 1 and 2, will promise tax policies, \( T^1 \) and \( T^2 \), respectively.

First, we describe voters' preferences as follows. A basic idea here is that voters derive utility both from the tax policy and from the benefit level that is likely to be misperceived by voters. Thus, one component of every voter's welfare depends on tax policy through its effects on his income or utility. This component is known by both candidates and thus represents a deterministic factor. This means that there is complete information concerning the preferences of voters in relation to the visible tax policy. The other component of voters' welfare is derived from the misperceived benefit in the candidates' programs which is imperfectly observed by the candidates because of its misperception to voters, and so this represents a random or probabilistic factor. This implies that political candidates have incomplete information as to benefit misperceptions of voters.

More specifically, each voter \( i \) derives utility \( U_i(T^c; MB^c_i) \) from both visible tax policies, \( T^c \), and misperceived benefits, \( MB^c_i \), whose differences between candidates serve to reflect a random element in our model. That is, each voter \( i \) derives indirect utility \( V_i(T^c) \) from tax policies which are visible to him, and thus we call this 'tax-induced utility'. We assume that \( \frac{\partial V_i}{\partial T^c} < 0 \) and \( \frac{\partial^2 V_i}{\partial T^c \cdot \partial T^c} < 0 \), \( c = 1, 2 \). The tax-related utility function shows a decreasing utility (or increasing disutility) and increasing marginal utility from taxation. Thus, the tax-related utility is assumed to be a concave function in tax policy. In addition to this, each voter \( i \) obtains utility from benefit levels which are assumed to be misperceived because of the 'benefit illusion' of voters, and thus we call this 'misperceived-benefit-induced utility'. Since we have assumed that tax and benefit policies are chosen separately and perceived asymmetrically, the utility function can therefore be expressed in an additively separable form:

\[
U_i(T^c; MB^c_i) = V_i(T^c) + MB^c_i, c = 1, 2
\]

Thus, the preferences of voters incorporate voters' misperceived benefit policy characteristics into the utility function in addition to the well-perceived tax policy. Clearly, this functional form has, in our case, an advantage of

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Note that for the convenience of terminology, we assume throughout the whole section that 'candidates' and 'parties' are interchangeable, 'voters' and 'taxpayers' are also interchangeable. In addition, 'tax policy' and 'tax rate' are interchangeable, 'benefit policy' and 'public services' (or public expenditure or spending) are interchangeable, and 'benefit misperception' and 'benefit illusion' are interchangeable.

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There are two ways to describe the utility function either in an additive form, \( V_i(T^c) + \phi^c_i \), or in a multiplicative form, \( V_i(T^c) \cdot \exp(\phi^c_i) \), where \( \phi^c_i \) denotes the non-policy evaluation of voter \( i \) on candidate \( c \), \( c = 1, 2 \).
expressing a separate relation between tax and benefit policies. We considered that two candidates compete with two policy issues, tax and benefit policies: tax policy is a deterministic variable, while benefit policy is a random variable. However, we assume there is a separation relation between tax and benefit policies since tax policy is visible and benefit policy is hidden in nature. In other words, this corresponds to the assumption that voters perceive no connection between tax burden and public services. This feature of separate relation between taxes and public services can be represented well by the additively separable utility function.

On the other hand, this separate relation implies that voters have asymmetric information on the two policy issues: that is, voters have complete information on tax policy, but incomplete information on the benefit policy because of illusion or misperception.

Now, the individual voter $i$'s total utility obtained from both deterministic tax policy and random benefit element is represented as follows, depending on which candidate will win:

$$
U_i(T^1; MB^1_i) = V_i(T^1) + MB^1_i \\
U_i(T^2; MB^2_i) = V_i(T^2) + MB^2_i
$$

if candidate 1 wins

$$
U_i(T^1; MB^1_i) = V_i(T^1) + MB^1_i \\
U_i(T^2; MB^2_i) = V_i(T^2) + MB^2_i
$$

if candidate 2 wins

where $V_i(T^1)$ and $V_i(T^2)$ are the individual voter $i$'s indirect utilities derived from the candidate's tax policies, $T^1$ and $T^2$, respectively. In addition, $MB^1_i$ and $MB^2_i$ are the utilities that individual voter $i$ obtains from misperceived benefit levels provided by candidates 1 and 2, respectively.

Second, from this utility function, we can infer voters' decision rule in the absence of abstention. Voters will decide their votes by assessing and comparing the total utilities between the two candidates. Thus, voters' decision in voting depends on the total utility differential between the two candidates. Individual voter $i$ is assumed to vote either for candidate 1 if $U_i(T^1; MB^1_i) > U_i(T^2; MB^2_i)$, or for candidate 2 if $U_i(T^1; MB^1_i) < U_i(T^2; MB^2_i)$. In this case, voter's choice is deterministic.

Third, we specify the probability for a voter $i$ to vote for a candidate. We will focus on the case for candidate 1 for analytical convenience. Then, the probability assignment for an individual voter $i$ to vote for candidate 1, $P_i^1$, is represented by the total utility differential between the two candidates:

$$
P_i^1 = \Pr\{U_i(T^1; MB^1_i) > U_i(T^2; MB^2_i)\}
$$

$$
= \Pr\{V_i(T^1) + MB^1_i > V_i(T^2) + MB^2_i\}
$$

$$
= \Pr\{V_i(T^1) - V_i(T^2) > (MB^2_i - MB^1_i)\}
$$

where $(MB^2_i - MB^1_i)$ represents the 'misperceived benefit differentials' of voters between the two candidates.

The differential in benefit misperceptions represents voter $i$'s evaluation of misperceived benefit differences between candidates 1 and 2. This shows that voters evaluate the misperceived benefits of the two candidates in their probability voting for a candidate. This corresponds to the candidate bias, or candidate preference, since the candidate bias in our context is caused by the benefit misperception difference.

In other words, voter $i$'s utility for a particular candidate's voting is the sum of his utility for the candidate's tax policy (i.e., tax-related utility) and an additional component that reflects other policy factors which affect independently his preferences for the candidates (i.e., misperceived-benefit-related utility).
differentials. For instance, candidate bias means that voters are said to be in favor of candidate 1 if \( (MB_2^i - MB_1^i) < 0 \). In other words, this indicates that candidate 1 has an advantage over candidate 2 in voter \( i \)'s choice when \( (MB_2^i - MB_1^i) < 0 \) even if they have the same tax policies. Thus, we may refer to \( (MB_2^i - MB_1^i) < 0 \) as the expected candidate bias in favor of candidate 1. In addition, when \( (MB_2^i - MB_1^i) = 0 \), then \( P_1^i \) would reduce to \( V_1(T_1) > V_1(T_2) \), and thus voters' choices become deterministic.

Note here that the degree of variation of \( (MB_2 - MB_1) \) is assumed not to be zero. From this formulation, we can rewrite the voter \( i \)'s probability to vote for candidate 1, \( P_1^i \), as:

\[
P_1^i = \begin{cases} 1 & \text{if } (V_1(T_1) - V_1(T_2) > (MB_2^i - MB_1^i)) \\ 0 & \text{otherwise} \end{cases}
\]

But, the probability voting function, \( P_1^i \), is a discontinuous function of the utility differential between the two candidate policies.

Fourth, the problem is how to connect the less visible misperceived benefits from public services to the visible tax policy making. We employ the probabilistic linkage method by assigning a probability distribution function to a random element in order to derive a continuous probability voting function. We start with the fact that the candidates cannot observe exactly the misperceived benefit terms, \( MB_1^i \) and \( MB_2^i \), because of voters' misperception, or at least can only observe imperfectly. Thus, they will treat 'their differences' as a random variable when selecting their tax policies. Thus, both candidates assign a twice continuously differentiable probability distribution function \( F_i \) to 'misperceived benefit differential', \( (MB_2^i - MB_1^i) \), and \( F_i \) has a positive density everywhere:

\[
F_i'(MB_2^i - MB_1^i) = f_i(MB_2^i - MB_1^i) > 0
\]

Note that both candidates are assumed to make the same probability assignments for voters' misperceived benefits: \( F_1^i = F_2^i = F_i \). This distributional assumption is consistent with assuming that the candidates know the misperceived benefit differences for each voter. This is also consistent with assuming that they are uncertain about the value of misperceived benefits for any particular voter, but only know the distribution of the misperceived benefits across voters.

The process of assigning a probability distribution function is as follows. If we define the misperceived benefit differentials as \( \phi_i = (MB_2^i - MB_1^i) \) and let \( \phi_i \) vary among vot-

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9 Note that candidate bias, or candidate preference, and misperceived benefit bias are all interchangeable.
10 Again, we define the candidate bias as misperceived benefit difference between candidates.
11 Similarly, we can specify \( (MB_2^i - MB_1^i) > 0 \) as the expected candidate bias in favor of candidate 2.
12 In other words, if the variance of \( (MB_2^i - MB_1^i) \) goes toward zero, then the voter choices become deterministic.
13 For example, they have access to the same information concerning the candidate preferences distribution in the electorate through opinions polls.
14 Note that in the non-policy context, Hinich (1978) and Enelow and Hinich (1982) assigned a normal distribution to the non-policy difference between two candidates.
ers, then we can assign a continuous probability distribution function $F_i$ to the cumulative distribution of $\phi_i$. Voters’ randomly chosen benefit preferences are largely beyond the candidates’ immediate control and, in particular, it is not expected to be altered by the tax policy that a candidate adopts because of the separation relation between tax and benefit. Hence, the distribution $F(\phi_i)$ is independent of tax policies. Both candidates are assumed to know voters’ preferences on tax policies and the distribution $F(\phi_i)$, but they cannot identify the misperceived benefit differentials $\phi_i$ associated with a particular voter. As $\phi_i$ is a random variable to the candidates, voter $i$’s vote for candidate 1 can thus be predicted as a probabilistic choice.

Then, we can derive a continuous probability voting function. Since we assign a probability distribution $F_i$ to ‘misperceived benefit differential’, then the voter $i$’s probability to vote for candidate 1 is a continuous function of the utility differential obtained from tax policies:

$$P_i^1 = F_i\left[ V_i(T^1) - V_i(T^2) \right]$$

where $F_i$ is the probability distribution function assigned to misperceived benefit differential. $F_i(\cdot)$ is a smooth and continuous function. This smoothness implies that a small unilateral deviation by one party does not lead to jumps in its expected votes, and thus gives rise to well-defined equilibria. $F_i(\cdot)$ is a continuous and well-behaved cumulative distribution function (c.d.f.) which is associated with a probability distribution.

Note that under Downsian electoral competition with two political candidates, the probability to vote for a candidate, $P_i^c$, $c = 1, 2$, jumps discontinuously from 0 and 1 as voter $i$ always votes with certainty for the candidate that promises the better policy. It is worthwhile to assume that a density function $f_i$ is unimodal and symmetric. In particular, unimodal density function has a unique maximum. In addition, if $MB_i^1$ and $MB_i^2$ are independent identically distribution (i.i.d.), then a density function $f_i$ is symmetric.

Similarly, candidate 2 has a symmetric problem. Assuming that there is no abstention, then the probability that voter $i$ votes for candidate 2 is defined as $P_i^2$:

$$P_i^2 = 1 - P_i^1 = 1 + F_i\left[ V_i(T^2) - V_i(T^1) \right]$$

where $F_i$ represents a probability distribution function of $(MB_i^1 - MB_i^2)$. Note that when $(MB_i^1 - MB_i^2) < 0$, this indicates that the independent bias or independent preference is now in favor of the party 2.

Finally, following Downs’ election model, the objective function of each candidates is assumed to maximize the expected vote ($EV^c$) which is defined as the sum of the probability of voters $i$ to vote for a candidate: $EV^c = \sum P_i^c$.

Hence, the candidate 1 is to maximize $\sum P_i^1$, whereas the candidate 2 is to maximize $\sum P_i^2$ or minimize $\sum P_i^1$. For instance, candidate 1 maximizes his expected vote as follows:

\[\text{For more characteristics of density function, refer to Lindbeck and Weibull (1987).}\]
Max \( EV^1 = \sum_{i=1}^{n} P_i^1 = \sum_{i=1}^{n} F_i^{1}[V_i(T^1) - V_i(T^2)] \) \( (8) \)

This objective function means that each of the two candidates selects its tax policy so as to maximize its expected vote. We assume that the function \( P_i^1(\cdot) \) is increasing and strictly concave in \( V_i(T^1) \), and decreasing and strictly convex in \( V_i(T^2) \). Then this model of electoral competition gives rise to a symmetric two-person zero-sum game. It is also known that this game has a unique equilibrium in pure strategies and moreover, the two candidates’ policies are convergent, in equilibrium, on the same policy.

3.1. Political Equilibrium Tax Structure

Based on a simple model described above, we now turn to characterize the political equilibrium tax structure. Each party wants to maximize expected votes \( (EV) \) subject to the budget constraint, which is defined as \( TR^c = b_i(T^c) \cdot T^c \), where \( TR^c \) is the tax revenues for the candidate \( c \) and \( b_i \) is tax base or taxable activities:

\[
\frac{\partial TR^c}{\partial T^c} = b_i + T^c \cdot \frac{\partial b_i}{\partial T^c} = b_i \left( 1 + \frac{T^c}{b_i} \cdot \frac{\partial b_i}{\partial T^c} \right) = b_i \left( 1 + \varepsilon_b^c \right)
\]  

(9)

where \( \varepsilon_b^c \) represent the tax elasticity with respect to tax base, defined as:

\[
\varepsilon_b^c = \langle (T^c/b_i) \cdot (\partial b_i/\partial T^c) \rangle.
\]

First, we consider the political equilibrium tax structure from maximizing expected votes. For example, candidate 1 maximizes his expected vote with respect to his tax policy subject to the budget constraint:

\[
\begin{align*}
\text{Max} & \quad \sum_{i=1}^{n} P_i^1 = \sum_{i=1}^{n} F_i^{1}[V_i(T^1) - V_i(T^2)] \\
\text{s.t.} & \quad TR^1 = \sum_{i=1}^{n} b_i(T^1) \cdot T^1
\end{align*}
\]  

(10)

Similarly, the objective function for the candidate 2 can be specified. Then, we can derive first-order conditions for candidates 1 and 2, respectively, as:

\[
\begin{align*}
\frac{\partial f_i(\Phi_i)}{\partial b_i} & = \lambda \cdot \frac{\partial TR^1}{\partial T^1} \\
\frac{\partial f_i(\Phi_i)}{\partial b_i} & = \mu \cdot \frac{\partial TR^2}{\partial T^2}
\end{align*}
\]  

(11)

where \( \lambda \) and \( \mu \) are Lagrange multipliers for candidates 1 and 2, respectively, in association with each budget constraint. And \( V_i(\cdot) \) represent the marginal political cost (MPC) of voters from taxation.

Rearranging these conditions gives then:

\[
\begin{align*}
\frac{\partial f_i(\Phi_i)}{\partial b_i} & = \lambda \\
\frac{\partial f_i(\Phi_i)}{\partial b_i} & = \mu
\end{align*}
\]  

(12)

where \( f_i(\Phi_i) > 0 \) represents the probability densities which are positive and evaluated at the tax-induced utility differential, \( \Phi_i \), where \( \Phi_i = V_i(T^1) - V_i(T^2) \). Thus, \( f_i(\Phi_i) \) indicates the voter \( i \)'s marginal probabilistic vote response to tax-derived utility: \( f_i(\Phi_i) = F_i(\Phi_i) = \partial F_i/\partial V_i \). If \( f_i(\Phi_i) > 0 \), then this implies that the voter \( i \)'s probabilistic vote will respond positively as voter \( i \)'s utility increases. From the first-order conditions, we de-
rive the political tax equilibrium as follows.

**Proposition 1:** The political equilibrium tax structure depends both on the political opposition from taxation, \( V'(T^1) < 0 \), and on probability density, \( f_i(\Phi_i) \), which are induced from the differentials in benefit misperceptions by voters. Then, the two first-order conditions show that for each candidate, the marginal loss in expected votes, or political opposition from the tax policy, per revenue increase should be equal for all voters \( i \) : thus,

\[
MPC_{c}^T = \frac{MPC_{1}^T = \cdots = MPC_{n}^T}{\text{where}}
\]

Now, we suppose that \( T^1 = T^2 \) is a necessary condition for equilibrium (i.e., a Nash equilibrium in the expected-vote maximizing game)\(^{16}\): that is, in a Nash equilibrium with simultaneous policy announcements, both candidates announce the same equilibrium tax policies: \( T^1 = T^2 \). Then, \( \Phi_i = V_i(T^1) - V_i(T^2) = 0 \), and thus, we have \( f_i(\Phi_i) = f_i(0) \). Now, substituting this into the first-order condition for candidate 1, then we obtain:

\[
\frac{V_i'(T^1)}{b_i \cdot (1 + \epsilon_i)} = \lambda, \quad \forall \ i = 1, 2, \cdots, n \quad (13)
\]

where \( f_i(0) \) denotes the probability density (p.d.f.) corresponding to the cumulative distribution function \( F_i(\cdot) \), evaluated at 0 (i.e., at the equilibrium). Now, let us consider the following two special cases of candidate preference variations across voters, which are induced by voters’ misperceived benefits:

(Case 1) no candidate bias case:

\[
f_i(0) = f_j(0), \text{ for voters } i \neq j
\]

(Case 2) candidate bias case:

\[
f_i(0) \neq f_j(0), \text{ for voters } i \neq j
\]

First, we consider the Case 1 in which no candidate bias exists. If all voters have been assigned the same candidate preference distribution, then \( f_i(0) = f_j(0) = f(0) \), for voters \( i \) and \( j \), \( i \neq j \). Then, this implies that

\[
\frac{V_i'(T^1)}{b_i \cdot (1 + \epsilon_i)} = \lambda, \quad \forall \ i = 1, 2, \cdots, n \quad (14)
\]

In this case, the political equilibrium tax structure depends only on the political opposition from taxation, \( V_i'(T^1) \). That is, the marginal loss in expected votes (or political opposition from taxation) from tax policy per revenue increase is equal among voters \( i \). In this case, each candidate has a ‘centripetal policy incentive’ as defined by Cox (1993). This corresponds, in general sense, to ‘policy converging incentive’ by candidates. It is the visible tax policy that matters to voters. Thus, both candidates select the same tax policy, in equilibrium, which affects all voters.

Furthermore, this electoral equilibrium involves another important feature. That is, the equilibrium of this electoral competition implements the maximum of a weighted social welfare function, where voter \( i \) is supposed to

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receive political weight $f_i$. Thus, the political equilibrium in this special case is identical with the utilitarian optimum achieved when maximizing the 'social welfare function' $\sum f_i \cdot V_i(T^c)$ subject to the budget constraint. This implies that voters with higher $f_i$ will weigh more heavily, because in a neighborhood of the equilibrium they are more likely to reward policy favors with their vote. That is, more responsive voters, who have a higher density $f_i$, will receive a better treatment under the electoral competition in a representative democracy. However, if all voters are equally responsive (i.e., if they all have the same value of $f_i$), then this form of electoral competition will implement the utilitarian optimum.

In summary, the lack of any candidate bias from benefit misperception reduces the model to the familiar case in which party policies converge on the policy that may be regarded as socially optimal. In this special case where no systematic variations in candidate preferences are observed, but tax preferences are different among voters, optimal tax policies of both candidates will be pursued until the marginal loss in expected votes from taxation is equal in all voters, implying that democratic electoral competition results in the same policy as in the utilitarian social welfare maximization.

Second, we consider the Case 2 in which candidate bias exists across voters. We assume that all voters have different candidate preference distributions: $f_i(\Phi) \neq f_j(\Phi)$, for voters $i$ and $j$, $i \neq j$, (but the same tax preference: $V_i = V_j = V$, for voters $i \neq j$). Then, the first-order condition for party 1 is changed into:

$$\frac{V_i(T^1)}{b_i \cdot (1 + c_b^1)} = \frac{\lambda}{f_i(\Phi_1)}$$

This implies that the political equilibrium tax structure depends only on the expected candidate bias distribution, $f_i(\Phi_1)$, which is assumed to stem from the differences in the misperceived benefits from public services, since political opposition from taxation across voters are assumed to be identical. Since we assumed that the numerator in the left-hand side is the same across voters, the political tax structure is a decreasing function of the expected candidate bias, $f_i(\Phi_1)$. This implies that the equilibrium tax policy is negatively related to the expected candidate bias. Thus, we summarize this outcome from the candidate bias as follows.

**Proposition 2:** If some voters have stronger candidate bias from different benefit misperceptions, then both candidates will favor such voters. By contrast, if there is weaker candidate bias by some voters, then candidates will disfavor such voters.

In equilibrium, both candidates will favor those voters whose expected candidate biases stemmed from misperceived benefits are stronger because such voters have smaller political opposition. Thus, the two candidates will not tend to favor marginal or swing voters who have weaker candidate bias and thus larger political opposition from taxation. Instead, the political candidates tend to favor voters with...
stronger candidate preferences.

In particular, this result implies that there will be ‘centrifugal policy incentive’ which is defined by Cox (1993). Each political candidate will choose both tax policy and benefit policy differently in order to attract the majority and minority voters. For example, each candidate has an incentive to provide visible tax to the majority, whereas providing less visible benefit to the minority, in order to maximize expected votes. In other words, this implies that candidates attempt to manipulate less visible benefit policy which will affect the minority voters. Thus, they have a relatively large freedom for tax increase relative to identical candidate preferences. Alternatively, by manipulating hidden benefits, they can increase political support from majority voters.

In summary, in a special case in which candidate preferences are different, but tax preferences are identical among voters, both candidates will, in equilibrium, favor voters with stronger candidate preferences. That is, different candidate preferences of voters stemming from misperceived benefits between candidates will provide an incentive for both candidates to favor voters with stronger candidate preference when choosing tax policy.

3.2. Informational Requirements and Sufficient Conditions: Concavity Condition and Stability of the Outcome

We attempt to specify the informational requirements of the probabilistic voting theory in comparison with those of deterministic voting theory.

In the deterministic voting theory, strong assumptions are required concerning the information that candidates possess about voters. The assumption that a voter votes with certainty for the candidate closest to him will require a set of candidates who can measure voter’s opinion without error. By contrast, the general probabilistic voting theory assumes that candidates see voter’s opinion as imperfectly measured and thus, include a random term in their vote calculations.

Then, the question is ‘how much must the candidates know about this random term?’ For instance, the candidate 1 must be able to calculate his expected votes,

\[ EV^1 = \sum F_i = F_i \left[ U_i(T_1^1) - U_i(T_2^1) \right] \]

given the distribution function \( F_i \) characterizing his beliefs about how this random term is distributed in the voters. This implies that given the distribution function \( F_i \), candidate 1’s informational requirement is close to assuming that the candidate must know only the tax-policy induced utility difference between himself and his opponent for each pair of policy platforms: \( U_i(T_1^1) - U_i(T_2^1) \). This requirement seems to be as reasonable as the assumption in the deterministic theory that the candidates know voter’s opinion without error.

The results that have derived from deterministic and probabilistic voting theories are quite different. Work on the deterministic voting theory stresses the instability of the electoral process, while work on probabilistic voting theory emphasizes the stability of the electoral process. In addition, the characteristics of electoral equilibrium are generally ‘attractive’, whether from the standpoint of a social welfare function or in terms of representing a golden mean\(^\text{18} \). Furthermore, Enelow and Hinich (1989) showed that the existence of equilibrium depends on the magnitude of the variance

\(^\text{18} \) In particular, Coughlin (1986) and Lindbeck and Weibull (1987) proved the former result, and Enelow and Hinich (1984) showed the latter outcome.
of the random element, the size of the feasible set of candidate policy locations, the salience of policies among voters, the dimensionality of the policy space, and the degree of concavity in voters’ utility functions.

The question we would like to address is ‘which factors are linked with stability of electoral equilibrium in our model?’. In the presence of misperceived benefits as a random element, tax policy stability will depend on the magnitude of the variance of the random element, the salience of tax policy among voters, and the degree of concavity in voters’ utility functions.

Supposing that policy space in our case is unidimensional (i.e., tax policy), then the following conditions will be important for the stability of equilibrium, so that political tax equilibrium will be stabilized if the following conditions can be met:

(i) the variance of the random element is large: as the variance of the random element increases, this makes it easier to satisfy the sufficient condition, and thus the policy equilibrium is likely to be more stable.

(ii) the policy salience increases: the more salient voters weight on tax policy, the more stable is the policy equilibrium19.

(iii) the voters are risk averse: the more concave the voter utility function is, the easier the sufficient condition is satisfied, and thus the more stable is the policy equilibrium. We summarize stability of the equilibrium as follows.

Implication 1: These stabilizing factors are important in that these can bring electoral stability to the policies of the candidates. In other words, the inability of voters to agree about differences in the random-policy attributes of the candidates may stabilize the election if the second-order condition is met.

Now, we turn to examine the stability of the equilibrium based on the concavity condition. We have assumed a finite population \( n \) of voters \( i \), each of whom sees a different policy difference between the two candidates. Again, the expected vote for candidate 1 was given by:

\[
EV_i^1(T^1, T^2) = F_i\left[U_i(T^1) - U_i(T^2)\right] \quad i=1,2,\ldots,n
\]

\[
= F_i \cdot \Phi_i, \text{ where } \Phi_i = \left[U_i(T^1) - U_i(T^2)\right]
\]

(16)

The first-order necessary condition for \( EV_i^1 \) to be maximized is given as:

\[
\frac{\partial EV_i^1}{\partial T^1} = \frac{\partial}{\partial T^1} \left[U_i(T^1) - U_i(T^2)\right] = 0
\]

\[
= f_i(T^1) \cdot U_i(T^1) \quad (17)
\]

Then, the second-order sufficient condition is derived from this as:

\[
\frac{\partial^2 EV_i^1}{\partial T^1 \cdot \partial T^1} = f_i(T^1) \cdot U_i(T^1) + f_i(T^1) \cdot U_i(T^1) \leq 0
\]

\[
\Rightarrow f_i(T^1) \cdot U_i(T^1) \leq -f_i(T^1) \cdot U_i(T^1)
\]

(18)

Thus, from this second-order condition, we have the following concavity index as:

\[
\frac{f_i(T^1)}{f_i(T^1)} \leq -\frac{U_i(T^1)}{U_i(T^1)} \quad (19)
\]

where the right-hand side represents the ‘concavity index’ of utility function and the left-hand side denotes the ‘degree of uncertainty’. Thus, this general condition requires that, for given probability density functions, the concavity index of utility function be exceeding the
degree of uncertainty.

Now, supposing that \( \Phi_i = 0 \) and thus \( U_i(T^1) - U_i(T^2) = 0 \) (i.e., no utility difference derived by the same tax policy between two candidates), then we have \( f_i'(\Phi_i) = 0 \). Then, the sufficient condition of the candidate 1 for electoral equilibrium is met if and only if:

\[
\frac{\partial^2 EV_i^1}{\partial T^1 \cdot \partial T^1} \Rightarrow 0 \leq -\frac{U_i''(T^1)}{U_i'(T^1)}
\]  

(20)

This condition shows that since the denominator is always positive, the sufficient condition depends on the concavity of the numerator. Hence, the sufficient condition is satisfied if and only if the utility function of voters is concave: \( U_i''(T^1) < 0 \).

For concave utility function, we, like Enelow and Hinich (1989), refer to this condition as the degree of concavity of the voters’ utility function. This condition is similar to the Pratt-Arrow measure of ‘absolute risk aversion (RA)’ (i.e., \( R_A(\theta) = -U''(\theta)/U'(\theta) \) for given policy issue \( \theta \)), but is different in that we have the square term in the denominator. Similarly, Lindbeck and Weibull (1987) derive \( [U_i''(\theta)/U_i'(\theta)]^2 \) which differs from ours slightly, and refer to it as the ‘concavity index’ of the utility function, where \( \theta \) is policy space.

4. Some Extensions
4.1. Benefit Misperception Degree

In this section, we begin with the question ‘where does the misperception come from?’. One possible answer is that it stems from the ‘benefit illusion’ of voters. The benefits are perceived by voters to be either underestimated or overestimated. Now we examine this by including a parameter representing the degree of benefit misperception.

In the previous section, we have assumed that voters have misperceptions on the benefits, \( MB_i^1 \) and \( MB_i^2 \). This assumption abstracts from the degree of benefit perception. Instead, we introduce ‘benefit perception’, \( BP_i^c \), by voters, and a parameter, \( \alpha_i \), representing its degree. We may consider \( \alpha_i \) as the degree of voters’ benefit illusion. Now, ‘benefit misperception’ is expressed as \( \alpha_i \cdot BP_i^c \). Thus, benefit perception will be either underestimated or overestimated by voters, depending on \( \alpha_i \).

That is, benefit misperception means either underestimated or overestimated benefit perception. Now, we can represent the differential of benefit misperception voters have as \( \alpha_i \cdot (BP_i^2 - BP_i^1) \). Then, we assign a probability distribution function \( H_i \) to voters’ benefit perception differentials, \( (BP_i^2 - BP_i^1) \). The density function of \( H_i \) is assumed to be positive everywhere: \( H_i = h_i > 0 \). Now, we examine the effect of either its underestimation or overestimation on the political opposition and tax policy making.

Voters’ perceptions towards the benefit levels of public services will depend on the value of a parameter representing the degree of misperceptions of voters. If \( \alpha_i = 1 \), then voters perceive benefits accurately. If \( \alpha_i < 1 \), then voters underestimate benefits. If \( \alpha_i > 1 \), then they overestimate benefits. For example, if voters underestimate their benefits, then each can-
date may increase its taxation because of lower political opposition.

After defining \( \alpha_i \cdot (BP_i^2 - BR_i^1) \) as \( \alpha_i \cdot H_i \), and substituting this into the maximization problem, then, the first-order condition for candidate 1 is modified as:

\[
\frac{\alpha_i \cdot h_i(0) \cdot V_i'(T^1)}{b_i \cdot (1 + \epsilon_h^i)} = \lambda
\]  

(21)

where \( h_i \) works as the party bias, evaluated at the equilibrium. The following result summarizes the effect of benefit misperception degree on the equilibrium tax structure.

Proposition 3: Assuming that \( h_i > 0 \) and identical party bias, \( h_i = h_j \), for voters \( i \) and \( j \), then the political tax structure depends on the degree of benefit misperception, \( \alpha_i \), in equilibrium, in addition to the political opposition from taxation. If voters underestimate the benefits, \( \alpha_i < 1 \), then political opposition from taxation will be, other things being equal, decreased and thus, this will provide an incentive for each candidate to increase taxes. On the contrary, if voters overestimate the benefits, \( \alpha_i > 1 \), then political opposition from taxation will be increased, other things being equal.

The British Social Attitude (BSA) survey (1996) showed that voters’ support for higher public spending is decreased markedly when tax consequences are considered. But the BSA survey result rules out the effect of voters’ perception on the tax consequences. Thus, we may predict from our result that when voters underestimate benefits, voters’ support for higher public spending will be increased even if tax consequences are taken into account. This result contradicts the BSA survey result. In other words, the BSA survey result is justified if and if only voters overestimate the benefits of public services. Thus, candidates tend to favor voters with underestimated benefits, and thus with smaller political opposition from imposing taxes.

4.2. Tax Policy Weight

Now, we suppose that the voter’s utility function resulting from voting for a candidate 1 can be described as:

\[
U_i(T^1, MB_i^1) = V_i(\beta_i \cdot T^1) + MB_i^1
\]  

(22)

where the parameter \( \beta_i (\beta_i > 0) \) represents the relative salience that voter \( i \) attaches to the tax policy, \( T^1 \). Incorporating this into the vote probability function and deriving the first-order condition is yielded as:

\[
\frac{\beta_i \cdot f_i(0) \cdot V_i'(T^1)}{b_i \cdot (1 + \epsilon_h^i)} = \lambda \quad \text{for } i = 1, 2, \ldots, n
\]  

(23)

where \( \beta_i \) designates the tax policy salience relative to the benefit policy.

Implication 2: For given identical party biases among voters, the equilibrium tax structure depends on the relative salience attached to tax policy, \( \beta_i \). The higher salient the tax policy is, the larger the political opposition from taxation is. Thus, we can predict that political parties or candidates will be increasingly responsive to the voters with higher salience to tax policy.

For instance, we assume that there are two voting groups, minority and majority groups, and that they have different policy importance between tax and benefit policies. Moreover, we suppose that the influence of the minority over the policy issue in the election is larger than
the majority: \( \beta_{\text{min}} > \beta_{\text{maj}} \) where \( \beta \) denotes
the relative importance of tax policy. In other
words, the importance of the tax policy issue
relative to misperceived benefit policy is
greater for the minority than it is for the ma-
jority. Then, this would appear to be an exam-
ple of an 'intense minority' and an 'apathetic
majority', since the minority may care more
about the policy issues. In this case, we can
predict that political parties will be increas-
ingly responsive to the minority view when the
minority becomes more intense about the tax
policy issue.

4.3. Tax Administration Cost Effect

In a basic model, we assumed that tax policy
is visible to voters. This assumption means
that voters can perceive tax policies of both
candidates without incurring any perception
costs. But this abstracts the possibility that
both candidates incur administration costs to
implement their tax policy or to advertise their
tax policy in order to increase the visibility and
transparency. Note that voters will not incur
any perception costs because tax policy is per-
ceived correctly by voters because of its visibil-
ity\(^\text{21}\). Furthermore, we assume that candidates
have different administration costs between
taxes and benefits. Each candidate spends re-
sources in implementing tax policy, but does
not spend in informing less visible and misper-
ceived benefits: we refer to this as tax admini-
stration costs. Thus, we focus on the tax ad-
ministration costs, rather than the benefit ad-
ministration costs, to examine whether candi-
dates engage in proposing excessively costly
tax policy.

Now, we extend the basic model to include
administration costs necessary to implement
and advertise tax policies. Here we define ad-
ministration costs as the costs incurred by
candidates to implement tax policy, instead of
benefits. We assume that administration costs
for each candidate, \( A_c \) for \( c = 1, 2 \), depend only
on its own tax policy, \( T^c \), and are assumed to
be twice continuously differentiable. In par-
ticular, we assume that both the costs and the
marginal costs increase as the tax increases or
as tax policy is more complicated\(^\text{22}\):

\[
A_c = A_c(T^c), \ c = 1, 2 \\
\frac{\partial A_c}{\partial T^c} > 0, \quad \frac{\partial^2 A_c}{\partial T^c \cdot \partial T^c} > 0
\]

So, the budget constraint is now given as:

\[
TR^c = b_c(T^c) \cdot T^c - A_c(T^c)
\]

Then, with administration costs incorporated,
we can reformulate the first-order condition for
candidate 1 as:

\[
\frac{f_i(0) \cdot V_i(T^1)}{b_i \cdot (1 + e^1_i) - A'_i(T^1)} = \lambda
\]

where \( A'_i \) represents the marginal tax ad-
ministration cost of candidate 1 incurring to
implement tax policy, and was assumed to be
positive in equilibrium: \( A'_i(T^1) = \frac{\partial A_i}{\partial T^1} > 0 \).

This modified condition shows that political
equilibrium tax structure still depends on the
political opposition and probability density for
benefit misperception. It means that the mar-
ginal disutility, or political opposition, from
taxation should be equal among voters \( i \) per
revenue increase net of tax administration
costs. Moreover, this implies that electoral

\(^\text{21}\) However, voters will incur perception costs on the bene-
fits because they are less visible and thus misperceived by
voters.

\(^\text{22}\) The assumption of positive marginal costs is of signifi-
cance in the sense that it prevents each party from gaining
the votes by costless decreasing the tax policy to the voters.
competition for votes will not induce each candidate to engage in costly tax policy. That is, if tax policy is excessively costly, then voters will perceive such policy to be more complex, and thus each candidate would face larger political opposition.

From this equation, we can deduce a positive relation between tax administration costs and voters' political opposition from taxation. In other words, an increase in tax administration costs leads to an increase in political opposition of voters from taxation, thus resulting in an incentive for both candidates to decrease tax administration costs. This implies that voters will favor candidates with lower marginal tax administrative costs which lead to lower political opposition towards taxation. We summarize tax administration cost effect as follows.

Proposition 4: Assuming that $\partial A_1 / \partial T_1 > 0$ and for given identical party bias $f_1(0)$, both candidates may have an incentive to decrease tax administration costs in equilibrium, since lower administration costs lead to reducing political opposition of voters from taxation. Thus, voters tend to favor a candidate with lower tax administration costs.

For example, informed voters who perceive easily tax policy will consider such a candidate (with lower administration cost) as one with relatively simple tax policy or with more transparent tax policy.

Note that dealing with redistribution, or transfer, policies between two parties in a representative voting framework, Lindbeck and Weibull (1987) extend their basic model to include administration costs associated with the implementation of redistribution policy, and examine whether the competition for votes would induce both parties to offer 'excessively costly redistributions' to voters. Then, they prove that the political equilibrium for redistribution policy is still 'Pareto efficient' in the case of identical party preference among voters, and thus conclude that electoral competition for votes will not induce both parties to promote excessively costly redistribution programs. They also suggest that voters or groups with high marginal administrative costs for redistribution policy receive fewer transfers. This implies that political parties favor voters with low administrative marginal costs. Their result is similar as the outcome in our model although both models use different policy variables.

5. Concluding Remarks

In a general probabilistic voting model, the two important assumptions are to make that candidates are uncertain about voters' choice in voting behavior, and voters are also uncertain about the benefit levels proposed by candidates. Voters' uncertainty stems from the voters' misperception about benefits of public services. For the candidates' uncertainty, candidates see voter's perception on the benefit policies as imperfectly measured or observed and thus, they include a random term in their expected vote calculations so as to represent this immeasurable or unobservable variable.

Theoretically, there can be a direct link between tax and benefit. That is, individual voters can consider both the benefits to them from a particular spending program and the taxes that they are likely to pay in higher taxes for that benefit. But we assume that there are
separate and asymmetric relations between them. First, taxes are separately related to benefits. Second, voters have misperceptions on the benefits from public services, while having correct perceptions on tax policy. We have made two distinctive assumptions: in addition to visible tax policy, the benefit policy is also an important determinant of voting behavior but separately related to taxes, and voters’ attitudes to benefit policy or public expenditure are imperfectly perceived by the candidates or parties, and thus, it is treated as random variable.

We have examined the effect of benefit misperception on the tax policy making and its political opposition in a general probabilistic voting model. We focused on the candidates’ selection of taxation policy. However, differences between candidates concerning voters’ misperceptions on benefits of public services are also important for the tax policy outcome of party competition. The relation between benefit policy and taxation has been divided into complete linkage and complete separation. But, we adopt an incomplete or probabilistic linkage in order to examine how voters’ different misperceptions towards benefits of public spending affect tax policy.

We summarize our main results. First, the political equilibrium tax structure depends both on the political opposition towards taxation, and on probability densities which are induced from the differentials in benefit misperceptions by voters. Then, this implies that for each candidate, the marginal loss in expected votes, or political opposition, towards the tax policy per revenue increase should be equal for all voters. Second, assuming different candidate bias and that some voters have stronger candidate bias from different benefit misperception, then candidates will favor such voters because of their smaller political opposition. On the other hand, weaker candidate preference from the misperceived benefit leads to an increase in political opposition from taxation. This implies that the political candidates will not tend to favor marginal or swing voters who have weaker candidate bias and thus larger political opposition from taxation. Third, the political opposition from taxation in equilibrium depends on the degree of benefit misperception. For instance, if voters underestimate the benefit perception, then the political opposition from taxation will be, other things being equal, decreased. Finally, assuming that marginal administration costs are positive, political candidates may have an incentive to decrease tax administration costs in equilibrium, since higher administration costs lead to larger political opposition from taxation.

References


Enelow, James M. and Melvin J. Hinich, “A New Ap-


