ALTERNATIVE APPROACH TO INTERPRET AND ESTIMATE POLITICAL PARAMETERS IN POLICY DECISION MAKING

Sigit B. Sudjalmo
Universitas Bengkulu

Abstract

Artikel ini menyajikan pendekatan alternatif untuk interpretasi dan estimasi parameter-parameter politik dalam membuat kebijaksanaan pemerintah. Peranan faktor politik dalam pembuatan kebijaksanaan ini diilustrasikan dalam Fungsi Preferensi Politik (PPF), yang menyatakan bahwa hasil kebijakan merupakan hasil perpaduan antara pasar politik dan pasar ekonomi. Selanjutnya, dalam pembuatan kebijaksanaan tersebut ada proses tawar-menawar antara pemerintah dan kelompok-kelompok masyarakat, atau antara kelompok-kelompok masyarakat itu sendiri yang berujung pada kondisi kesepakatan bersama atau posisi ekuilibrium. Proses tawar-menawar ini dapat dievaluasi dengan menerapkan teori permainan kooperatif. Beberapa model permainan yang diuraikan dalam tulisan ini memberikan interpretasi bobot politik yang berbeda dalam proses pembuatan kebijaksanaan.

Kata kunci: *political factor, game theory, bargaining, policy*

INTRODUCTION

Research on government regulation has long tradition to treat policy or political factor to be exogenous variable. Recently, focus has also been given to assume that policy maker has self interest in the policy decision making. One of the popular framework is Political Preference Function (PPF) which recognise policy outcome as the result of both economic markets and political markets. Here, efforts have been given to estimate political parameters.

Political weights are endogenous and depend on the relative effectiveness of lobbying expenditure by each group. Thus the optimal resource devoted to lobbying by each group might also be affected by other group lobbying activity. This implies that each group would make conjecture about the resource of others. This strategic component could be evaluated using cooperative game theory. This paper provides alternative interpretation of political parameters using game theory.

FRAMEWORK

Assuming that the bargaining process between pressure groups and the government leads to binding agreement, it is reasonable to apply cooperative game solution. The existence of a political economic game lead to an enforceable agreement or equilibrium. The game is employed to derive solution reflecting the social power and influence of various groups.

The model features consists of the policy maker and interest groups, all with their own objective function. While the policy maker decides and enforces policy, the participants seek to influence the policy maker decision so as to maximise their interest. Thus, the objective functions between the policy maker and the interest groups are different. In the model, the actions of each group are aimed at the policy makers. Embodied in the bargaining or lobbying is strength or power function of interest groups which determine the policy outcome. This feature of the model is first introduced by Zusman (1976) in his study of incorporation of social power in economic analysis.

Following Zusman (1976), the policy maker objective function is:

$$\begin{aligned} U_0 &= U_0(x) \\ &= u_0(x_0) + \sum_{i=1}^{n} s_i(c_i, \delta_i) \end{aligned} \tag{1}$$

and interest group objective function is:

$$\begin{aligned} U_i &= U_i(x) \\ &= u_i(x_0) - c_i \end{aligned} \tag{2}$$

where $u_i(x_0)$ is performance measures of interest groups, the function s_i is the power function of the i-th group over the policy maker, c_i is cost of lobbying to the interest group; and δ_i is an indicator of whether a 'reward' or 'penalty' strategic is pursued by interest group in its attempt to influence the policy maker. This means,

$$s_i(c_i,\delta_i)=\begin{cases}\alpha_i(c_i) \text{ when a reward strategy is selected } (\delta_i=\alpha)\\ -\beta(c_i) \text{ when a penalty strategy is selected } (\delta_i=\beta)\end{cases}$$

The case of $\delta_i(.)=0$ means political abstinence is implied.

The political power function $s_i(.)$ and strategy variable $\delta_i(.)$ are specified in accordance with the political dynamics as perceived by the policy maker. The political power function measures the policy maker perception of an interest group's political impact, while the strategy variable measures interest group intent; both are unobservable.

Nash (1953) shows that cooperative game is preceded by a non-cooperative game, in where the disagreement payoff is determined by the players' threat strategies. Given the disagreement payoff, the solution to the cooperative game is the joint strategy which maximise the Nash product (Harsanyi 1963, Zusman 1976). Then, the political-economic equilibrium is defined as the joint solution to the cooperative game and the structural economic equations.

Modelling bargaining as Nash product

$$N=\prod_{i=0}^{n}(U_i-d_i) \qquad (3)$$

The binding agreement is the product of the differences between the cooperative value of each group's objective measure u_i (i = 0,...,n) and its corresponding disagreement value, d_i.

For the case of two players, the policy maker and an interest group, (1) and (2) are substituted into (3) to get

$$N=[U_0(x)-d_0][U_1(x)-d_1] \qquad (4)$$

$$N=[u_0(x_0)+s_1(c_1,\delta_1)-d_0][u_1(x_0)-c_1-d_1] \qquad (5)$$

Players in the cooperative game maximise the product of performance measure gains over disagreement payoff level. Choices of strategy are simultaneously determined. Mathematically, equation

(5) is maximised with respect to x_0 and c_1, the policy instrument and the lobbying cost to interest groups. These are strategies available to each group in the bargaining process.

Maximising (5) w.r.t. x_0 and c_i

$$\underset{x_0, c_i}{Max}\, Ln.N = \text{Ln.}\left[u_0(x_0) + s_1(c_1, \delta_1 - d_0\right] + Ln.\left[u_1(x_0) - c_1 - d_1\right] \qquad (6)$$

The Nash solution satisfies the FOC for each group maximising problem:

$$\frac{\partial \ln. N}{\partial x_0} = \frac{1}{(U_0 - d_0)} \frac{\partial u_0}{\partial x_0} + \frac{1}{(U_1 - d_1)} \frac{\partial u_1}{\partial x_0} = 0 \qquad (7)$$

$$\frac{\partial \ln N}{\partial c_1} = \frac{1}{(U_0 - d_0)} \frac{\partial s_1}{\partial c_1} + \frac{1}{(U_1 - d_1)}(-1) = 0 \qquad (8)$$

Multiply (7) and (8) by $(U_0 - d_0)$ to get

$$\frac{\partial u_0}{\partial x_0} + \frac{(U_0 - d_0)}{(U_1 - d_1)} \frac{\partial u_1}{\partial x_0} = 0 \qquad (9)$$

$$\frac{\partial s_1}{\partial c_1} - \frac{(U_0 - d_0)}{(U_1 - d_1)} = 0 \qquad (10)$$

Interpreting $\frac{(U_0 - d_0)}{(U_1 - d_1)} = \frac{\partial s_1}{\partial c_1}$ as the bargaining weights, it is clear that the results similar to ones from maximising the sum of weighted welfare of interest groups.

$$J = u_0(x_0) + H_1.u_1(x_0) \qquad (11)$$

or in more general:

$$J = \sum_{i=0}^{I} H_i u_i(x_0) \tag{12}$$

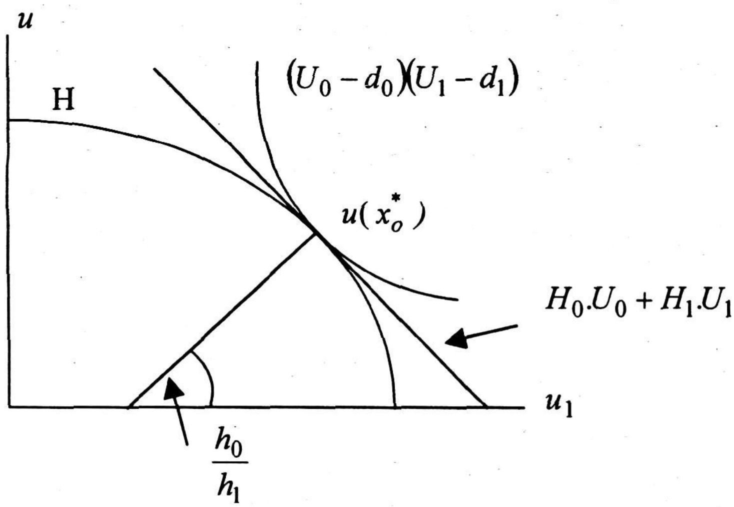
where the economic constraints (group objective functions) have been substituted into the criterion function. The weight $H_0 = 1$ (for government/policy maker) and other weights (for i= 1 to I) are :

$$H_i = \frac{(U_0 - d_0)}{(U_1 - d_1)} = \frac{\partial s_i}{\partial c_i} \tag{13}$$

from equation (10).

Solution (9) and (10) imply that the joint strategy is to choose x_0^* and c_1^* so as to maximise their (players) own objective function.

Figure 1. Nash Solution



Following Harsanyi (1963), Zusman (1976) provides the different path to the solution of Nash product. However, the end result gives a general criterion function same as (11). To compare the results, Zusman solution is described here.

Due to Harsanyi, Zusman express that the equilibrium threat strategies (x_0^*, c_0^*) are such that:

$$d_0\left(x_0^*, c_1^*\right) - H_1 d_1\left(x_0^*, c_1^*\right) = \max_{x_0 \in X_0} \min_{c_1 \geq 0} [u_0(x_0) + s_1(c_1, \delta_1) -$$

$$H_1(u_1(x_0) - c_1)] \tag{14}$$

where H_1 is constant so that

$$H_1 \geq 0 \tag{15}$$

$$U_0(x^*) + H_1(x^*) = \max \left[U_0(x) + H_1.U_1(x)\right] \tag{16}$$

Here the maximisation of $\left[U_0(x) + H_1.U_1(x)\right]$ consists of:

(i) c_1^* is selected so as to maximise $s_1(c_1^*) - H_1 c_1^*$

(ii) x_0^* is selected so as to maximise $u_0(x_0^*) + H_1.u_1(x_0^*)$

At the cooperative solution $\frac{\partial s}{\partial c_1} = H_1$

It means the solution of the conflict is similar to the maximisation of:

$$J = J = u_0(x_0) + \frac{\partial s}{\partial c_1} . u_1(x_0) \tag{17}$$

which is equation (11) in the previous solution.

Separation between performance measures and political variables in policy maker and interest group objectives, on the form (1) and (2), allows weights H_i to be distinct from performance measures u_i . The weight of the form (10) reflects the social power and objective of various interest groups in addition to the policy maker own preference. Zusman (1976) views H_1 as the slope of the political efficiency frontier at the solution point.

The model proposes an alternative understanding that PPF weights can be viewed as resulting from Nash bargaining game. Theoretically, they are endogenous in the model. Model (11) shows that the equilibrium of a political-economic system is associated with the maximisation of the sum of the policy maker objective function and the interest group objective function, weighted by the marginal strength of its power, $\frac{\partial s_i}{\partial c_i}$, over the policy maker in equilibrium. The theory, thus predicts a maximising behaviour of players in the political economic system. Alternatively, it may be interpreted as the policy maker utility gain from cooperation (compared to disagreement) relative to the interest group's corresponding utility gain.

The game model is a similar construct as PPF formulated by Gardner (1987). However, the interpretation could be different. The PPF model on the form of 'self-willed' government as formulated by Gardner recognises government as absolute autonomy forcing the policy and assigning the weights to affected groups exogenously. In the Nash, however, political weights are result of bargaining between interest groups, a function of relative gains from disagreement points. In the model, they are expressed in parameters reflecting the lobbying effectiveness of groups.

Following Harsanyi (1963) model (11) or (17) may be expanded for n-interest groups to be

$$J = u_0(x_0) + \sum_{i=1}^{n} \frac{\partial s_i}{\partial c_i} . u_i(x_0) \tag{18}$$

with the similar interpretation as (11).

In real world, the bargaining problem may not always between the government and interest groups. In this case, Beghin (1990), Beghin and Foster (1992) specify the game as bargaining between interest groups of which the actions are aimed to each other. The model is

$$\prod_{i=1}^{n} (U_i - d_i) \tag{19}$$

without specifying $i = 0$ for the policy maker as a specific different objective function.
Maximising (19) is similar to maximising the weighted sum of utility of interest groups:

$$J = \sum_{i=1}^{n} H_i U_i \tag{20}$$

where:

H_i = the bargaining weight
U_i = net payoff received by the group

FOC from maximising (19) or (20) is

$$\sum_{i=1}^{n} H_i . \frac{\partial U_i}{\partial s} = 0 \qquad (21)$$

While the model (20) is the sum of weighted welfare of interest groups, the interpretation of this model follow the game model (19) from which the criterion function has been derived.

EMPIRICAL MODEL

The structural model of a political economic system consists of the following components: (i) the economic structural equations; (ii) the set of feasible policy instruments; (iii) the policy maker's and interest groups objective functions; and (iv) the interest groups political power functions $s_i(c_i, \delta_i)$. Empirically, the PPF model is estimated in several steps. The constraint structure is typically estimated first, with interest group and policy maker performance measures derived from the economic structure.

It is important to note the cost of lobbying, c_i, and the political power, $s_i(c_i, \delta_i)$, is unobservable. Theoretically, we only know that they are on the equilibrium position, such that the political parameters may be indirectly observed from equilibrium solution. The absence of these political data make hypotheses tests cannot be constructed to directly test for game specification. The alternative method to identify the political power might be done by parameterisation of these unknown variables as suggested by Zusman (1976) and Beghin (1990).

ESTIMATION OF THE POWER PARAMETERS

The game solution will give x_0^* as an optimal strategy. Given that $u(x_0^*)$ is the theoretical Nash solution which lies on the frontier, the value might not be same as observed value.

Let $x_0^{'}$ be the observed level of policy instrument. The solution is estimated by finding values of the policy instrument (x_0^*) such that $u(x_0^*)$ is on the equilibrium and close to $u(x_0^{'})$. The estimation is to find (x_0^*, h^*) such that

$$\sum_{i=0}^{n} h_i^*\left(u_i(x_0^*) - u_i(x_0^*)\right) = \max \sum_{i=1}^{n} h_i\left(u_i(x_0) - u_i(x_0^{'})\right) \qquad (22)$$

The fact that $\frac{h_i^*}{h_0^*}$ is equal to unknown power coefficient H_i, the maximisation w.r.t. x_0 yields the same solution value, since $u(x_0^*)$ is on the efficiency frontier and h_i^* is the coefficient of the tangent at $u(x_0^*)$. There, h_i^* minimise $\left(u_i(x_0^*) - u_i(x_0^*)\right)$ subject to $u(x_0^*)$ being on the efficiency frontier. Here $u(x_0^*)$ is an estimate of the theoretical solution of the game, and $\frac{h_i^*}{h_0^*}$ is an estimate of the coefficient power $\left(\frac{\partial s_i}{\partial c_i}\right)$. This is a saddle-point problem. The non-linear programming might be employed to obtain the solution of this game.

ON THE ISSUE OF POWER FUNCTION

The game has brought to the optimum solution, and at the same time provided the power parameters. The specification of the power function, as indicated by Zusman (1976) and Becker (1983) models might become less important. However, some studies have tried to identify the possibilities to specify them which the aim to estimate the whole system. Zusman (1976) specify the political power function on the basis of his general model of power function, $s_i(c_i, \delta_i)$ which consists of $\alpha(c_i)$ and $\beta(c_i)$. He notes that the properties of function are (a) the functions are non negative and monotone increasing; (b) the arguments c_i are non-negative; (c) $\alpha_i(0) = \beta_i(0) = 0$; and (d) the functions are strictly concave. The candidates of the function are, therefore:

$$\alpha_i(c_i) = A_i.c_i^{a_i} \quad ; \text{for } A_i > 0; \; 0 < a_i < 1 \tag{23}$$

$$\beta_i(c_i) = B_i.c_i^{b_i} \quad ; \text{for } B_i > 0; \; 0 < b_i < 1 \tag{24}$$

where a_i and b_i express lobbying effectiveness of group i. These power function is also indicated in Becker (1983) game model where the wealth transferred is determined by influence function of interest groups.

The task here is to estimate the unknown parameters A_i, a_i, B_i, b_i. While Zusman suggest the same method as estimating the game solution, the estimation itself is not readily clear due to the fact that lobbying cost c_i is not observable. Beghin (1990) propose another way to specify the power function.

Beghin (1990) believes that the power function is influenced by economic variables. Specify his game model, from (19), as:

$$\prod_{i=1}^{n} \left(U_i(s(z),z)_i - g(P,d)_i\right) \tag{25}$$

where $s(z)$ is the vector of strategies available to the players as has been previously explained. Here Beghin specify z as the vector of exogenous variable displacing the game.

The FOC of (25) requires

$$\sum H_i(z_i).\frac{\partial U_i(s(z),z)}{\partial s(z)_i} = 0 \tag{26}$$

The work of Beghin is to estimate equation (26) to get the coefficients of Bargaining power. However, the estimation is done through several steps.

Theoretically, the political power function must exist in the system. Lack of theoretical basis, however, the specification is mainly trial and errors. The only guidance from the model is that the bargaining power is influenced by some exogenous variables other than policy instrument. For example, Beghin specify the ratio of bargaining coefficients as linear functions of exogenous variables for the case of Agricultural policy in Senegal.

$$\frac{h_2(z)}{h_3(z)} = h_{23} + h_{231}.WP_g \quad (27)$$

$$\frac{h_3(z)}{h_1(z)} = h_{31} + h_{311}.WP_r + h_{312}.ER + h_{313}Pop. \quad (28)$$

where

$h_i(z)$	:	bargaining coefficient for group i
Wp_g	:	world price of groundnut
Wp_r	:	world price of rice
ER	:	exchange rate
Pop	:	population

The weights are normalised sum to one to solve to the unknown weights, then substituting (27) and (28) into (26) to get the system of equations to be estimated. While the purpose of specifying the power function is to recover the value of the bargaining power, the way Beghin specifies the power function is difficult to be interpreted.

ON THE MEANING OF EFFICIENCY

The solution of the game allows the policy outcome which might have different value from the observed level. It means the game model of PPF relaxes the assumption of efficiency hypothesis in the PPF of self willed government. Put in another way, each model has different interpretation of the efficient policy. While the PPF efficiency in the self-willed model is the observed policy level, the efficiency in the PPF game model is the result of bargaining which might not be the same level as the observed policy in real world. Assuming that the real world rarely behave in a perfect manner, it indicates that policy efficiency test could constructed against the theoretical solution.

However, given the model reflects the real world, the solution would be close to the observed value. It means, the closeness of actual behaviour to the economic efficiency frontier may serve as one criterion for selecting objective function (Zusman 1976). This means the validity test to assess predictive ability of the PPF model can be done by comparing predicted policy outcomes with observed policy instruments.

REMARKS

The PPF game model has interpreted the political weights as the result of bargaining process. The weights are embodied in the power functions or influence functions. Due to the unobservable political variables, the game model solves the power parameters. The solution of the game gives the optimum value of enforceable policy and the power of interest groups devoted to be in that level, all at the same time as the result of bargaining process. Thus, interpretation of the political weights would be different from the weights in the self-willed PPF which interpret them as exogenously assigned by the policy maker.

Untested efficient hypothesis in the self-willed PPF is challenged by the game PPF, since this model provides theoretical policy solution which may different from the observed value. Thus the hypothesis of efficient policy may be constructed and tested.

However, the issue of influence functions still remains to be resolved numerically. Although, the game model gives the power parameter values, but the specification of influence functions, if any, must be done separately. Thus, theoretically the simultaneous of the whole components in the political-economic system still an important issue to date.

REFERENCES

Becker, G.S. 1983. A Theory of Competition Among Pressure Groups for Political Influence. *The Quarterly Journal of Economics* 98: 373-399.

Beghin, J.C. and W.E. Foster. 1992. Political Criterion Functions and the Analysis of Wealth Transfer. *American Journal of Agricultural Economics* 74(3): 787-794.

Beghin, John C. 1990. A Game-Theoretic Model of Endogenous Public Policies. *American Journal of Agricultural Economics* 72: 138-148

Gardner. B. 1987. *The Economics of Agricultural Policies*. New York: Macmillan.

Harsanyi, John. 1963. A Simplified Bargaining Model for the N-person Cooperative Game. *International Economic Review* 4: 193-220.

Nash, John. 1953. Two-person Cooperative Games. *Econometrica* 7: 55-72.

Zusman, Pinhas. 1976. The Incorporation and Measurement of Social Power in Economic Models. *International Economic Review* 17: 447-462.