THE DISTRIBUTION OF SUBSIDIES IN UKRAINE. EFFECT OF PRESIDENTIAL ELECTIONS.

by

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A thesis submitted in partial fulfillment of
the requirements for the degree of

MA in Economics

National University "Kyiv-Mohyla Academy"

2000

Approved by _____
Chairperson of Supervisory Committee

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Program Authorized
to Offer Degree _____

Date _____

National University "Kyiv-Mohyla

Academy"

Abstract

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Chairperson of the Supervisory Committee: Professor Anatoliy Voychak
Director of the Christian University

In my work I examine the influence of the Ukrainian Presidential elections on the distribution of subsidies for regions. The null hypothesis is that net transfers in the regions are not affected by the results of the election. Using a political-economic regression model, I apply the Banzhaf voting power index of the regions, using the fact that the power index measures the reward that each must obtain for his marginal contribution. Most results do not support the null hypothesis and reveal the political bias of distribution of subsidies by regions.

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ACKNOWLEDGMENTS

The author wishes to thank Prof. Eyal Winter, Prof. Roy Gardner, Prof. Gene Ellis, Prof. Charles Steele, Prof. James Feehan, Prof. Mykhaylo Zarichnyi, and three of her friends that wish to remain anonymous for helpful comments.

Chapter 1

INTRODUCTION.

The interdependence between politics and economics is an important and interesting question that political economy deals with. In my work I consider the influence of the Ukrainian Presidential elections (hereinafter PE) on the distribution of subsidies (government spending) for regions and vice versa. Using a political-economic regression model I test the hypothesis that the division of subsidies is not affected by the results of election. Under the definition that the distribution of subsidies is done "fair" if it is done only on the base of some economical criteria and is not affected by any political events, the greater is the influence of PE on the distribution the more unfair this distribution is done.

In political-economic models that examine the influence of economical factors on politics or of political ones on economy (Arcelus and Meltzer 1975; Chowdhury 1993; Fair 1978; Frey and Schneider 1978; Holbrook 1991; Stigler 1973; Wright 1974) the opinions about what political and economical variables should be included, differ from model to model. This could be explained by the fact that there is no strong theoretical background for such regression analysis and most of them are built on so-called intuition and common sense. Among the political measures, the most widely used are electoral votes, time before election, election dummy variables, popularity level of President, government popularity, partisanship, political ideology, and voting participation. Among economic variables we can mention the rate of growth, inflation, government transfer payments, the unemployment rate, and the change in per capita real income.

Analyzing the interdependence between political and economic systems, Arcelus and Meltzer (1975) and Stigler (1973) obtained negative result (they did not find any such interdependence), while the results obtained by Chowdhury (1993), Fair (1978), Frey and Schneider (1978), Holbrook (1991) and Wright (1974) are positive.

Wright (1974, p. 30, 33) focuses on the allocation of US government expenditures among the states and argues that interstate inequalities in per capita federal spending can be explained in large part as the results of a process of maximizing expected electoral votes. The result is that his "political" model explains between 58.7% and 79.6% of the variance in per capita spending in USA over the 1933-1940 period.

The reaction function examined by Frey and Schneider (1978a, p. 178-182) shows how government (the president) influences the state of the economy in order to stay in power. The relationship is econometrically tested with quarterly data for the United States for the period 1953-1975 and is described in the following way:

$$\begin{aligned} TR(t) = {} & c_0 TR(t-4) + c + c_1 (government receipts)_{t-4} \\ & + c_2 (squared\ popularity\ deficit) + c_3 (time\ before\ elections) \\ & + c_4 (each\ president's\ ideology) + u_t , \end{aligned}$$

where $TR(t)$ = government transfers to private households.

In my work I modify and simplify models of Frey and Schneider (1978a) and Wright (1973) eliminating measures, difficult in the sense of obtaining data or evaluating, or specific only for USA[1].

[1] There were also models of other countries under my consideration, but there were reasons not to use them. The model of India by Chowdhury (1993) and UK's one of Frey and Schneider (1978b) were too complicated for utilization, and Remmer (1993) model for eight countries of Latin America and the model of Cargill and Hutchison (1991) for Japan do not deal with transfers.

Thus my political-economic model is formulated as following:

$TR(i,t) = k_0 + k_1 GR(i,t-1) + k_2 POL(i)$, where

$TR(i,t)$ = net government transfers in region i;

$GR(i,t-1)$ = government receipts (tax revenue) from region i;

$POL(i)$ = political variable; votes for candidate A (the candidate who won the election) submitted in region i.

The null hypothesis is that the results of election do not affect the division of subsidies by regions (k_2 is insignificant). The prediction about k_1 is that $k_1 < 0$, supporting the fact, that the greater is the volume of taxes collected in region, the greater amount of funds goes to region's budget, the less is the region's necessity for subsidies.

This model makes sense for the person who is a President now and plans to be a candidate in the next Presidential election (or for the President that would like to obtain a concrete result of any referendum that is held during his executive term). This is definitely the case of Ukraine, when the same candidate won 1994 and 1999 Presidential elections. Thus before the next elections he had an incentive to manipulate with transfers in order to win the next election.

I deal with the 1995–1998 data (four years between two Presidential election) and analyze four panel and one pooled regressions using OLS.

Chapter 2

MARKETS, ACTORS, INSTITUTION

Using a regression model, I substitute the voting results (by regions) by the Banzhaf voting power index of regions. Doing that, I use the fact that the power index measures the reward that each must obtain for his marginal contribution (Ordeshook 1999, p. 465) and regard subsidy, if the division of subsidies are done unfair, as a "reward" for "right votes".

I examine the model of voting power that combines ideas from game theory with the empirical results of voting. Thus it is very important to describe the mechanism of Presidential elections and the laws that are the legal base for these elections in order to insure that the model will be correctly stated and that the introduction of the Banzhaf index that follows will be more understandable.

According to the Constitution of Ukraine (Ch. V, art. 102-103) and the Law of Ukraine "On elections of the President of Ukraine" (http://www.rada.kiev.ua):

1. The President of Ukraine is elected by citizens of Ukraine based upon universal, equal (each voter has one vote) and direct suffrage by secret voting for a five-year term (thus the direct voting system in Ukraine differs from the Electoral College in the USA[2] and Banzhaf index will be modified);

[2] The Electoral College (EC) was established as a compromise between election of the president by Congress and election by popular vote. The electors are a popularly elected body chosen by the States and the District of Columbia. The EC consists of 538 electors (one for each of 435 members of the House of Representatives and 100 Senators; and 3 for the District of Columbia). Each State's allotment of electors is equal to the number of House members to which it is entitled plus two Senators. States went three main routes in choosing electors: the legislative system, where state legislatures choose the electors; a district system, where electors are selected by the people of each congressional district; and the general ticket, or a winner-take-all system, where a popular vote was held in the entire state, and the winner took all electoral votes. Constitution says that it is each state's own decision of how to choose electors, and there are only

2. The same person may not serve as President for more than two consecutive terms (there is an incentive for politically biased distribution of subsidies after first term);
3. Participation of Ukrainian citizens in elections of the President of Ukraine is voluntary (thus the number of people that has voted can differ from the number of registered voters and this fact influences the model of voting power);
4. A candidate is considered legitimately elected president if he receives more than 50% of the votes of the electorate which participated in the elections.

In Ukraine there have been yet three Presidential elections (in 1991, 1994 and 1999), but as the data on elections has become available only for 1994 and 1999 years, I examine only these two elections. I want to emphasize that I am investigating the case where two candidates go for run-off (second round of election), as it happened in Ukraine.

According to the Law of Ukraine "On elections of the President of Ukraine" (http://www.rada.kiev.ua):

1. If more than 2 candidates were listed on the ballot and none of them was elected, a repeat voting is organized between the 2 candidates receiving the greatest number of votes, excepting those candidates who withdrew after the first round. If as a result of withdrawals only one presidential candidate remains, the repeat voting will take place with only one presidential candidate remains, the repeat voting will take place with only this one candidate running;
2. The candidate is considered legitimately elected president if, as a result of the repeat voting, he received more votes than the other candidate did and on condition that the votes cast for him exceed those cast against him. If in the repeat voting there is only one candidate running, he is considered elected president of Ukraine if the majority of the voters who took part in the elections voted for him.

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two states that use the district system, and the remaining states use the general ticket system. A candidate is considered legitimately elected president if he receives a majority of electoral votes (http://www.nara.gov)

Chapter 3

BANZHAF INDEX

The Banzhaf index (BI) is one of the basic and the most popular power indices (Grofman 1981; Merrill 1982; Owen 1978; Rabinovitz and MacDonald 1986; Rapoport and Golan 1985). The other indices are the Shapley-Shubik (Shapley and Shubik 1954) and the Deegan-Packel (Rapoport and Golan 1985) ones. As Ordeshook states (1999, p. 470) it is difficult if not impossible to interpret the differences between the indices in a particular context. I use the Banzhaf index because in order to find the most accurate values of indices we must write computer programs, and according to computation ability the most easily computed is the the Banzhaf index[3]. Several basic concepts from game theory must first be reviewed in order to understand this index.

Consider a set $N = \{1, \ldots, n\}$ of n players. Denote by T the set of all possible coalitions that consist of players from set N. Assign non-negative integer "weights" (e.g. votes or parliamentary seats) $v_1, v_2, \ldots, v_n$ to the players. Let W be the set of all winning coalitions and L the set of all losing ones. Assume that in order to accept any decision we need q votes where q is called a quota (Taylor and Zwicker 1993, p.171-172). It is convenient to use a shorthand notation $[q; v_1, v_2, \ldots, v_n]$ to describe the weighted games.

DEFINITION 1. Let $C \in T$. C is a *winning coalition* if $\sum_{i \in C} v(i) \geq q$.

[3] I have also estimated the Shapley-Shubik indexes later. As it turns out the correlation between the Banzhaf and the Shapley-Shubik indexes is 0.9995, so the further conclusions obtained for the Banzhaf index are valid for the Shapley-Shubik values.

DEFINITION 2. Let $C \in T$. C is a *losing coalition* if $\sum_{i \in C} v(i) < q$.

DEFINITION 3. A *simple game* is a pair *(N, W)*, where *N* is the set of players and *W* is the set of all winning coalitions.

A partition of *T* into two mutually exclusive and exhaustive sets *W* and *L* satisfies four requirements:

1) $\varnothing \in L$;

2) $N \in W$;

3) if $R \in W$ and $R \subset H$ then $H \in W$;

4) if $H \in W$ then $N \setminus H \in L$.

Conditions (1) and (2) guarantee that the null coalition of no players cannot win and that the grand coalition of all players must win, respectively. The heart of the definition is condition (3), which expresses the intuitive electoral meaning of "winning coalition. Condition (4) guarantees that at most one coalition extracted at any single time from the body of *n* players can be winning. Simple games satisfying condition (4) as well as conditions (1) through (3) are called proper (Rapoport and Golan, 1985, p. 675).

The Banzhaf index measures the power of players in simple games, in which all combinations of voters are considered in constructing the index. The Bazhaf index of voting power is developed in such way.

DEFINITION 4. For a simple game *(N, W)* define a *swing* for player *i* to be a coalition *S*, where player *i* is a member of coalition *S*, *S* is winning, and coalition $S \setminus \{i\}$ is losing (Ordeshook 1999, p.468). Let *s(i)* denote the number of swings for

player *i*. s*(i)*, called the *absolute Banzhaf index*, counts the number of times player *i* could change a coalition from losing to winning.

More useful is a *normalized BI Z(i)*, where

$$Z(i) = BI(i) = s(i) / \sum_{i=1}^{n} s(i), \quad i \in N .$$

To illustrate the Banzhaf index in order to make these definitions more clear let's consider a simple 3-player example. Assume that we have a parliamentary legislature with three parties A, B, and C controlling 30, 20 and 14 seats, respectively. Suppose that to pass a piece of legislation we need 35 votes. Then this system may be represented as a simple weighted game [35; 30, 20, 14]. All the winning coalitions in the game are AB, AC, and ABC. Counting the number of swing yields *s(A)=3, s(B)=1, s(C)=1*. Therefore *BI(A)=3/5=0.6*, *BI(B)=BI(C)=1/5=0.2*.

Another famous example, that can illustrate the Banzhaf index is the original European Economic Community (now the European Union), set up by the Treaty of Rome in 1958, that gave four votes to France, Germany, and Italy, two votes to Belgium and the Netherlands, and one vote to Luxembourg (Taylor and Zwicker 1993). Passage required at least 12 of the 17 possible votes. There are 14 winning coalitions in this game. The results are presented in the Table 1 on the next page, where F = France, G = Germany, etc. We place 1 if a coalition is a swing for player and 0 if it is not. As we can see *BI(F)=BI(G)=BI(I)=10/42=0.238*, *BI(B)=BI(H)=6/42=0.143* and, surprisingly, *BI(L)=0*.

The model (auxiliary). Before I examine the second round (run-off for two candidates) of 1994 and 1999 Presidential election and the results by all 27

Table 1.–Calculating Banzhaf index for EC countries.

		Winning coalitions															
		FGI	FGIB	FGIBH	FGIBHL	GIBH	GIBHL	FIBH	FIBHL	FGBH	FGBHL	FGIH	FGIHL	FGIL	FGIBL		
v(i)	i															s(i)	BI(i)
4	F	1	1	0	0	0	0	1	1	1	1	1	1	1	1	10	10/42
4	G	1	1	0	0	1	1	0	0	1	1	1	1	1	1	10	10/42
4	I	1	1	0	0	1	1	1	1	0	0	1	1	1	1	10	10/42
2	B	0	0	0	0	1	1	1	1	1	1	0	0	0	0	6	6/42
2	H	0	0	0	0	1	1	1	1	1	1	0	0	0	0	6	6/42
1	L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
															Total	42	

regions that Ukraine consist of (24 oblasts, Autonomous Republic of Crimea, city of Kyiv and city of Sevastopol'), let me introduce all the necessary notations:

n = number of all Ukrainian regions, $n = 27$;

A = 1st candidate, B = 2nd candidate (assume that candidate A won the election);

$a(i)$ = number of votes for candidate A in region i, $i = 1, \ldots, n$;

$b(i)$ = number of votes for candidate B in region i;

$r(i)$ = number of registered voters in region i;

$pop(i)$ = population of region i;

a = total number of votes for candidate A in Ukraine;

b = total number of votes for candidate B in Ukraine;

r = total number of registered voters in Ukraine;

pop = population of Ukraine.

In my model I examine not one but even two BI. The first one is an ex ante BI (hereinafter EABI), and it is defined by the following conditions:

$v(i)$ = weight of region = $r(i)$, q = quota = $r/2 + 1$.

An assumption under which I define such conditions is that all the registered voters participate in election and registered voters of each region vote for the same candidate that analytically can be written as

$$\forall\, i \in N \quad [a(i) = r(i)\ and\ b(i) = 0]\ or\ [a(i) = 0\ and\ b(i) = r(i)].$$

This assumption can look as a strong one, but it could be enough realistic in the case when two candidates have rather different political orientations.

The second one is a "post factum" (ex post) BI (denote it as PFBI) and for that index

$v(i)$ = weight of region = $a(i)$, q = quota = $b + 1$.

Thus we can work with this index only after the election, when we already know the results of election and the real contribution of each region in the victory of candidate A. Quota is chosen under the assumption, that the preferences of the people that voted for candidate A are the following: vote for candidate A–do not vote at all–vote for candidate B (and not: vote for candidate A–vote for candidate B–do not vote at all).

In my work I use data of 1994 and 1999 Presidential elections from the server supported by Verkhovna Rada Internet team (http://www.rada.kiev.ua) and International Foundation for Election Systems (IFES[4]) (http://www.ifes.kiev.ua). Visual Basic computer programs that I wrote in order to compute EABI and PFBI are presented in Appendix A and the results in Appendix B.

[4] IFES is a Washington-based nonprofit organization dedicated to supporting and strengthening democratic processes and institutions in fledgling democracies. Today IFES has worked in 90 countries around the world.

The difficulty lies in treating and comparing the difference between the obtained numerical results of EABI and PFBI. It is somewhat easier to analyze EABI_94 and EABI_99, and accordingly, PFBI _94 and _99. We can say that in 1994 the PFBI is greater than EABI in 16 from 27 regions, and in 1999 the EABI is greater than post factum one in 19 from 27 regions. In 1994 and 1999 Donetsk, Dnipropetrovsk and Kharkiv oblasts have the greatest EABI and PFBI that in my opinion could be explain by the fact, that the population of these oblasts is the largest and they are consistent in their support of current President (almost surely because they are located in one region and current President is from Dnipropetrovsk oblast). Very interesting results are obtained comparing '94 and '99 EABI: there is a large increase in voting power of the city of Kyiv that could be supported by a postulation that there is a permanent inflow of population in Ukrainian capital from other regions. There can also be observed almost unchanged voting power of Lviv, Odesa and Cherkasy oblasts.

Chapter 4

THE MODEL AND THE RESULTS

Now we turn back to our political-economic model:

$$TR(i,t) = k_0 + k_1 GR(i,t-1) + k_2 POL(i),$$

where the political variable *POL(i)* is:

a(i) = votes for candidate A submitted in region *i*;

EABI(i) = ex ante Banzhaf index for region *i*;

PFBI(i) = post factum BI for region *i*.

The null hypothesis is that the results of Presidential election do not affect the distribution of subsidies by regions. The alternative hypothesis is that allocation of transfers by regions is influenced by the results of election. The data on annual net transfers *TR(i, t)* and taxes *GR(i, t - 1)* by regions, $t = 1995 - 1998$, is taken from World Bank survey of subsidies in Ukraine.

Tables C1-C4 from Appendix C reports the OLS regression estimates for 1995-1998 years. All coefficients relating to taxes have the theoretically expected negative sign and are statistically significant at the 1% significance level.

EABI(*i*) is always significant at 1% significance level and is positive as predicted. PFBI(*i*) although having expected positive sign is always insignificant. Votes *a(i)* for candidate A are insignificant only in 1995, and then become significant and in 1998 reach 1% significance level.

Very impressive is a result of significance of votes for winner that can be treated as very strong political bias in the distribution of subsidies. As the coefficient is positive the President tries to support the regions thanks to which he won before. If it was possible to win with such quantity of votes before, so there is a possibility that it could be possible to win with the same amount next time.

The significance of EABI can be explained in such way that the President is also oriented to the "potential" strength of region. The insignificance of PFBI is rather confused taking into account the significance of votes, so maybe it could be treated as a signal that PFBI is not a good equivalent for votes, or that the Presidential election does not influence the division of subsidies.

Constant C is significant at 1% significance level in 13 from 15 regressions, and at 5% significance level in other two. It is positive and shows that the region obtain subsidies anyway, even if the amount of taxes collected in this region equals zero.

For further analysis Table 2 presents the results obtained from pooled data. In this regression we have the added dummy variable PRES, that denotes the amount of time (years) that are left to the dection, that takes the values 4,3,2,1. This variable is significant at 1% significance level that could serve as indicator of the influence of the political system on the economic one.

GR(i, $t-1$), EABI(i) and a(i) are also statistically significant at the 1% significance level as in previous twelve panel regressions. Again there is a quite confusing result on PFBI that contrary to panel regression is significant. All the variables are statistically significant and have the theoretically predicted and justified sign.

Table 2.– Pool Regression Coefficients: Net Transfers as Function of Taxes and Political Variables, 1995-1998

Independent Variables			
Constant	171,453	175,296	189,555
	(7.73)	(7.02)	(8.24)
GR(i, t-1)	-0.160872	-0.114309	-0.129587
	(9.83)	(7.91)	(8.98)
a(i)	-	-	0.076287
	-	-	(4.17)
EABI(i)	2,569,694	-	-
	(5.48)	-	-
PFBI(i)	-	960,276	-
	-	(2.50)	-
PRES(t)	-36,418	-25,087	-28,805
	(4.97)	(3.28)	(3.92)
Adj. R^2	0.48	0.36	0.42

Note: The figures in parentheses are the absolute values of *t*-statistics.
Variable definitions:
GR(i, t-1) = government receipts (tax revenue) from region i
a(i) = votes for candidate A submitted in region i
EABI(i) = ex ante Banzhaf index for region i
PFBI(i) = post factum BI for region *i*
PRES(*t*) = number of years that left to election

Chapter 5

CONCLUSION

The model of the interaction between the economical and the political systems presented in this work is rather simple and can be considered a first step towards the formulation of a realistic approach to politico-economic interdependence. Many important aspects are obviously missing. Taking into account the simplicity of the model and its preliminary character, the econometric estimates give quite reasonable results. In particular, two of three political variables show that President makes an effort to influence the economy through the specific division of subsidies in order to increase his popularity and hence his chances of reelection. Political bias of the distribution increases as elections come nearer.

The other political measure does not highlight such effect, possibly implying that the capacity of politicians to manipulate the economy are distinctly limited, particularly in an environment of economic instability.

As an implication of this work this procedure could be applied not only for Ukraine, but also i.e. for EU countries where much debates on the distribution of subsidies is currently going on. Additionally the methodology applied allows us to conduct tractable estimations of voting measure for Direct voting system.

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APPENDICES

APPENDIX A.

Remind the definition of the Banzhaf index for better understanding the computer program that I wrote for its calculation that follows.

DEFINITION. $s(i)$, called the *absolute Banzhaf index*, counts the number of times player i could change a coalition from losing to winning, or saying in another words the number of swings for player i. A *swing* for player i is a coalition S, where player i is a member of coalition S, S is winning, and coalition $S\backslash\{i\}$ is losing.

Remembering that the empty coalition (no players in it) is losing and coalition of all players is winning by definition, we can say that in order to calculate BI we should examine all coalitions that consist of 1, 2, ., n players and find the number of swings for each player. It was convenient not to calculate BI for all regions in one program, but to use small programs which calculate the number of swings for coalitions that consist of k and $k+1$ regions, $k = 1, n-1$. As an example I give a program for calculating the swings for regions in 8- and 9-regions coalitions for EABI(i) in 1999[5]. Programs for other number of regions in the coalition can be constructed similarly. Totally it took about two hours computing EABI (as also three other Banzhaf indices) and 67,108,857 from 132,932,104 examining coalitions were swings.

```
Sub EABI_99_8and9()                    'beginning of the program
```

[5] All the comments that can facilitate the understanding of this program are placed after apostrophe mark (') to the right of the body of program.

```
n = 27: q = 18,779,691                  'define a total number of regions and quota
c = 0                          'c = number of all reviewed coalitions, used for testing

Dim a(30) As Long                       'defining a vector of votes for winner
Dim w(30) As Long                       'defining a vector of swings for each region

n = n + 1
Worksheets("DATA_99").Activate

For z1 = 2 To n + 1
  a(z1) = Cells(z1, 2).Value                    'reading a(i) from Excel worksheet
Next z1

For i1 = 1 To n–8                       'procedure for calculating number of swings
  For i2 = i1 + 1 To n - 7
  s2 = a(i1) + a(i2)
    For i3 = i2 + 1 To n - 6
    s3 = s2 + a(i3)
      For i4 = i3 + 1 To n - 5
      s4 = s3 + a(i4)
        For i5 = i4 + 1 To n - 4
        s5 = s4 + a(i5)
          For i6 = i5 + 1 To n - 3
          s6 = s5 + a(i6)
            For i7 = i6 + 1 To n - 2
            s7 = s6 + a(i7)
              For i8 = i7 + 1 To n - 1
              s8 = s7 + a(i8)
                For i9 = i8 + 1 To n
                s9 = s8 + a(i9)
                c = c + 1
                If s9 > q Then GoTo 1 Else GoTo 2
                  1   if s9 - a(i1) < q then w(i1) = w(i1) + 1
                      if s9 - a(i2) < q then w(i2) = w(i2) + 1
                      if s9 - a(i3) < q then w(i3) = w(i3) + 1
                      if s9 - a(i4) < q then w(i4) = w(i4) + 1
                      if s9 - a(i5) < q then w(i5) = w(i5) + 1
                      if s9 - a(i6) < q then w(i6) = w(i6) + 1
                      if s9 - a(i7) < q then w(i7) = w(i7) + 1
                      if s9 - a(i8) < q then w(i8) = w(i8) + 1
                      if s9 - a(i9) < q then w(i9) = w(i9) + 1
```

```
                    wc = wc + 1

                2   Next i9
            Next i8
          Next i7
        Next i6
      Next i5
    Next i4
  Next i3
Next i2
Next i1

  For z2 = 2 To n
    Cells(z4, 12).Value = w(z4)          'writing computed number of swings
  Next z4

  Cells(33, 12).Value = c              'writing number of all reviewed coalitions
  Cells(34, 12).Value = wc                'writing a total number of all swings

End Sub
```

APPENDIX B.

Table B1. – Political variables: votes for winner, registered voters, computed ex ante and post factum Banzhaf index, 1994.

regions	votes for A (Kuchma), *a(i)*	registered voters, *r(i)*	ex ante BI, EABI(*i*)	ex ante BI, in % EABI(*i*)	post factum BI, PFBI(*i*)	post factum BI, in % PFBI(*i*)
Crimea	1 041 671	1 607 820	0.0425	4.25	0.0679	6.79
Vinnitsa	440 079	1 404 542	0.0370	3.70	0.0404	4.04
Volyn'	83 971	759 038	0.0199	1.99	0.0082	0.82
Dnipropetrovsk	1 314 798	2 867 802	0.0780	7.80	0.0702	7.02
Donetsk	2 006 417	3 783 292	0.1075	10.75	0.0708	7.08
Zhytomyr	345 392	1 094 301	0.0287	2.87	0.0325	3.25
Zakarpattia	136 787	825 297	0.0216	2.16	0.0133	1.33
Zaporizhzhia	706 536	1 536 826	0.0405	4.05	0.0577	5.77
Ivano-Frankivsk	35 481	1 027 300	0.0269	2.69	0.0035	0.35
Kyiv	363 462	1 416 408	0.0373	3.73	0.0340	3.40
Kirovohrad	315 967	912 626	0.0239	2.39	0.0299	2.99
Luhansk	1 290 372	2 076 361	0.0553	5.53	0.0701	7.01
Lviv	71 746	2 013 906	0.0536	5.36	0.0071	0.71
Mykolayiv	330 841	957 844	0.0251	2.51	0.0312	3.12
Odesa	802 683	1 846 412	0.0490	4.90	0.0619	6.19
Poltava	587 760	1 292 446	0.0340	3.40	0.0510	5.10
Rivne	71 961	820 357	0.0215	2.15	0.0071	0.71
Sumy	519 940	1 054 445	0.0277	2.77	0.0464	4.64
Ternopil'	29 646	863 423	0.0226	2.26	0.0029	0.29
Kharkiv	1 078 813	2 322 575	0.0622	6.22	0.0684	6.84
Kherson	401 741	909 496	0.0238	2.38	0.0373	3.73
Khmel'nytskiy	346 454	1 124 513	0.0295	2.95	0.0326	3.26
Cherkasy	380 666	1 130 215	0.0297	2.97	0.0355	3.55
Chernivtsi	176 342	669 593	0.0175	1.75	0.0172	1.72
Chernihiv	588 081	1 044 664	0.0274	2.74	0.0510	5.10
City of Kyiv	359 271	1 864 418	0.0494	4.94	0.0336	3.36
C. of Sevastopol	189 972	305 746	0.0080	0.80	0.0184	1.84
total (Ukraine)		37 531 666				
Note: in order to calculate PFBI we need total number of votes for candidate B, so in 1994 b = 12 111 603						

Table B2. – Political variables: votes for winner, registered voters, computed ex ante and post factum Banzhaf index, 1999.

regions	votes for A (Kuchma), *a(i)*	registered voters, *r(i)*	ex ante BI, EABI(*i*)	ex ante BI, in % EABI(*i*)	post factum BI, PFBI(*i*)	post factum BI, in % PFBI(*i*)
Crimea	434 738	1 541 048	0.0406	4.06	0.0282	2.82
Vinnitsa	359 833	1 396 295	0.0367	3.67	0.0234	2.34
Volyn'	479 344	772 488	0.0202	2.02	0.0310	3.10
Dnipropetrovsk	1 181 358	2 851 624	0.0775	7.75	0.0734	7.34
Donetsk	1 557 340	3 742 378	0.1061	10.61	0.0915	9.15
Zhytomyr	394 896	1 090 343	0.0286	2.86	0.0256	2.56
Zakarpattia	657 314	878 778	0.0230	2.30	0.0423	4.23
Zaporizhzhia	473 731	1 542 368	0.0407	4.07	0.0307	3.07
Ivano-Frankivsk	859 839	1 039 979	0.0273	2.73	0.0548	5.48
Kyiv	617 704	1 433 418	0.0377	3.77	0.0398	3.98
Kirovohrad	278 644	886 295	0.0232	2.32	0.0181	1.81
Luhansk	598 522	2 017 065	0.0536	5.36	0.0386	3.86
Lviv	1 623 941	2 014 743	0.0536	5.36	0.0940	9.40
Mykolayiv	300 881	969 182	0.0254	2.54	0.0196	1.96
Odesa	620 075	1 844 794	0.0489	4.89	0.0400	4.00
Poltava	355 382	1 305 341	0.0343	3.43	0.0231	2.31
Rivne	541 209	845 450	0.0221	2.21	0.0350	3.50
Sumy	409 352	1 037 461	0.0272	2.72	0.0266	2.66
Ternopil'	727 359	874 027	0.0229	2.29	0.0467	4.67
Kharkiv	772 210	2 315 155	0.0620	6.20	0.0494	4.94
Kherson	267 271	922 413	0.0242	2.42	0.0174	1.74
Khmel'nytskiy	446 681	1 120 759	0.0294	2.94	0.0290	2.90
Cherkasy	334 245	1 128 274	0.0296	2.96	0.0217	2.17
Chernivtsi	375 996	691 277	0.0181	1.81	0.0244	2.44
Chernihiv	293 358	1 014 440	0.0266	2.66	0.0191	1.91
City of Kyiv	790 392	1 986 767	0.0528	5.28	0.0506	5.06
C. of Sevastopol	94 710	297 218	0.0078	0.78	0.0062	0.62
total (Ukraine)		37 559 380				
Note: in order to calculate PFBI we need total number of votes for candidate B, so in 1994 b = 10 665 420						

APPENDIX C.

Table C1. – Regression Coefficients: Net Transfers as Function of Taxes and Political Variables, 1995

Independent Variables			
Constant	53,636	93,626	100,506
	(2.19)	(3.64)	(4.95)
GR(i, t-1)	-0.699644	-0.292061	-0.369267
	(3.93)	(2.24)	(2.59)
a(i)	-	-	0.057834
	-	-	(1.54)
EABI(i)	3,339,588	-	-
	(3.14)	-	-
PFBI(i)	-	699,617	-
	-	(0.97)	-
Adj. R^2	0.34	0.11	0.16

Note: The figures in parentheses are the absolute values of *t*-statistics.
Variable definitions:
GR(i, t-1) = government receipts (tax revenue) from region i
a(i) = votes for candidate A submitted in region i
EABI(i) = ex ante Banzhaf index for region i
PFBI(i) = post factum BI for region i

Table C2. – Regression Coefficients: Net Transfers as Function of Taxes and Political Variables, 1996

Independent Variables			
Constant	79,871	122,846	135,147
	(3.04)	(4.30)	(5.97)
GR(i, t-1)	-0.286729	-0.129023	-0.151819
	(5.49)	(3.40)	(3.76)
a(i)	-	-	0.076936
	-	-	(1.96)
EABI(i)	4,119,749	-	-
	(3.60)	-	-
PFBI(i)	-	1,073,154	-
	-	(1.39)	-
Adj. R^2	0.56	0.28	0.33

Notes: See Table 1.

Table C3. – Regression Coefficients: Net Transfers as Function of Taxes and Political Variables, 1997

Independent Variables			
Constant	58,486	124,224	139,821
	(2.38)	(3.49)	(5.56)
GR(i, t-1)	-0.244557	-0.148254	-0.172732
	(9.88)	(5.28)	(6.64)
a(i)	-	-	0.150859
	-	-	(3.68)
EABI(i)	5,852,726	-	-
	(5.90)	-	-
PFBI(i)	-	699,617	-
	-	(0.97)	-
Adj. R^2	0.79	0.50	0.62

Notes: See Table 1.

Table C4. – Regression Coefficients: Net Transfers as Function of Taxes and Political Variables, 1998

Independent Variables			
Constant	62,359	119,320	121,778
	(3.32)	(4.32)	(6.28)
GR(i, t-1)	-0.166170	-0.098140	-0.119186
	(9.46)	(4.71)	(6.29)
a(i)	-	-	0.105186
	-	-	(3.32)
EABI(i)	4,273,915	-	-
	(6.30)	-	-
PFBI(i)	-	1,045,667	-
	-	(1.43)	-
Adj. R^2	0.78	0.45	0.59

Notes: See Table 1.