

A LOGIT ANALYSIS OF DEVELOPMENT AND DEMOCRACY. THE ROMANIA'S CASE

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Abstract

The paper analyzes empirically, in Romania's case, the relationship between economic development (dependent variable) and its political factors (independent variables). The analysis is based on the construction of a linear "Logit Model" and the data set is covering the period 1926-2007. The main results show that, in Romania's case, which the economy has an expansive and competitive market, the economic development, can be accompanied, by high levels of democratization, with high political stability, on a republican base, but this is not a rule.

Keywords: Development, Democracy, Regime Durability, Binary Choice Model, Logit Analysis

JEL classification: I15, I18, C24

1. INTRODUCTION

According to Bildirici and Sunal (2006), the economic development varies from one period to another and from one country to another, being subordinate to a series of factors, such as: human capital, physical capital, population and technological progress. The authors showed that the mentioned factors may be opposite: public debt, role of the state, tax structure, political instability, defense expenditures, geographical position, foreign capital, specialization in foreign trade and technological adaptation.

Between the political factors, two of them are remarkable in a particularly way: the intensity of democratization and the political regime durability. In this case, there are two statements for discussion: on the one hand, the variables' sign of the relationship between "intensity of democratization & political regime durability" and economic development, and

on the other hand, the sense of this causal relationship (development first and democracy later or democracy first and development later?).

The field literature offers contradictory results about the sign of considered variables and the sense of the relationship between intensity of democratization, political regime durability and development.

(a) In the first statement's case - "Development First and Democracy Later", Lipset (1959) argues that the economic development ensures the democratization, more precisely "development first and democracy later".

In the same note, Almond (1991) reviews key works of some scholars and explains, statistically, the significant correlation between economic development and democratic institutions (the accentuation of economic development generates an increase of state democratization). Przeworski and Limongi (1997), show that the sustainable development can support the democracy's survival, even if the countries are poorer. Pei (1999) considers that the economic development will transform social structure and create a large enough middle class as the social basis of democracy. Przeworski, Alvarez, Cheibub and Limongi (2000) develop their previous research and conclude: "the economic development does not generate democracies, but democracies are much more likely to survive in wealthy societies".

Chen (2007), after he made a review of the field literature, explains that the states with high economic growth are strong democracies, having the highest level of development. Moreover, he formalized the idea that the economic development is growing, as the democratization is increasing and vice-versa.

Finally, Robinson (2006), analyzing the economic effects of development on democracy, concludes that the application of techniques adopted from best-practice econometrics shows no evidence that economic development has a causal effect on democracy. More, neither does it support the idea that economic development influences the probability of coups but not democratizations. Therefore, the researches on the causal relationship between "economic development and intensity of democratization & political regime durability" are not conclusive regarding the sign; some of them claim the connections of the same direction and other authors, of the contrary direction.

(b) In the second statement's case - "Democracy First and Development Later", Sirowy and Inkeles (1990) believe that democracy facilitates economic development and not vice versa. More precisely, they said "democracy first and development later". In the same way, Przeworski, Alvarez, Cheibub and Limongi (2000) consider that, in general, political instability decreases state's economic development (in particular, in autocracies).

Siegle, Weinstein and Halperin (2004) argue that democracy brings political checks and balances, responsiveness to citizen priorities, openness, and self-correcting mechanisms - all of them contributing to steady growth and superior living conditions. Also, Campos (1994) and Menocal (2007) find that democracy determinates economic development and Bhagwati (2002) things that democracy is better for development only when is accompanied by an expansion of markets and competition.

There is not a unanimity point of view regarding "the sign" of variables: the economic development, intensity of democratization and political regime durability. More, Bardhan (1999) is also reticent regarding the investigations methodology and the quality of the existing data sets. He recommends the traditionally analysis and combats the „cross-country regressions”.

According to the second statement's case - "Democracy First and Development Later" - all the theoretical elements presented allow us to formulate two theoretical working assumptions. The hypotheses are:

H₁: The level of economic development is growing as the intensity of democratization is increasing.

H₂: The level of economic development is growing as the political regime durability is increasing.

Summarizing, the meanings of the hypothesis' work relations are presented in Table 1, in Appendix.

In this assumption approach, the second statement's case relives that the relationship between development and democracy/political regime durability have the same direction (if the country is more democratic/more political stabile, the economic development increase and vice-versa).

2. DATA

Starting with the theoretical argues shown, the paper analyzes empirically, in Romania's case, the relationships between economic development, intensity of democratization and political regime durability.

The economic development (GDP per capita - G) is taken from Maddison (2009), intensity of democratization (Index of Democratization - D) from Vanhanen (2007) and political regime durability (Regime Durability Score - RD) from Marshall & Jagers (2009).

In our binary choice approach, the dependent variable G becomes "The probability of GDP per capita to increase with 5%" (PG):

$$PG = \begin{cases} 1, & \text{if } \frac{G_n - G_{n-1}}{G_{n-1}} \times 100 > 5\% \\ 0, & \text{if } \frac{G_n - G_{n-1}}{G_{n-1}} \times 100 \leq 5\% \end{cases} \quad (1)$$

where n is a period.

Because the considered independent factors (D and RD) have different scales of measurement, for a comparative analysis, the levels of variables were normalized:

$$ID, DU_{Normalized} = \frac{D, RD - D, RD_{Min.}}{D, RD_{Max.} - D, RD_{Min.}} \quad (2)$$

D and RD become ID and DU, where 0 corresponds to the minimum intensity level of indicators and 1 indicates the maximum intensity level.

Finally, I entered a control dummy variable - T, which reflects the type of the state (monarchy or republic). If the state is a monarchy, the dummy is 1, and if the state is a republic, dummy is 0 (in Romania, in the considered sample, the monarchic period covers the interval 1926-1947).

The data set is covering the period 1926-2006, with democratic and autocratic regimes, with 81 observations (see the variables and its sources in Table 2, in Appendix).

3. ESTIMATION AND RESULTS

Based on the theoretical assumptions made above and on the normalized illustrated variables, the signs of PG and its determinant factors (ID, DU and T) are shown in Table 3, in Appendix.

The analysis is based on the construction of a binary choice model (Linear Probit Model), where PG represents dependent variable and ID, DU and T are independent variables. For the first time, this type of model has been used in economy in the 1950s. The pioneer binary choice model in economic field treats the analysis of ownership of cars as a function of household income (Farrell, in 1954).

Based on Akaike info, Schwarz and Hannan-Quinn criterions, I selected a logit model, between probit, logit and extreme value alternatives, as types of binary choice model (see Table 4, in Appendix).

According to Dougherty (2007), “in logit estimation one hypothesizes that the probability P of the occurrence of the event is determined by the function”:

$$P_i = F(Z_i) = \frac{1}{1 + e^{-Z_i}} \quad (3)$$

where Z is a linear function of the explanatory variables.

The marginal effect of Z on the probability, which will be denoted $f(Z)$, is given by the derivative of this function with respect to Z :

$$f(Z) = \frac{dp}{dZ} = \frac{e^{-Z}}{(1 + e^{-Z})^2} \quad (4)$$

As with logit analysis, the marginal effect of any variable is not constant. It depends on the value of $f(Z)$, which in turn depends on the values of each of the explanatory variables. To obtain a summary statistic for the marginal effect, the usual procedure is parallel to that used in logit analysis, basing of the mean values of the explanatory variables.

In the considered case, Z is given by:

$$Z = \alpha + \beta_1 xID_i + \beta_2 xDU_i + \beta_3 xT_i + \varepsilon \quad (5)$$

where α are the intercept term and i is the period of time (years 1926-2006). Table 5, in Appendix, shows that from 81 included PG observations, 40.74% are 0 and 59.26% are 1.

The econometric tests of the “Logit model”, presented in Table 6, in Appendix, shows that the coefficients are significant at standard levels of confidence (at limit for 10%), a conclusion reinforced by the low values of the probabilities. To obtain the robust standard errors, I used Berndt-Hall-Hausman optimization algorithm.

Based on the model, the prediction values are illustrated in Table 7, in Appendix. The estimated model correctly predicts 76.07% of the observations (51.52% of the Dep=0 and 89.58% of the Dep=1 observations). Overall, the estimated equation is 14.81% points better at predicting responses than the constant probability model.

The correlogram of standardized residuals and the correlogram of standardized residuals squared show that there are not autocorrelations or partial correlations of the residuals for all considerable lags, except de lag 1 and 2 (Table 8 and 9, in Appendix). More, the Andrews and Hosmer-Lemeshow Goodness-of-Fit Tests show that the caution in order to interpret the results is minimal (Table 10, in Appendix).

In conclusion, the model may be considered stabile and representative to describe, in Romania's case, the connection between PG and ID, DU & T.

The method for identifying the effects of ID, DU & T on PG consists in calculating the marginal effects with the mean values of the explanatory variables. The Table 11, in Appendix, shows the marginal effects, calculated by multiplying $f(Z)$ with the estimate coefficients of the logit regression. Starting from the marginal effects measured on the "logit model" built, we can identify the following remarks:

- an one-point increase in the *ID*, increases by 59.84% the PG;
- an one-point increase in the *DU*, increases by 66.13% the PG;
- an one-point increase in the *T*, increases by 32.12% the PG.

We can observe that the results confirm the conclusions of Sirowy and Inkeles (1990), Przeworski, Alvarez, Cheibub and Limongi (2000), Siegle, Weinstein and Halperin (2004), Campos (1994), Menocal (2007) and Bhagwati (2002). A novelty is the existence of a significant impact of state's type (monarchy or republic) on the economic development.

4. CONCLUSIONS

For the analyzed period, in Romania, a high level of democratization, in an augmented political durability, on a republican base, can ensure a relative high probability of GDP per capita to increase with 5%. This is true, according to Bhagwati (2002), only if the economy is accompanied by an expansion of market and competition. Contrary, a low level of democratization, in a reduced political durability, on a monarchical base, ensures a low probability of GDP per capita to increase with 5%.

Between the three determinant factors (ID, DU and T), the most important is the T, followed, with a small difference, by the ID and DU.

The main results show that, in Romania's case, which the economy has an expansive and competitive market, the economic development, can be accompanied, by high levels of democratization, with high political stability, on a republican base, but this is not a rule. The forecast of the probability of GDP per capita to increase with 5%, in the 1926-2007 periods, in Romania, is illustrated in the Graphic 1, in Appendix.

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Appendix

Table no. 1 The "signs" of the hypothesis' work variables

Variable and "tendency sign"	Variable and "tendency sign"
Economic development + or –	The intensity of democratization + or –
Economic development + or –	The political regime durability + or –

Table no. 2 The variables description and its sources

Variable	Measure and description	Source
Economic development (G)	GDP per capita, suggests the level of economic development as GDP per capita (1990 International Geary-Khamis dollars).	Maddison (2009)

Variable	Measure and description	Source
Intensity of Democratization (D)	Index of Democratization illustrates the rank of democracy's level (democracy - high level, autocracy - low level)	Vanhanen (2007)
Political Regime Durability (RD)	Regime Durability Score represents the number of years since the most recent regime change or the end of transition period defined by the lack of stable political institutions.	Marshall & Jagers (2009)
Type of the state (T)	Dummy variables, reflects the form of government (monarchy - 1 or republic - 0).	Dummy methodology

Table no. 3-The expected signs of PG - ID, DU and T according to working hypothesis

PG	The determinant factors of PG	The trend of determinant factors of PG
+	ID	+
+	DU	+
+	T	+ or -

Table no. 4 Selection of binary choice model type

Binary choice model type	Value of Akaike info criterion	Value of Schwarz criterion	Hannan-Quinn criterion
Probit	1.204284258766524	1.322528661466398	1.25172546259236
Logit*	1.202994272136891*	1.321238674836764*	1.250435475962727*
Extreme value	1.21446667798653	1.332711080686403	1.261907881812366

Table no. 5 The PG annual frequencies in 1926-2006 periods

Dependent Variable: PG				
Value	Count	Percent	Cumulative Count	Percent
0	33	40.74	33	40.74
1	48	59.26	81	100.00

Table no. 6 The econometric tests of "Logit Model PG, ID, DU and T"

Dependent Variable: PG				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
ID	-1.679342	1.027103	-1.635027	0.1020
DU	-1.416280	0.942829	-1.502159	0.1331
T	-2.838627	0.668695	-4.245024	0.0000
C	1.971147	0.671192	2.936787	0.0033
Mean dependent var	0.592593	S.D. dependent var		0.494413
S.E. of regression	0.438683	Akaike info criterion		1.202994
Sum squared resid	14.81812	Schwarz criterion		1.321239

Log likelihood	-44.72127	Hannan-Quinn criter.	1.250435
Restr. log likelihood	-54.74798	Avg. log likelihood	-0.552114
LR statistic (3 df)	20.05343	McFadden R-squared	0.183143
Probability(LR stat)	0.000165		
Obs with Dep=0	33	Total obs	81
Obs with Dep=1	48		

Table no. 7 The prediction values of PG base on the model

Dependent Variable: PG						
	Estimated Equation			Constant Probability		
	Dep=0	Dep=1	Total	Dep=0	Dep=1	Total
P(Dep=1)<=C	17	5	22	0	0	0
P(Dep=1)>C	16	43	59	33	48	81
Total	33	48	81	33	48	81
Correct	17	43	60	0	48	48
% Correct	51.52	89.58	74.07	0.00	100.00	59.26
% Incorrect	48.48	10.42	25.93	100.00	0.00	40.74
Total Gain*	51.52	-10.42	14.81			
Percent Gain**	51.52	NA	36.36			

Table no. 8 The correlogram of standardized residuals

Autocorrelation and Partial Correlation							
Autocorrelation		Partial Correlation		AC	PAC	Q-Stat	Prob
. **	. **	1	0.326	0.326	8.9153	0.003	
. ***	. **	2	0.337	0.258	18.557	0.000	
. *	. *	3	0.094	-0.086	19.317	0.000	
.	. *	4	-0.040	-0.158	19.459	0.001	
. *	. *	5	0.068	0.142	19.871	0.001	
.	.	6	-0.041	-0.024	20.020	0.003	
. *	. *	7	0.120	0.102	21.332	0.003	
. *	. *	8	0.112	0.079	22.478	0.004	
.	. *	9	0.014	-0.112	22.495	0.007	
. *	. **	10	-0.113	-0.221	23.713	0.008	

Table no. 9 The correlogram of standardized residuals squared

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
. *.	. *.	1	0.162	0.162	2.1959	0.138
. **	. **	2	0.280	0.261	8.8598	0.012
. *.	. .	3	0.081	0.006	9.4192	0.024
. .	.* .	4	0.029	-0.060	9.4922	0.050
. .	. .	5	0.064	0.049	9.8491	0.080
. .	. .	6	-0.041	-0.052	10.003	0.125
. .	. .	7	0.037	0.025	10.130	0.181
. *.	. *.	8	0.077	0.103	10.675	0.221
. .	. .	9	0.023	-0.010	10.723	0.295
. .	. .	10	0.051	-0.004	10.970	0.360

Table no. 10 Andrews and Hosmer-Lemeshow Goodness-of-Fit Tests

Dependent Variable: PG								
Quantile of Risk			Dep=0		Dep=1		Total	H-L
Low	High		Actual	Expect	Actual	Expect	Obs	Value
1	0.1515	0.2033	5	6.60841	3	1.39159	8	2.25047
2	0.2033	0.2883	7	6.16624	1	1.83376	8	0.49182
3	0.2958	0.5546	7	5.12516	1	2.87484	8	1.90852
4	0.5635	0.6243	4	3.23378	4	4.76622	8	0.30473
5	0.6289	0.6621	1	2.84217	7	5.15783	8	1.85196
6	0.6640	0.7056	4	2.54428	4	5.45572	8	1.22132
7	0.7131	0.7624	1	2.07015	7	5.92985	8	0.74633
8	0.7682	0.8053	2	1.72108	6	6.27892	8	0.05759
9	0.8109	0.8409	0	1.38841	8	6.61159	8	1.67997
10	0.8457	0.8685	2	1.30030	7	7.69970	9	0.44010
Total			33	33.0000	48	48.0000	81	10.9528
H-L Statistic:			10.9528		Prob. Chi-Sq(8)		0.2044	
Andrews Statistic:			20.4347		Prob. Chi-Sq(10)		0.0254	

Table no. 11 The marginal effects of “Logit Model PG, ID, DU and T”

Variable	Mean	b	Mean × b	f(Z)	bxf(Z)
ID	0.191956	-1.6793	-0.32236	0.239155	-0.40162
DU	0.321304	-1.4163	-0.45506	0.239155	-0.33871
T	0.271605	-2.8386	-0.77099	0.239155	-0.67887
C	1.000000	1.9711	1.971147		
Total			0.422746		

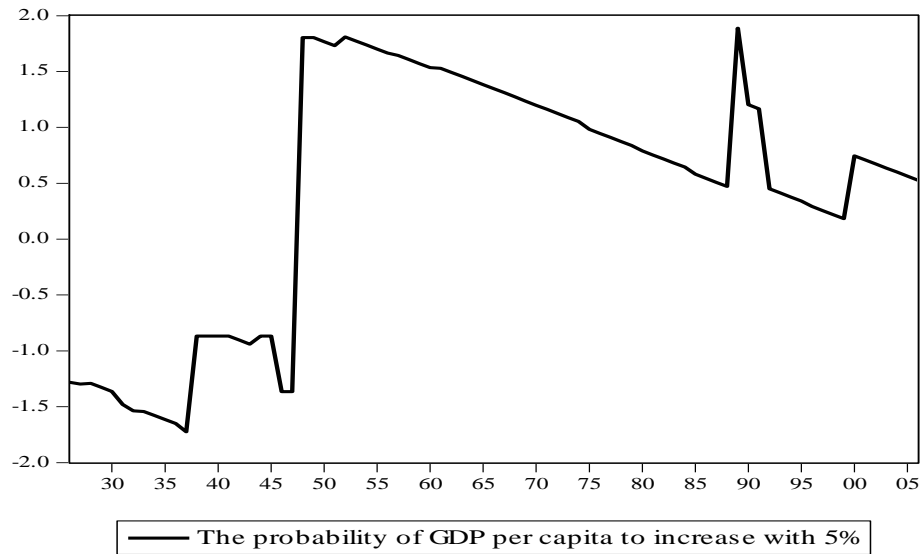


Figure no. 1 The probability of GDP per capita to increase with 5%, in the 1926-2007 periods, in Romania