Searching for Factors of Accelerated Economic Growth:
The Case of Ireland and Turkey

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Abstract:

Purpose: This study analyses the determinants of economic growth acceleration in two completely different sets of institutions provided by two example economies, using a modified threshold error correction model (TECM).

Design/Methodology/Approach: The contribution is based on an extended (sequential) methodology related to a set of two-regime threshold error correction models (TECM) that helps to investigate determinants of economic growth in both long run and short run. The validation of the results were prepared using Hansen and Seo test. Supportive role of structural breaks analysis is emphasized.

Findings: There exists a set of variables that determine accelerated economic growth patterns. In the export-oriented Irish economy with a stable set of institutions and well educated society the growth has been led by net exports. In the case of Turkey, periods of accelerated growth appeared in short time so the results are much diversified, taking both factors and periods of growth.

Practical Implications: It is possible to indicate a diversity of the growth patterns as well as evaluate the economic policy corresponding to them.

Originality/Value: The study offers an in-depth insight into econometric modelling of economic growth as well as the fluctuations around it.

Keywords: Economic miracle, Ireland, Turkey, Threshold Error Correction Model (TECM).

JEL codes: O11, C22.

Paper type: Research study.

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1. Introduction

The issue of accelerated economic growth called sometimes an economic miracle has attracted the attention of many politicians and economists for many years. Most often, the starting point for research in this area is the historically identified examples of a period of economic development of selected countries, such as: the German miracle, the Chilean miracle, the Japanese miracle, etc. (Katz, 1998; Reichel, 2002; Jones, 2003; Vietor, 2007; Klein, 2009). A postulate to attempt to develop a theory of economic miracles has even appeared (Selinger, 2010). Two definitions of economic miracles are worth to be mentioned. The first one defines an economic miracle as a period of faster-than-expected economic growth (Sharma, 2012). It puts the attention on the resulting aspect of growth, which is observed by statistical indicators like the real GDP growth rate and helps selection of economies that experienced such a period. The second definition concentrates on identification of causes that induce economic growth not only to fasten it up but also to develop the entire economy. Economic miracles are here a consequence of internal economic shocks caused by national economic policy, at the root of which lie institutional determinants of changes in the economic system that could be barriers to, or drivers of development (Balcerowicz, Rzońca (eds.), 2014). It is worth noting that the reported concept of economic reforms is in line with Acemoglu and Robinson (2013). The detailed discussion on the concept of economic miracle undertaken in top economic publications is provided in Boehlke (2019).

As concerns empirical literature on factors of economic growth, authors typically concentrate their attention basing on cross-sectional data (Sala-i-Martin, 1997) or on panel data (Teixeira and Queirós, 2016 as an example of a numerous literature). On the other hand, Jerzmanowski (2006) proposed a framework for systematic analysis of changing within-country growth patterns and the investigation of their determinants. Basing on Pritchett's (2000) observation that the growth process can be thought of as transitions between different growth regimes he applied a Markov-switching regression. He distinguished among four growth regimes such as miracle, catch-up, stagnation and crisis and transitions among them. The results, obtained for yearly data since 1962 till 1994, are quite convincing since they show that better institutions appear to improve long run growth by making episodes of fast growth more persistent while weak institutions do not rule out growth take-offs but limit their sustainability.

In the paper we are partly in line with the approach reported by Jerzmanowski (2006) in that sense that we based our analysis on time series data for individual country and then we proposed a switching regression approach based on a two-regime Threshold Error Correction Model – TECM (Balke and Fomby, 1997). The novelty of the research lies in extending standard TECM tests, i.e., Enders and Siklos (2001) and Kapetanios *et al.* (2006) by introducing a set of switching variables into the short run equation. These variables are a subject of testing. We put our attention on identification of factors of economic growth in two economies, i.e.,

Ireland and Turkey. The purpose of the paper is to find out determinants of accelerated economic growth observed temporarily in two completely different sets of institutions provided by two example economies using a modified threshold error correction model (TECM). The period of the analysis covers the years from 1980 till 2016.

The paper is structured as follows. In the second part brief characteristics of Irish and Turkish economies has been made. The econometric models used for empirical analysis of economic growth were specified in the section three, while in the section four empirical results are presented and discussed. Conclusions are presented in the last part.

2. Institutional Factors of Growth in Ireland and Turkey

Ireland has been widely studied in the economic literature as an example of successfully introducing economic reforms (Birnie, 2001; Honohan and Walsh, 2002; Kelly and Everett, 2004; O'Leary, 2015; Boehlke *et al.,* 2018). Generally the authors agree that the institutional development is a main source of the economic and social success of Ireland although different sources of the success have been stressed. The main pillars of Irish economic growth and its intensive course consists of solid macroeconomic fundamentals, general regulatory environment supporting and encouraging business and entrepreneurship development, good access to risk capital, educational attainment of the workforce and conditions to R&D activity (Cassidy, 2004). The brake-point in Irish economic history was the accession to EEC in 1973. According to Prithett's classification (Pritchett, 2000) Ireland was among the fastest developing countries based on the rate of per capita GDP growth.

The most spectacular achievements were noticed in the years 1980 – 2007. Since 1987 voluntary "pay pact" between the Government, Trade Unions and employers was a very important institution to reduce public debt and wages. It influenced the shape and the implementation mode of economic strategy, especially from the fiscal and monetary policy point of view. Strategic issues for long-term economic growth exposed changes in the structure of Irish economy by investment in in public transport, new housing, IT sector and protection of the nature environment (O'Hagan and Newman, 2005). The very important reason of Irish economic success was also the relatively high level of human capital value as a result of investment in the education sector. In the case of English speaking society is no accident that almost 50% of foreign direct investments from United States and Great Britain had been allocated in the country, mainly in an information technology sector and financial and legal services. Taking it to the industrial policy it could be possible to notice failures as well as some successes. For example, the concentration on tax policy and tax incentives favored foreign capital over domestic capital. Also the preferences for particular sectors were probably too risky. Finally, after 1980 Irish economic growth was accelerated because of the strong impact of foreign direct investment and

changes of internal economic policy stimulating rapid growth of export and building social confidence.

On the other hand the economy of Turkey is among the emerging economies. Pritchett (2000) classified it among the group of countries with the rate of per capita GDP growth highet than 1.5%. The economic history of Turkey could be described by four main periods signified with major changes in economic policy and institutional order: 1923-1929, a period of private accumulation, 1929-1950, a period of state accumulation, 1950-1980, a period of state guided industrialization based on import substituting protectionism, and finally 1980 onwards, a period of opening the Turkish economy to international liberal trade and financial market transactions (Akalin, 1995).

By the late 1970s, Turkey's economy had reached a deep economic crisis (Yeldan and Unuvar, 2015). As a consequence, in 1980 the reform program was implemented. Its main idea was to shift Turkish economy toward export-led growth. The government pursued it by means of economic package including devaluation of lira, flexible exchange rates, maintenance of positive real interest rates, very restrictive control of the money supply and credit, tax system reform, subsidies and other public expenditures reduction, freeing of prices for goods and services offering by state enterprises and opening the economy for foreign investments. Results of these reforms were really visible. In early 1980s the real GNP grew by 3% per year, industrial output raised by an average over 9% per year, lira devaluation resulted in higher export. Export of manufactured goods increased by an average of 45% per year.

The relatively high inflation rate and unemployment rate were still very important socio-economic problems (Boratav, Yeldan and Kose, 2001). All those positive economic indicators helped Turkey to achieve high marks from credit-rating agencies and after that to cover its budget deficits in a period of 1993-1996 by foreign loans (Gazioglu, 2003). The interest rate was relatively low so the demand for money and credit offered by foreign banks and financial institutions increased rapidly under the regime of fixed exchange rate of the Turkish lira. In effect the interest rate increased and lira was devaluated by implementing flexible exchange rates and process of "dollarization" started to go (Feridun, 2012). It was a standard mechanism of debt and currency crisis for developing countries implementing a neo-liberal economic policy in the opened economy.

In 1994 about 50% of total deposit base was in foreign currency (in 1993 only 1%). That deep currency crisis in Turkey was associated with fiscal imbalances, capital outflows, liquidity conditions and banking sector performance (Nurhan, 1999). The government had to implement a new program of economic reforms and economic policy. Main changes in economic policy concerned the large public debt reduction, increase in prices and in taxes, privatization of state-owned companies and lira devaluation (Feridun, 2009). The period between 1994-2001 in Turkish economic

history is often defined as the successive crisis. It was marked by corrupt governments, political instability, foreign divestment, budgetary deficit and hyperinflation. The 2000s meant an area of profound shifts in the social and economic spheres of Turkish economy. This period is often defined as "Turkish economic miracle" despite of that only in 1987-1989 the Turkish economy grew about 9% per year.

Following the crises of 2000 and 2001, the political arena had witnessed the rise to power of the Justice and Development Party (AKP). It is very interesting that after the election in 2002 it was observed the withdrawal from its populist discourse as an anti-IMF and anti-liberal reactionary movement and turned to implementing the neo-liberal economic policy. The significant features of AKP governments over the post 2003 period was that they had successful adoption of the neo-liberal policy under the domination of strong government without confronting any strong political opposition. It is reasonable because voters in Turkey hold coalition governments less responsible for economic performance than single party governments (Akarca, 2017). Over this period, Turkey continued to specialize in standard technologies and low labor cost production in line with an export-based growth strategy, within the international division of labor. The generally favorable global conditions that were conductive to the intensive growth performance of the economy under the AKPs first rule of administration are not present in the new circumstances. The general conclusion from the investigation of the Turkish economic miracle case is that the periods of rapid economic growth of this country depend on election cycles in which political powers and army influenced the goals and instruments of economic policy implementing by the government.

When looking at the stylized facts in 2016 Ireland's GDP per capita amounted 61,606.48 USD and in the same year Turkey had 10,767.61 USD, according to the World Bank. For comparison in 1980, which is the starting year of our analysis GDP per capita in Ireland was 6,378.78 USD and in Turkey it was respectively equal 1,564.25 USD. For over 35 years Turkey multiplied it by almost 7 times and Ireland by almost 10 times. But it is worth noting that Irish economy not only multiplied its initial economic level but also it became one of the richest economies in Europe.

3. Research Methodology

In the paper a threshold error correction model (TECM) approach is applied, with a central assumption that there exists a long run path describing the direction of the economic development but in the short run temporal asymmetry in the process of adjustment is possible. It is argued that in the short run the dynamics is nonlinear and concentrated around a certain threshold variable, which is a subject of testing. The magnitude of threshold is than the subject of estimation. A modified testing approach using a TECM basis has been proposed and validated using other tests.

The econometric model applied in the empirical analysis is the threshold error correction model (TECM). Its idea comes from seminal papers by Balke and Fomby (1997) as well as Enders and Siklos (2001). In our research we used three versions of the TECM approach.

The first one is that proposed by Enders and Siklos (2001). At the beginning it is assumed that in a linear cointegrating equation exists under the conditions defined in Engle and Granger (1987).

$$Y_t = \alpha_0 + \sum_{i=1}^{k} \alpha_i X_{it} + u_t \tag{1}$$

Then the testing regression is estimated as

$$\Delta u_t = I_t \rho_1 u_{t-1} + (1 - I_t)\rho_2 u_{t-1} + \sum_{i=1}^{p} \beta_i \Delta u_{t-i} + \varepsilon_t \tag{2}$$

where

$$I_t = \begin{cases} 1 & \text{for} & u_{t-1} \geq \gamma \\ 0 & \text{for} & u_{t-1} < \gamma \end{cases} \quad \text{or} \quad I_t = \begin{cases} 1 & \text{for} & \Delta u_{t-1} \geq \gamma \\ 0 & \text{for} & \Delta u_{t-1} < \gamma \end{cases}$$

and $\gamma=0$.

The set of two null hypotheses to be tested is as follows:

$$H_1: \rho_1 = \rho_2 = 0$$
$$H_2: \rho_1 - \rho_2 = 0$$

H_1 is for the case of no threshold cointegration then the Engle-Granger linear cointegration (Engle and Granger, 1987) is confirmed, while H_2 assumes a symmetric reaction, so that it is again the argument for linear cointegration. If the Enders and Siklos procedure indicates threshold type of cointegration around the long run equilibrium it means that the short run adjustment is asymmetric respectively for positive and negative changes. When the results of testing are not convincing, the reasonable solution is to ask about single variables that diversify the mechanism of a short run adjustment. Thus the second approach applied in the research is the model proposed by Kapetanios *et al.* (2006) and modified by Bruzda (2007). Having (1) unchanged the testing equation (2) is a subject of re-formulation in the form

$$\Delta Y_t = I_t \rho_1 u_{t-1} + (1 - I_t)\rho_2 u_{t-1} + \omega \Delta X_t + \sum_{j=1}^{p} \psi_{yj} \Delta Z_{t-j} + e_t \tag{3}$$

where indicator functions I_t remain the same as defined above and $\gamma=0$. The set of possible threshold variables is defined in the vector Z_t

$$Z_t = (Y_t, X_{1t}, X_{2t}, \dots, X_{kt})', X_t = (X_{1t}, X_{2t}, \dots, X_{kt})'.$$

This test can be extended by allowing for other than $ECM_{t-1} = 0$ and $\Delta ECM_{t-1} = 0$ threshold variables. Then the level of γ is subject of estimation where:

$$I_t = \begin{cases} 1 & \text{for} \quad Z_{t-i} \geq \hat{\gamma} \\ 0 & \text{for} \quad Z_{t-i} < \hat{\gamma} \end{cases} \quad \text{or} \quad I_t = \begin{cases} 1 & \text{for} \quad \Delta Z_{t-i} \geq \hat{\gamma} \\ 0 & \text{for} \quad \Delta Z_{t-i} < \hat{\gamma} \end{cases}$$

and:

$$-\infty < \hat{\gamma} < \infty \; ; \; \hat{\gamma} = arg \min_{\gamma} AIC(\gamma)$$

At the third stage we propose a new testing procedure based on the entire set of variables available in both: long run and short run equations. This procedure extends the set of possible thresholds and determines the way of their impact on the identification of periods of intense economic growth within observed sample (Gałecki and Osińska, 2019). The testing equation is given as

$$\Delta Y_t = I_t \, \rho_1 \, u_{t-1} + (1 - I_t)\rho_2 \, u_{t-1} + I_t \omega_1 \Delta X_t + (1 - I_t)\omega_2 \Delta X_t + \sum_{j=1}^{max\{p;q\}} I_t \psi_{1yj} \Delta Z_{t-j} + \sum_{j=1}^{max\{p;q\}} (1 - I_t)\psi_{2yj} \Delta Z_{t-j} + e_t \tag{4}$$

where all symbols are as in equation (3).

In model (4) the short term equations differ between the regimes taking both: a vector of explanatory variables and parameters' estimates. The advantage of such an approach is that in the final TECM different set of variables can act in different regimes having the long run relationship unchanged. To validate the results, Hansen and Seo test for threshold cointegration has been applied (Hansen and Seo, 2002).

4. Empirical Analysis

Despite of increasing critique, presented among others by Stiglitz, Fitoussi and Durand (2018), the real GDP growth rate is considered as a measure of economic growth. However it is generally accepted in a quantitative approach, in the case of Ireland the real GDP measure was a subject of questioning when its growth rate was much higher than it had been expected. It was due to the high FDI inflows from international companies located outside Ireland.

Thus a huge amount of money coming from profits earned in Ireland had been transferred to their 'mother' companies in the country of origin. It caused that the revised growth rate was much smaller than it could be expected observing GDP levels. For this reason it is commonly accepted to use the real Gross National Product (GNP) instead of the real GDP when Irish economy is studied.

In the case of Turkey situation is also complicated. The Turkish Statistical Institute recently released an unprecedented revision to its GDP series. The new series

produce an upward revision of the level of GDP by around 20 percent (for GDP in 2015), and consequently the increase in the real growth rate of GDP after 2009 by an average of 1.8% per year was observed. Meyersson (2017) provides the explanation of that fact. We used the revised time series data, observed yearly in 1980-2016. Due to relatively small number of observations we assumed two regimes in the observed path of economic growth, one corresponding to stable or accelerating growth and the other corresponding to decrease and recession. In the analysis both forms of data: levels and logs have been applied. The set of variables in interest is given in Table 1.

Table 1. *Variables used in the study (constant prices)*

Variable	Country	Description	Original unit
GNP	I	Hodrick-Prescott trend of real GNP	Billions euro, constant price
GDP	T	Hodrick-Prescott trend of real GDP	Millions USD, constant price
NI_EU_t	I	Net income from EU	Millions euro
EXR	T	Exchange rate	Turkish lira /USD
FDI_t	I,T	Foreign Direct Investment	Millions euro/USD
U_t	T	Unemployment rate	[%]
Emp_t	I	Employment	Thousands
PD_t	I,T	The Public Debt	[%] of GDP
$DeflGDP_t$	I,T	GDP deflator	[%] of GDP
I_t	I,T	Investments	[%] of GDP
N_Ex_t	I,T	Net Exports	Millions euro/USD
SR_t	I,T	Short-term interest rate	[%]
LR_t	I,T	Long-term interest rate	[%]
TFP_t *	I,T	Total factor productivity	Index, constant price
WB_l	T	Loans from the World Bank	Millions USD
IMF_l	T	Loans from the IMF	Thousands SDR

Note: The data were downloaded from http://www.economywatch.com/economic-statistics/country/Ireland/, http://www.cso.ie/en/statistics/, http://stats.oecd.org/ and Federal Reserve Bank of St. Louis, World Bank, International Monetary Fund, www.quandl.com/data. Letter I stands for Ireland and T for Turkey. *MFP_t was observed only in 1980-2011, thus replaced by TFP_t.

All the variables presented in Table 1 have been tested using Augmented Dickey Fuller test for a unit root (Dickey and Fuller, 1979). Structural breaks were also examined using both Andrews and Zivot test (Andrews and Zivot, 2002), and, Bai and Perron test (Bai and Perron 1998; 2003). Most of them exhibited one unit root and structural breaks in different periods of time. The detailed results were presented in Fałdziński (2019). In this part we present two types of the results:

First, is the original Enders and Siklos regression based on equation (2);

Second, is the best result from the estimation of equation (3) and equation (4).

Table 2. *Enders and Siklos test results based on equation (2).*

Country	Endogenous variable	Threshold variable	H1: ($\rho_1 = \rho_2 = 0$) p-value	H2: ($\rho_1 - \rho_2 = 0$) p-value	Decision
IRELAND	GNP	ECM(t-1)	0.0021	0.823	LR
	GNP	ΔECM(t-1)	0.0004	0.102	TH_C
	logGNP	ECM(t-1)	0.00005	0.137	TH_C
	logGNP	ΔECM(t-1)	0.00009	0.321	LR
TURKEY	GDP	ECM(t-1)	0.0011	0.479	LR
	GDP	ΔECM(t-1)	0.0014	0.496	LR
	logGDP	ECM(t-1)	0.0007	0.237	LR
	logGDP	ΔECM(t-1)	0.0011	0.351	LR

Note: *LR- linear relationship. TH_C – threshold cointegration.*

Enders and Siklos test indicated twice a threshold cointegration in the case of Ireland. Following the procedure of testing described in section three the eq 3 and 4 are employed for further analysis. The results for Ireland using eq 4 have confirmed a threshold type of cointegration with such threshold variables as NI_EU(t-2) with the threshold value of 1627.9 mln euro and Deflator GDP(t-3) with the threshold value 64.9 [% of GDP] – for levels. In the case of logarithmic data the threshold was net export i.e. d_logN_Ex(t-2) with the value 1.055 mln euro and d_ECM(t-1) equal to zero. Other variables that were considered as thresholds did not exhibit their significant presence in the nonlinear mechanism of GNP growth in Ireland.

As the case of Turkey has been considered the Kapetanios *et al.* approach (equation 3) allowed finding a wide set of possible thresholds for data taken in levels only. The extraction of respective results is presented in Table 3. In the case of Turkey it was not possible to indicate individual threshold variables in the TECM model defined in equation (4). However Hansen and Seo test allowed confirming several threshold variables such as ECM(t-1). d_ECM(t-1). I(t-1). d_I(t-5). TFP(t-1) and EXR(t-3).

Table 3. *Kapetanios et al. test results based on equation (3): The case of Turkey*

Threshold Variable	H0: ($\rho_1 = \rho_2 = 0$) p-value	H2: ($\rho_1 - \rho_2 = 0$) p-value	Decision
d_ECM(t-1)	<0.0000	0.0017	TH_C
d_TFP(t-2)	<0.0000	0.0000	TH_C
d_IMF_L(t-3)	<0.0000	0.0000	TH_C
d_WB_L(t-3)	<0.0000	0.0001	TH_C
Net Export (t-4)	<0.0000	0.0405	TH_C

DeflGDP(t-4)	<0.0000	0.0917	TH_C
d_DeflGDP(t-4)	<0.0000	0.0760	TH_C
d_PD(t-4)	<0.0000	0.0012	TH_C
LR(t-5)	<0.0000	0.0861	TH_C
WB_L(t-5)	<0.0000	0.0000	TH_C
d_N_Ex(t-5)	<0.0000	0.0142	TH_C
d_I(t-5)	<0.0000	0.0010	TH_C

In the case of Turkey the results are much more diversified implying different threshold variables to influence the regimes in levels. In the case of logs no thresholds were found. Hansen and Seo test results confirmed TECM or other threshold type regression for the following variables from Table 3: Net Export (t-4). DeflGDP(t-4). d_DeflGDP(t-4). LR(t-5). d_N_Ex(t-5) and d_I(t-5). For other cases a linear cointegration relation is suggested by the test. These findings are in line with the periods of economic and political instability of the country observed in analyzed period. Thus empirical findings for Turkish economic growth path confirm periodical successes that are possible but they were frequently based on investments financed from the external sources (IMF and WB loans).

The applied methodology allows calculating how often the economy exhibited accelerated growth rate. In the case of Ireland in 32.3% of the considered period exhibited accelerated growth. In the case of Turkey it covers only 2.9% of entire period. It should be noticed that the period 1980-2016 covers more diversified economic processes that it has been reported in Jerzmanowski (2006) so, the final results cannot be fully compared.

5. Conclusions

In the paper we examined the patterns of economic growth in two economies, Ireland and Turkey. A comparison of the two polarized examples enlightens the main institutional issues facing economic policy makers who intend to make their economies grow. By summing up we concluded taht Ireland started its reforms in the second half of the XXth century and it managed to place itself among the core European economies. After the era of "Celtic Tiger" between 1995 and 2007 it slowed down but it recovered quite fast after the recession of 2007-2009. On the other hand, Turkey is a very important developing economy located among G-20 countries with insufficient domestic capital and strong dependence from the election cycle which fastened its growth only in the beginning of the XXIst century. The comparison of the two cases provides the basis for interesting conclusions of both, theoretical and practical nature.

We applied a threshold error correction approach to find out determinants of intense economic growth in two completely different sets of institutions provided by two

example economies. We found this approach useful and valuable not only in the original version proposed by Enders and Siklos but also its modifications made by Kapetanios *et al*. (2006) and the one proposed in our study although limitations coming from insufficient number of observations in regimes can be noticed. All time series were examined for unit root and structural breaks. We obtained many results coming from different versions of tests which can be summarized as follows:

➢ The mechanism of economic growth in Ireland can be both linear or nonlinear and it depends upon the selected threshold. This implies the evidence of growth acceleration.
➢ Nonlinearity is implied by net income from the European Union deflator GDP and net export which in Ireland takes positive values.
➢ It has been confirmed that the long term export-led strategy with highly transformed and competitive products led in the framework of well-developed and stable economic institutions pushed Irish economy from periphery to the core.
➢ In the case of Turkey the results are much more diversified implying different threshold variables to influence the regime's change. However they rarely support the thesis about finding a reliable stable path of growth in the long run.

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