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**REGIMES IN ECONOMIC GROWTH IN BALKAN COUNTRIES**

*Key words: Economic Growth, Economic Theory, Markov Switching Modeling, Balkan Countries.*

***Abstract***

*The most usual concept of economic growth starts with the assumption of linear trend in the data series, mainly based on the “Solow” model growth pattern, characterized by linear trend in the data series. However, when big shocks happen such as pandemic, war or conflict, they seriously impact the growth patterns in the countries, causing big “tectonic” changes in growth processes in the countries. The impact is actually result of the tectonic movements in the main growth determinants such as physical capital, human capital or total factor productivity. This impact and its effects has been especially relevant in the case of Balkan countries, where dissolution of the former state, but also the consequent changers caused shifts in growth patterns. In this paper they are defined as growth regimes with specific changes in determinants for each regime. The main goal of this paper is to examine the determinants of GDP growth rate that diverts the growth pattern from some linear trend in the case of selected Balkan Countries. They are good example to test for regime switches in growth pattens due to the big shocks and adjustment happening in the course of last three decades such as dissolution of former state, structural changes in transition, wars, conflicts, Global Financial Crisis, Covid-pandemic. The results from Markov Switching VAR model suggest that the real economic activity experience regime shifts, characterised with specific determinants movements within the regime. Hence, the conclusion is that the possible nonlinear notion of economic growth should be further explored especially in the case of countries where big shocks cause big shifts in growth patterns.*

**Introduction**

Usually, growth analyses start with the assumption linearity implying only linear or trended movement in output growth and its relation with the explanatory variables in most of the studies of economic growth. This assumption when growth moves as variation around a single trend, which means that the variations are negligible and do not affect the linear trend in the data (Pritchett, 2000). However, in some cases, growth process can be better depicted by shifts in growth regimes due to its great instability over time*.* Even more so, this movement of growth process is caused by the switches in the main variables that determine the growth pattern, such as big shifts in capital, human capital and total factor productivity factor. This idea was supported by the findings of many scholars who called for specification of a nonlinear data generating process (Durlauf et al., 2004, Pritchett, 2000, Easterly et al., 2000). Still, there is no clear guidance with respect to the empirical specification of growth nonlinearities, or with respect to the variables that should be used to capture the big shocks.

Our approach is designed to fill this gap in the literature by introduction of a review of the literature of non-linear approach in the modified growth regression for Balkan countries. This group of countries represents a good candidate for non-linear modelling for several reasons: firstly, the output growth actually recorded was not genuinely linear. Additionally, the collapses recorded in the Balkan countries have a peculiar nature and causation and in most cases last much longer than the collapses characteristic for the recession phase of the business cycle in developed countries (Aquiar and Gopinath, 2004, Pritchett, 2000). Finally, Balkan countries experienced big shifts in the determinants of growth. Hence, Balkan countries are appropriate example to be used to test the regime switches since they have experienced big structural shocks especially in recent three decades.

1. **Theoretical background**

Jerzmanowski (2006) has built on Pritchett’s observations on growth regimes and he characterized various growth regimes and the countries’ transitions among them using a Markov-switching regression using cross-country data for 89 countries over a period of 1962-1994 on growth rates of output per worker from the Penn World Tables 6.1. He estimated four distinct regimes corresponding to four growth processes.

* A stable growth regime corresponds to the growth experience predominant among developed economies, with long-run average growth of about 2 per cent and low growth volatility.
* A stagnation regime is characterized by no growth on average and larger volatility of growth shocks. In this regime, periods of growth and decline occur but are not very persistent.
* He also identified a separate regime of one-time large shocks to growth, claiming that while these shocks tend on average to be negative reflecting economic crises, the dispersion is very large and positive shocks are possible. However, he found that these shocks have no persistence.
* Finally, he identifies a regime of fast, miracle-like growth with an average long-run growth of 6 per cent.

The specification he uses combines simple within-regime dynamics with transition probabilities, which depended on countries’ quality of institutions. The quality of institutions is measured by the index of government anti-diversion policies[[2]](#footnote-2) borrowed from Hall and Jones (1999). This index combines measures of rule of law, risk of expropriation, corruption, bureaucratic quality, and government repudiation of contracts. His results show that countries can switch among regimes of stable growth, “miracle” catch-up, stagnation and crisis with the transition probabilities determined by the quality of institutions. In his research, he offered the estimated transition probabilities to switch into certain regimes for four countries with various levels of quality of institutions, such as US, with the highest quality, Korea with high quality, Brazil intermediate quality and Nigeria with low quality of institutions. Better institutions appear to improve long-run growth by making episodes of fast growth more persistent. Low average growth rates in countries with weak institutions are a result of these countries spending more time in stagnation regimes rather than being incapable of fast growth at all. He argues that weak institutions do not rule out growth take-offs but limit their sustainability. Although focused on the institutions’ role in growth, Jerzmanovski’s approach was crucial for the empirical strategy in this paper because it motivated the idea of growth regimes and switches, while at the same time suggesting the Markov Switching Modelling as an appropriate technique for identifying breaks in data series.

In addition, many other studies on the East Asian episodes of growth illustrated the importance of neoclassical transition dynamics. Young (1995) provides a careful analysis of the historical patterns of output growth, factor accumulation and productivity growth in the newly industrializing countries of East Asia: Hong Kong; Singapore; South Korea and Taiwan. He claims that the East Asian growth miracles, characterized by unprecedented growth in output and manufacturing sector exports, were fuelled more by growth in labour and capital than by rising total factor productivity as many authors had asserted before. More precisely, he argues that expanding investment rates (particularly investment in machinery) accompanied by rising labour force participation rates, intersectional transfers of labour and improved levels of education are the main factors behind the growth miracle occurrences. In his paper, he offered detailed descriptive analysis of the data on two aggregate inputs, capital and labour[[3]](#footnote-3) and estimated their share in various sectors in the economies. Once he accounted for the dramatic rise in factor inputs, he arrived at the estimated total factor productivity growth rates for his case countries that are closely approximated by historical performance of many of OECD and Latin American economies. Hence, he concluded that the “neoclassical theory with its highlight on factors changes and its well-articulated quantitative framework, can explain most of the difference between the performance of the newly industrialized countries and that of post-war economies” (Young, 1995, p. 675).

As mentioned, many researchers have performed empirical tests for various factors that may have caused the variation of growth such as for example: De Melo et al. (1996 and 2001) Fidrmuc (2003), Havrylyshyn and Rooden, 2000, Fischer and Sahay (2000), Falcetti et al. (2002), Eschenbach and Hoekman (2006), Hamma et al., (2012) bringing forward several general conclusions.

The core variables that proved to be statistically significant in most of the studies are physical and human capital (Havrylyshyn et al., 1998). In most of the studies change in physical capital is proxied by the ‘Investment annual growth rate’ or the ‘Share of Investment in GDP’ (Iradian, 2007, Dragutinović-Mitrović and Ivančev, 2010, Mervar, 2002). In the case of developed countries studies this approximation holds because the depreciation rate in the physical capital equation is considered as constant and proved constant in the studies. However, in the case of Balkan countries, the depreciation rate was changing drastically in the course of transition especially at the beginning, which in turn suggests that the simple investment rate could not proxy the movements of the physical capital. This conceptual flaw is usually repeated in empirical studies. In addition, human capital is mostly measured by the secondary school enrolment, which again does not represent human capital as an augmentation to labour as in developed countries growth analysis (Mervar, 2002, Arandarenko, **2007)**. This is because in the case of Balkan countries, the basis that is the labour quantity was the one that drastically changed rather than its augmentation or quality.

1. **Problem of endogeneity in modeling instable economic growth**

One important source of endogeneity relevant for the dynamic systems econometric modelling, in particular, is simultaneity. Simultaneity arises when one or more of the explanatory variables and the dependent variable mutually determine one another (Wooldridge, 2000). In fact, simultaneity is the situation when the one-way causal relationship between the independent and dependent variable is accompanied by a backward causal relationship i.e. the dependent variable affects the independent variable, creating a two-way causal connection(s) among the dependent and independent variable(s) in the model. This situation is particularly relevant in the context of time series analysis of causal processes. Simultaneity occurs in dynamic models and systems where the variables, dependant and independent, are interconnected.

The possibility of mutual causation between determinants of growth and the growth of GDP has been already recognized in the growth literature (Mirestean and Tsangarides, 2009, Durlauf et al., 2008). Many authors have stressed that alongside the main relation – from the growth determinants - physical and human capital- to GDP growth, there is also a backward relation; that is:

* GDP growth is a determinant of the flow of investments and hence the physical capital flow (Jorgenson, 1963, Lucas and Prescott, 1971, Hall and Jorgenson, 1971, De Long and Summers, 1991); and,
* GDP growth is a determinant of employment and human capital development (Lucas, 1988, Barro and Lee, 2000).

Conventional economic thought has already established the relation between the growth of the economy and the *physical capital changes* in the concept of the accelerator effect. According to this conception, businesses will be encouraged to make new investments increasing the physical capital stock, determined by - among other factors - the expected profit rate; which in turn depends on the growth of the economy (Jorgenson, 1963). Broadly, rising GDP (in an economic boom or prosperity) implies that businesses expect increasing sales, cash flow, more efficient use of the capacity and rising profits, which would encourage further investment in physical capital such as equipment and improved technology (Hall and Jorgenson, 1967). The opposite happens in the case of falling GDP when businesses are reluctant to invest as they expect falling sales and a worsened economic environment. As business confidence falls, the discouraged businesses may lead to negative growth of the economy through the further destimulation of consumer incomes and purchases resulting in negative multiplier effects (Lucas and Prescott, 1971). Although mainly related to business cycle movements and the business cycle concept, the feedback relationship between GDP growth and physical capital growth has general economic relevance, because it is part of the reasons behind deeper recessions (Hall, 1993, Kornai, 1994). Namely, Hall (1993) found that the falling investment played a part in deepening recession. Explaining the vicious circle that developed in the course of the recession in United States in 1990-91, Hall (1993, p.5) concluded:

*Firms cut all forms of investment; again as they would if there had been some permanent adverse shock. As usual in a recession, firms cut production by more than their sales fell, making up the difference from inventories.*

In similar vein, Kornai (1994, p.54) found that the investment fall not only resulted from the fall in economic activity, but also contributed to the whole recession, as “…the investment activity was completely paralyzed in certain periods of negative economic growth”.

The economic literature also documents the two-way relationship between GDP growth and changes in the labour market (employment growth and human capital development). Namely, economic growth is not only determined by the labour and human capital among other factors, as discussed by the endogenous growth theories (Lucas, 1988, Barro and Lee, 2000); but also economic growth causes changes in the employment and human capital in an economy (Hull, 2009, Satchi and Temple, 2006). Although it is not always clear how economic growth translates into labour market outcomes, in general, the literature suggests that positive economic growth exerts two main effects on labour markets: firstly, it stimulates job creation or employment increase (changes in the quantity of labour); and, moreover, it stimulates human capital development (changes in the quality of labour)[[4]](#footnote-4). The first effect is usually measured by the employment intensity of economic growth that is the growth in employment resulting from the growth in output (Hull, 2009). High employment intensity indicates that growth in output leads to considerable job creation, while low estimates of employment intensity suggest little correlation between economic growth and employment. The latter case is usually referred to as a “jobless recovery”, which can happen due to a variety of situations (Glosser and Golden, 2005). Namely, in some cases, economic growth favours increase in labour utilization rather than increase the number of jobs. This is especially emphasized in the eve of recessions, when companies are more reluctant to hire new workers until they are convinced about the sustainability of a new economic recovery (Glosser and Golden, 2005). Finally, another possibility is that companies employ new technologies and high-skilled labour resulting in increased productivity instead of mass job creation. In the latter case, the effects are related to improving the labour quality that is human capital development instead of increase in employment (Hull, 2009). In the opposite case of negative economic growth, the relation between the economic decline and labour market outcomes is again confirmed; with prompt or lagged conversion of economic downturn into increase in unemployment and negative impact on human development (Maddison, 1987).

Although brief, the above discussions suggest that economic growth measured by the GDP growth affects the two main determinants of growth, thereby implying the problem of endogeneity in the empirical model. This is an important empirical problem that results in biased regression coefficients; hence, the results of the single equation regime switching regressions undertaken in the course of this research are not reported. Instead, in order to address the possible mutual determination of the dependent and independent variables, the Markov Switching Vector Autoregressive (MSVAR) model can be applied in modelling of GDP growth dynamics in the course of big shocks. The MSVAR system addresses the problem of endogeneity as it allows modelling a system whereby each potentially endogenous variable is regressed on lags of all other potentially endogenous variables subject to the switch. In addition, this methodology has several other advantages: it not only allows for the inclusion of variables that are endogenous in a statistical sense, but it also encompasses the dynamic relationships among the variables and, also, the dynamic evolution of the growth process we are interested in. All of these - modelling the dynamics of growth as switching regimes and incorporating endogeneity - are issues of particular relevance to growth analyses that have been rarely considered jointly and, to our knowledge, have never been considered jointly in studies of growth, especially in the case of big shocks. Hence, the following analysis attempts to fill this gap in the growth literature.

The following approach is designed to fill this gap in the literature by introduction of a non-linear approach in the modified growth regression for Balkan countries.

1. **The modeling procedure**

The merger of Markov switching models with the empirical regression seems a reasonable next step in the model construction. As a result, the main formula to be estimated gets the following form:

Equation 1 ,



whereby, *t –* is the time subscript,is the GDP growth rate, is the fixed physical capital growth rate, is the growth in employment, and are the coefficients on the variables (dependant on *st*) and *ut* is the error term dependant on *st*. The constant term α0 captures technological progress which is a sufficiently broad concept to include the effects of shocks to human capital  and is also dependant on the specific regime (*st*).The term (*st*) designates the specific regime in which the system exists. The equation relates the output growth in each regime with the growth rates of capital, labour and technical change specific for a certain regime.

This approach identifies the regime classification in the growth process in each country, based on the information on the output changes *∆Y (GDP*), and on the information on the main determinants of output growth. This fusion should shed some new light on the contributions of various ingredients of growth in the different identified phases of transition or different regimes in the countries under analysis. As mentioned, one additional advantage of this framework is the fact that it enables the constant term of the “Solow residual” to be interpreted differently, depending on the conditions in the real economy. The authors from the endogenous growth strand of the literature give additional theoretical content to the Solow residual, arguing that it reflects not just technology but resource endowments, climate, institutions, social capital, macroeconomic policy and so on and hence it may differ across countries (Mankiw et al. 1992, Barro, 1996a, Barro, 1996b). Due to all the different conditions, the various countries use their existing resources with diverse degree of efficiency. In addition, countries’ capacity for developing or adopting new technology differs greatly depending on the institutional arrangements and the organization of the society (Abramovitz and David, 1994). Empirically, the extended interpretation of the Solow residual offers the appealing possibility of negative changes in the Solow residual. Namely, even in the neoclassical context of freely available technology, the possible technological regress in one country instead of progress can be attributed not only to the developments in the technological sphere but also to the developments in the human and social capital, such as inadequate education and skills, undeveloped institutions, legal and regulatory barriers and macroeconomic instability (Parente and Prescott, 1994, Howitt and Mayer-Foulkes, 2002, Fischer, 1993).

As mentioned above there is some potential endogeneity of the variables used in Equation 1. The endogeneity stems from the interrelation of the determinants within the system and needs to be taken into account in the empirical modelling. In order to resolve endogeneity in the MS regression, Krolzig (1998) developed the MS methods in the context of vector auto-regressions (MS-VAR)(Krolzig, 1998; Krolzig and Toro, 2001). These are standard VAR models, whereby some or all of the interrelated parameters are allowed to switch when the regime changes. The most general form of the MS-VAR process is the following:

Equation 2 

Where  is an -dimensional transposed vector,  is the vector of intercepts, are the matrices with the autoregressive parameters and  is the white noise vector process () and all can be dependent on the switching variable . In general, MS-VARs appear in a variety of specifications depending on which variables are allowed to switch. By allowing the potential determinants of the switch to interact in a dynamic framework, the issue of endogeneity as explained above arising from the potential simultaneity of the relationship between GDP growth and the accumulation of both capital and labour is addressed.

In our research, the empirical model will be defined in a reduced form vector-autoregressive model:

Equation 3 

where  is our three-dimensional vector comprised of: GDP annual growth rate, ; gross fixed capital annual growth rate proxied by the annual electricity consumption growth rate; and employment growth rate ,;  is a vector of exogenous variables which could enter contemporaneously or with a lag, but is not mandatory;  is the vector of intercepts,  and  are the matrices containing the autoregressive parameters and  is the white noise vector process ().

In this research data on GDP growth rates, annual electricity consumption growth rate and employment growth rate for Balkan countries are taken from the World Development Indicators.

# Interpretation of the results

This aprt will condense the results of the empirical analysis into one Table, in order to extract additional information and to draw some general conclusions.

The table reports the estimated coefficients, that is the results for the DY vector, i.e. annual GDP growth rate, where

* + the constant term captures the so-called Solow residual or change in the GDP growth rate due to systematic changes not captured in the model variables;
  + DY\_1 captures the impact of the past GDP growth rate on the contemporary GDP growth rate;
  + DE\_1 captures the impact of the past employment growth rate on the contemporary GDP growth rate;
  + DC\_1 captures the impact of the past physical capital growth rate on the contemporary GDP growth rate; and,
  + SE measures the standard error, which in this case is the indicator for measuring the volatility of the GDP growth rate variable.

The regime switches and changes that happened in the GDP growth rates, are of primary interest, hence the focus will be on these results. The results on DE and DC show the dynamics and regime switches for the Employment and Physical capital growth rates, but these are not our primary interest.

Table 1 The results from the MSM analysis DY (GDP annual growth, in per cent)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Country | Constant 1  (1) | Constant 2  (2) | Constant 3  (3) | DY\_1  (4) | DC\_1  (5) | DE\_1  (6) | SE  (7) |
| Bosnia and Hercegovina†† | -1.62\*\*\* | 2.59\* |  | -0.44 | 0.73\*\* | -0.81\*\* | 1.29 |
| Serbia | -11.01\* | 3.64\*\* | 6.87 | -0.31 | 0.80\*\* | -0.16 | 2.84 |
| North Macedonia | -3.98 | 1.03\*\* | 3.98\*\* | 0.42 | -0.05 | -0.01 | 1.10 |
| Croatia† | -5.79\* | 4.20 | 5.98\*\* | 0.64\* | 0.97\* | -0.93\*\*\* | 2.95 |
| Albania | -10.92 | 5.85\* | 10.33 |  | 0.09 | -1.35\*\*\* | 4.14 |

Note: \*-marks 1% level of significance, \*\*-marks 5% level of significance and \*\*\*-marks 10% level of significance.

† - part of EU now, however, shared similar past to ex- Yu countries.

†† - for BiH the data series are shorther, hence only two regimes could be identified.

As the table shows, the MVAR analysis confirms the idea of the non-linear growth hypothesis and reveals that Balkan countries for which the model could be estimated have experienced various regime switches. This estimation procedure reveals some of the features of each regime in each group enriched by the additional information on the added variables – physical capital and labour and Total factor productivity term.

The technical progress changes (column 1) in sign and sizes are similar to the mean GDP growth rates in the countries, suggesting negative changes and ‘technical regress’ in the first regime and positive changes or ‘technical progress’ in the next two regimes, with the third regime experiencing the highest positive changes.

Namely, the once-lagged GDP growth rate (DY\_1) is statistically insignificant, which is an unexpected outcome as usually the GDP growth processes is described as an autoregressive processes. However in the case of Balkan countries where big switches in GDP growth rates from one to another in successive year were experienced, this result is perhaps not surprising.

The once-lagged Employment growth rate (DE\_1) has a negative and statistically significant impact, according to the results. This is rather counterintuitive, since it implies that the decrease in employment should lead to increase in GDP growth rates. However, there are two possible lines of argument peculiar to Balkan countries that may explain this atypical effect:

Firstly, in the course of transition, the actual increase of economic activity was achieved parallel with the decreasing of the employed labour force as the actual data of many countries on GDP growth and employment growth shows. In fact, in early transition, as a result of the over employment specific for socialism, the reduced employment did not reduce the output, because reduced employment was part of a process of dramatic structural change, hence of reallocation of resources that – even at a constant technical level – enabled productivity growth sufficiently large to increase output. In addition, the reduced employment reduced the wages’ bills for the firms, releasing extra funds for raise in the production. Both lines of argumentation fit better the early rather than the later transition, which would suggest that in the estimated coefficient dominates the effect of the early transition. In fact, the estimated coefficient aggregates different effects as it was not allowed for it to switch across various regimes[[5]](#footnote-5); however in this case it is capturing mostly the effects of the early transition rather than the later. Namely, in this case, our employment growth variable may be acting as a proxy for productivity-enhancing structural change. Unfortunately, data limitations, and the corresponding limitations on the richness of our model, preclude further investigation of this possibility.

The second explanation is empirical but is related to the one given above, i.e. to the economic explanation. Namely, the whole interpretation of the results needs to be observed in a system in which everything depends on everything, since everything is modelled in a small VAR system. Further investigation would lead to impulse response analysis that cannot currently be performed in the context of our MS-VAR model. In addition, the employment and GDP dynamics are not the focus of our research.

Finally, the once-lagged Gross Fixed Capital growth rate (DC\_1) impact on the current GDP growth rate is positive and statistically significant. Every increase in physical capital by 1 percentage points in the past year will result in increase in the contemporary GDP growth rate by 0.73 percentage points in BiH, 0.80 percentage points in Serbia and 0.98 percentage points in Croatia. This effect is in accordance with the literature findings.

1. **Conclusion**

One general conclusion that can be made with great certainty is that the MVAR analysis does confirm the notion of non-linearity of GDP growth in the course of transition. In addition, it confirms the existence of three regimes and they can be identified when other variables are included in the analysis.

Thirdly, the size of the estimated constant coefficients in the multivariate analysis reveals a huge impact of the ‘technical progress’ or Solow residual on GDP growth rates in the various regimes, with it being the most prominent and positive in the third regime. Again, this is confirmed by the growth theory that suggest that move into higher regime will come as a result of the moving of the country among various balanced growth patterns different by their specific level of technology.

Finally, as mentioned, the results of the multivariate MSVAR analysis does not point directly to particular policies, but it does have profound implications for analysis and, hence, indirect implications for policy. Namely, the peculiar breaks of growth in the course of growth in Balkan countries should be considered both - theoretically and empirically - at the early stages of future research and corresponding policy formulation, as they might drastically change the approach and, hence, the results and conclusions.

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1. Faculty of Economics - Prilep, University St. Kliment Ohridski - Bitola [↑](#footnote-ref-1)
2. In general, the anti-diversion policies in Hall and Jones’ model (1999) are the policies that encourage productive activities such as the accumulation of skills or the development of new goods and production techniques in the society, and discourage predatory behavior such as rent-seeking, corruption, and theft. [↑](#footnote-ref-2)
3. Young (1995) divided capital input in five categories: residential buildings, non-residential buildings, other durable structure, transport equipment and machinery; while labour is distinguished into seven categories on the basis on sex, age and education. [↑](#footnote-ref-3)
4. Indeed the impact and the effects of the interrelations depend on many factors studied in the literature, such as: the level of development of the country, the type of growth, the level of urbanization of the country, the labour market characteristics such as its sectorial structure, the share of informal sector, labour income and so on (Satchi and Temple, 2006). [↑](#footnote-ref-4)
5. Switching lagged variables would burden additionally the otherwise overburdened models. [↑](#footnote-ref-5)