

Validity of Balanced Growth: Evidence from Turkey

Mehmet Çınar*

Sema Ay**

Abstract

One of the central hypotheses of neoclassical growth literature is the balanced growth hypothesis, which predicts that output, consumption and investment grow at the same rate. Empirically, this implies that consumption and investment must be cointegrated with output. This paper investigates these implications with respect to Turkey, using unit root tests and co-integration techniques. We find that the long-term growth path of Turkish economy is consistent with the balanced-growth hypothesis without a significant structural break.

Keywords

Great ratios , balanced growth , unit roots , co-integration , endogenous structural breaks

* Assoc. Prof. Dr., Uludağ University, Faculty of Economic and Administrative Sciences, Department of Econometrics - Bursa/Turkey
mcinar@uludag.edu.tr

** Assoc. Prof. Dr., Uludağ University, Vocational School of Social Sciences, Department of Foreign Trade - Bursa/Turkey
semay@uludag.edu.tr

1. Introduction

Searches for a long-term consistent and sustainable growth rate led to the development of different growth patterns. Differences in growth between countries are due to differences in growth policies working through different channels. Part of the politics focus on their impact on the economy's capital intensity—the stock of machines, equipment and buildings. Another part of the politics focus on their impact on the economy's technology that multiplies the efficiency of labor.

Solow's neoclassical growth model is regarded by economists as the standard growth model. Solow's model states that the fundamental way to achieve growth is to increase technology. The Neoclassical (Solowian) growth model contrasts with the Harrod-Domar model, in which growth is unstable and is not affected by the labor factor. One of the central hypotheses of neoclassical growth literature is the balanced growth hypothesis, which predicts that output, consumption and investment grow at the same rate.

This paper investigates the extent to which the balanced growth hypothesis is applicable to the development of the Turkish economy in the period of 1987-2009. During this period Turkey underwent financial liberalization, major economic crises and a Customs Union with the European Union. Whether the time series properties of Turkish national per capita output, consumption and investment properties are consistent, in whole or in part, with the balanced-growth predictions of the neoclassical growth model in this period will be examined. Additionally, while considering the question "Does the level of development affect the evidence for balanced growth?" the sensitivity of the conclusions to the inclusion/exclusion of a structural break will be evaluated to investigate the major economic events of the late 1980s.

The rest of the paper is organized as follows: Section 2 discusses the theoretical considerations; Section 3 is the literature review. The econometric methodology is described in Section 4. The data and empirical analysis are presented in Section 5 and Section 6 is the conclusion.

2. Theoretical Considerations

The balanced growth hypothesis has focused on balanced growth paths. On such paths, an economy's endogenous variables grow at constant, though not necessarily equal, rates; factor shares and the interest rate are constant, as is the capital output ratio. In particular, from the economy's resource constraint, according to which the sum of consumption and investment is limited by output, it follows that consumption, investment and output share the same steady-state growth rate. If these economic aggregates grow at the same rate, their ratios must be constant or stationary over time, implying that both consumption and investment must be co-integrated with output (Klein and Kosobud 1961, Ando and Modigliani 1963). It is forecasted that if the economy is on this path, it will grow along this path. And it is forecasted that if the economy is not on the balanced growth path, then it will head toward that path. The future economy of a country in the balanced growth path will always be a scaled-up version of today's economy and the thesis that the economies of developing countries converge with the economies of developed countries holds some weight.

On the other hand, according to Romer's (1986) endogenous growth theory, technology along with R & D and human capital are an essential element of economic growth. According to Romer's (1986)'s endogenous growth theory, the external dynamics of the internal dynamics are mobilized and with these dynamics, harmony will occur when sustainable growth is defined (Romer 1986: 1002-1037). Furthermore, the steady state depends on the production of knowledge transferred to the share economy by the total stock of human capital. In this regard, the liberalization of foreign trade and economic integration, particularly with countries rich in human capital, is expected to be favorably influenced by the growth process (Romer 1996: 4-13, Aghion and Howitt 1998: 5-12). Even though this does not change the total resource stock of the two countries, the citizens of both countries benefit from each other's knowledge and the expertise of stock, specialization and positive economies of scale arise (Rivera-Batiz and Romer 1991a, 1991b).

The balanced growth hypothesis is tested by two different approaches. The first of these is a univariate analysis of the difference between consumption ($c_t - y_t$) and investment with an output gap ($i_t - y_t$). These differences are referred to in the literature as the "Great Ratio".

If the great ratios of consumption of and investment in output are constant along the steady-state growth path, both the difference between the logarithm of consumption and the logarithm of output, $(c_t - y_t)$ and the difference between the logarithm of investment and the logarithm of output, $(i_t - y_t)$ become stationary processes. If the great ratios are stationary in this analysis, it is concluded that the balanced growth hypothesis is valid.

In the second approach, each of the three variables are dealt with one by one, and with co-integration analysis, it is tested whether the variables move together on a long-term basis. Where restrictions are imposed on the Vector Error Correction model (VECM), if we found that the co-integrating regression parameters are equal to constraints, then the conclusion is that the balanced growth hypothesis is valid. This situation can be shown as follows.

If the logarithms of output, consumption and investment behave as random walks or integrated processes of order 1, stationarity of the great ratios, in turn, implies two linearly independent co-integrating vectors and thus the following matrix of co-integrating vectors when the variables are ordered c_t, i_t, y_t (For details, see Kemper, Herzer, Zamparelli 2010).

$$\beta' = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & -1 \end{bmatrix} \quad (1)$$

In our study, the second approach is used. For the co-integrating vectors to imply “balanced growth”, there should be no trend in the co-integration space (Li and Daly 2009). These restrictions can be tested within the Johansen (1995) framework or alternatively by directly assessing the stationarity of the ‘great ratios’.

3. Literature Review

Kuznets’ (1942) study of the macroeconomic aggregates of the USA during that country’s period of industrialization led him to posit a long-run constancy in the ratio of savings to income. Klein and Kosobud (1961) applied more formal trend fitting methods to Kuznets’ data and concluded that some of the ‘great ratios’ were constant, but others, including savings/income, actually possessed a slight trend. At the same time Kaldor (1961)

posited a number of constancies, but did not include the savings/income ratio, as “stylized facts” of the growth process.

Their conclusion, however, has been questioned by Neusser (1991) who, by applying unit root and co-integration tests to time-series data for Austria, Canada, Western Germany, Japan, the United Kingdom (UK) and the United States (US), finds clear evidence in favor of the balanced-growth hypothesis solely for the US. Mills (2001) uses the technique of generalized impulse response functions as well as Johansen’s method for estimating co-integration rank and finds evidence to support the stationarity of the ‘great ratios’ for the UK during the post-war period.

On the other hand, Kunst and Neusser (1990), using Johansen’s method, strongly reject the hypothesis of stationary ‘great ratios’ for Austrian data. Serletis (1994) does not find any evidence of stationary ratios in a multivariate analysis of Canadian data (1929–1983). Furthermore, Serletis and Krichel (1995) do not find evidence from OECD and G7 countries, respectively, to support the hypothesis of balanced growth. This conclusion is in line with the results by Harvey et al. (2003), which reject the balanced growth hypothesis for Canada, France, Germany, Italy, Japan, the UK and the US. Harvey (2003), in a unit root and co-integration analysis for this country concludes that their findings are generally not consistent with balanced growth.

A common feature of these studies is the assumption that the determinants of the steady-state consumption and investment ratios are constant for the period of consideration. Other studies consider the possibility of structural breaks in these determinants, thereby finding more evidence for the balanced-growth hypothesis. Clemente et al. (1999), for example, argue that the evidence against balanced growth is less convincing when the possibility of structural breaks is considered. Clemente et al. (1999), analyzes the stationarity of the great ratios of consumption and investment to output for 21 OECD countries and find that allowing for one or two structural breaks substantially increases the number of rejections of the unit-root null hypothesis. Specifically, their unit-root test results suggest that the two ratios are stationary for Australia, Austria, Canada, Denmark, Finland, Portugal, Spain, Sweden, Switzerland and the US. Meckl (2002) analyzes structural adjustment by disaggregating the final-goods sector of

a standard research-driven growth model and generalizing the concept of a balanced growth path to explain that the balanced-growth behavior of aggregate variables is indeed consistent with a massive change in the sectoral composition of the economy.

Attfield and Temple (2006) examine the balanced-growth hypothesis for the US and the UK. Using co-integration analysis with structural breaks, they find the co-integrating vectors predicted by theory for both countries. Similarly, Li and Daly (2009) apply unit root and co-integration tests to time-series data for China. Allowing for a structural break in the late 1970s, they find evidence of balanced growth in the pre-break period. Finally, Kemper et al. (2010) examines whether the great ratios are stationary for Germany. They find that the long-run growth path of the German economy is consistent with the predictions of the neoclassical growth model if they allow for a structural break associated with the worldwide slowdown in productivity at the beginning of the 1970s.

In the light of the mixed empirical results in the literature, we are motivated to examine the empirical support for the balanced growth hypothesis in Turkey as a developing country. Turkey is an interesting example because of its economic liberalization since the 1980s, membership in the Customs Union with the EU and the differences in development between the regions considering the economic crises noted in earlier examinations of the evidence for balanced growth.

4. Econometric Methodology

The paper aims to determine the validity of the balanced growth hypothesis in Turkey. For this purpose, we used Johansen's (1995) multivariate co-integration analysis. The methodology to perform co-integration tests between two or more series first requires a determination of the order of integration for each variable in a model. We use the Augmented Dickey-Fuller (ADF) (1979) and Phillips-Perron (PP) (1988) tests to identify the order of integration.

Dickey and Fuller (1979, 1981) developed a test for unit roots, which, based on approximation auto-regression or moving average form, are assumed to be $\varepsilon_t \sim \text{iid}(0, \sigma_\varepsilon^2)$. However, most of the time, this assumption

is not required for the validity of the Dickey-Fuller tests. If there is evidence of nonzero autocorrelations of ε_t , the lagged terms of y_t which must be added by the time ε_t will have become white noise. This approach is attributed to the Augmented Dickey-Fuller tests (ADF). Here we used alternative strategies criteria for selection of maximum lag length (Ng and Perron, 1995). If the order of the model's lag length is not defined correctly, its estimating parameters will be biased. We can use strategies for selection of the truncation lag such as the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and the general-to-specific or specific-to-general approach. If y_t indicates the time series, such as current account deficit or budget deficit, the ADF (p) regression can be defined with the frame of a pure time series as follows:

$$y_t = \mu + \beta t + \delta y_{t-1} + \sum_{j=1}^p \alpha_j \Delta y_{t-1} + \varepsilon_t \quad (2)$$

Where ε_t white noise and the process are is performed with $iid(0, \sigma_\varepsilon^2)$. The value of p can be determined using different strategies, such as the Akaike Information Criteria (AIC) and the Schwarz Information Criteria (SIC) from general-to-specific or specific-to-general (Ng and Peron 1995, pp. 268-281).

The second motivation for an alternative unit root test is to allow for the disturbance process, ε_t , which is not $iid(0, \sigma_\varepsilon^2)$. Phillips-Perron adapted and generalized the Dickey-Fuller tests to situations where, for example, the ε_t are serially correlated, other than by augmenting the initial regression with lagged dependent variables as in the ADF procedure (Phillips and Perron 1988, pp. 335-346). Their approach is nonparametric with respect to nuisance parameters and thereby allows the use of a very wide class of weakly dependent and possibly heterogeneously distributed data. The Phillips-Perron versions of the Dickey-Fuller tests are flexible, in that the serial correlation between disturbances can be of an autoregressive or a moving average form.

The correction term of Phillips and Perron (1988) can be shown using the following forms:

$$Z_\alpha = T(\hat{\phi}_1) - CF \quad (3)$$

where CF is a correction term and calculated follows:

$$CF = \frac{0.5(s_{T\ell}^2 - s_\varepsilon^2)}{\sum_{t=2}^T (y_{t-1} - \bar{y}_{-1})^2 / T^2} \varepsilon_t .$$

Where lag length must be $\ell = o(T^{1/3})$ for consistency of parameter. However, where the autocorrelations of ε_t are predominantly negative, the Philips-Perron tests suffer severe size distortions, with the actual size being much greater than the nominal size. When this distortion in size is corrected for, it appears that the Philips-Perron tests provide more explanatory power than the ADF tests (Schwert 1989: 147-160).

Ng and Perron (2001) developed four statistical tests by utilizing GLS de-trended data sets. These proposed tests are based on previously developed unit root tests, to improve their performance in terms of size and power. The calculated values of these tests are based on the forms of Philip-Perron (1988) regarding Z_α and Z_t statistics, Bhargava (1986) regarding R_1 statistics, Elliot, Rotherberg and Stock (1996) regarding the best optimal statistics. The terms are defined as following (see Ng and Perron 2001 for further details):

$$MZ_\alpha = Z_\alpha + (T/2)(\hat{\phi}_1 - 1)^2$$

$$MZ_t = MSB * MZ_\alpha \quad (4)$$

$$MSB = (T^{-2} \sum_{t=1}^T Y_{t-1}^2 / s^2)^{1/2} \quad (5)$$

$$MPT = \left[\bar{c}T^{-2} \sum_{t=1}^T \tilde{Y}_{t-1}^2 - \bar{c}T^{-1} \tilde{Y}_T^2 \right] / s_{AR}^2 \quad (6)$$

$$MPT = \left[\bar{c}T^{-2} \sum_{t=1}^T \tilde{Y}_{t-1}^2 - \bar{c}T^{-1} \tilde{Y}_T^2 \right] / s_{AR}^2 \quad (7)$$

A problem common with the conventional unit root tests, such as the ADF, PP and Ng-Perron tests, is that they do not allow for the possibility of a structural break. Assuming the time of the break as an exogenous phenomenon, Perron (1989) showed that the power to reject a unit root decreases when the stationary alternative is true and a structural break is ignored.

The Bai-Perron (2003) procedure allows testing endogenously for the presence of multiple structural changes in an estimated relationship and has a number of advantages over previous approaches. In particular, the underlying assumptions are less restrictive, confidence intervals for the break dates can be calculated, the data and errors are allowed to follow different distributions across segments and the sequential method used in the application allows for the presence of serial correlation in the errors and heterogeneous variances across segments. Bai and Perron (2003) suggest several statistics to identify the break points (see Bai and Perron 2003):

- The SupFt (k) test, i.e., a sup F-type test of the null hypothesis of no structural break versus the alternative of a fixed (arbitrary) number of breaks k.
- Two maximum tests of the null hypothesis of no structural break versus the alternative of an unknown number of breaks given some upper bound, i.e., the UDmax test, an equal weighted version and the WDmax test, with weights that depend on the number of regressors and the significance level of the test.
- The SupFt ($\iota+1|\iota$) test, i.e., a sequential test of the null hypothesis of ι breaks versus the alternative of $\iota+1$ breaks.

Once the order of integration is determined, the next important task is to perform tests for co-integration between the two series to identify any long-term relationship. The concept of co-integration is a powerful one because it allows us to describe the existence of an equilibrium, or stationary, relationship among two or more time series, each of which is individually non-stationary (Granger and Mizon 1993).

For a bivariate system, Engle-Granger (1987) developed a test to identify a co-integrating relationship between the two series. The Engle-Granger residual-based tests for co-integration are simply unit root tests applied to the residuals. However, the results obtained from a single equation procedure may be sensitive to the choice of independent variable. This problem can be overcome by using both variables as dependent variables alternately. Johansen's (1995) approach accepts that all variables in the model are endogenous. The test uses the maximum likelihood method to determine the exact number of co-integrating vectors in the system. This approach considers an m-dimensional vector auto-regression (VAR) that

can be written as a conventional “error correction” model:

$$\Delta y_t = \Gamma_0 + \Pi y_{t-k} + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \quad (8)$$

Where y_t is a vector of m variables, Γ_0 are the deterministic drift and ε_t is a vector of Gaussian random variables. The vector of constants Γ_0 allows for the possibility of a deterministic drift in the data (Thornton 1998: 514). The matrix Π is called the long-run impact matrix and it contains information about the long-run relationship between variables. When $0 < \text{rank}(\Pi) = r < m$, Π can be written $\Pi = \alpha\beta'$, where the elements of the α matrix are the adjustment coefficients and the β matrix contains the co-integrating vectors – the trace statistic (λ_{trace}) and maximum eigenvalue (λ_{max}) statistic. These test statistics may be compared with the appropriate critical values provided by Osterwald-Lenum (1992) (Baharumshah 2004: 394). In Equation (6), we use the Akaike Information criterion (AIC), Schwarz’s Information Criterion (SIC) and the Lagrange Multiplier (LM) to determine the optimal lag length.

5. Data and Empirical Results

The raw data used in this study are those of GDP, final consumption expenditure, gross fixed capital formation, consumer price index and population between 1987 and 2009. The data are from the *International Financial Statistics* of the International Monetary Fund. The variables of interest in this study are real per capita GDP, real per capita consumption expenditure and real per capita fixed capital formation at the national levels. These variables are constructed as follows. First, the provincial series for GDP, final consumption expenditure and gross fixed capital formation are converted from nominal to real units via division by consumer price index. The national aggregation is performed on the provincial population data in order to construct a series for real per capita output (y), real per capita consumption (c) and real per capita investment (i) at the national levels.

All data are annually reported and cover the period from 1987 to 2009, implying that our analysis includes 23 annual observations ($T = 23$). Indeed, quarterly series are also available but only for a shorter time period. However, because the power of unit root and co-integration tests depends

far more on the time span than on the number of observations (Shiller and Perron 1985, Hakkio and Rush 1991, Lahiri and Mamingi 1995), we have chosen to use annual data.

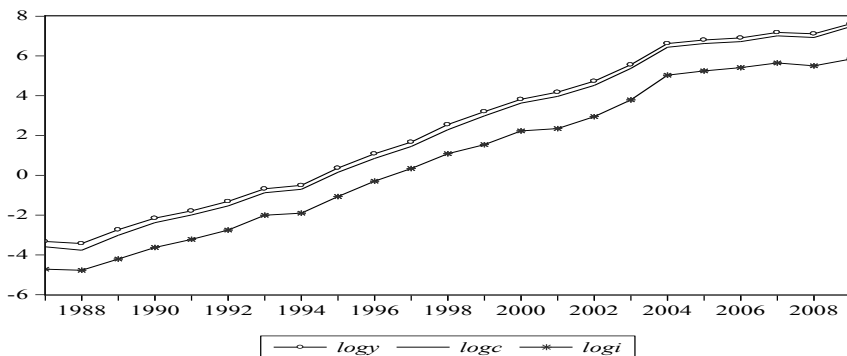


Figure 1: *logy, logc and logi during 1987–2009*

In this section, we examine the time series properties of these per capita series at the national levels. Figure 1 shows that over time the three variables, in logarithms: *logy*, *logc* and *logi*, have increased at the national levels of aggregation.

Figure 1 shows the time series plot of *logy*, *logc* and *logi* for Turkey from 1987 to 2009. On the basis of graphical inspection, the three aggregates seem to share similar trend tendencies. We would like to test more formally whether the series share a common stochastic trend, as is implied by the balanced growth conclusions of the stochastic neoclassical growth model.

5.1 Unit Root Tests

In this section, we present the results of the unit root tests. Table 1 shows the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Ng-Perron (2001) tests results. Since the ADF test results are very sensitive to lag lengths, Hatemi-J and Irandoust (2000: 358) are followed; a combination of Akaike’s Information Criterion (AIC), Bayesian Information Criterion (BIC), the likelihood ratio (LR) test and finally, diagnostic testing is used to select the optimal lags required in each case. The numbers of lags are

determined by the AIC, BIC and LM tests.

ADF test results indicate that all series are non-stationary and the first differences of the series are stationary.

Table 1: Time Series Unit Root Tests Results

Variables	ADF ¹	PP ²	Ng-Perron ³			
	Delta	Delta	MZ _a	MZ _t	MSB	MPT
Levels						
<i>logy</i>	-0.5688 (0)	-0.5580	-4.394	-1.289	0.293*	5.848*
<i>logc</i>	-0.5454 (0)	-0.5409	-3.711	-1.158	0.312*	6.627*
<i>logi</i>	-0.6697 (0)	-0.6553	-4.921	-1.388	0.282*	5.349*
First differences						
<i>logy</i>	-4.2491*** (0)	-4.2465***	-8.579**	-2.061**	0.240**	2.892***
<i>logc</i>	-4.4931*** (0)	-4.4704***	-8.470**	-2.040**	0.241**	2.955***
<i>logi</i>	-4.1108*** (0)	-4.1182***	-9.133**	-2.136**	0.233**	2.682***

Notes:

¹ The ADF test for all unemployment series; models include constant terms.

² The PP test for all unemployment series; models include constant terms.

³ While in the MSB and MPT tests the null hypotheses are stationary, in the MZa and MZt tests are non-stationary.

*** Significant at the 1% level, ** significant at the 5% level, * significant at the 10 level%

The Phillips-Perron test results are applied under the lag length $\ell = o(T^{1/3}) \cong 2$. The results of the Phillips-Perron test show that all of the unemployment series include unit roots. If we take the first differences of the series, we find that the series are now stationary. Lastly, the Ng-Perron unit root tests shows that the all of the three series appear to be non-stationary I (1).

We observed that the logy, logc and logi include the unit root and are not stationary for Turkey in the results of the three unit root tests we applied. If we take the first differences of the three series, we can show that the series become stationary. That is, the test results presented in Table 1 indicate that these series may be treated as I (1).

In Table 1, the ADF, PP and Ng-Perron unit root tests do not consider structural breaks. However, in the relevant period, there are two important crises in 1994 and 2001 in Turkey. Because of economic crises, the series may be non-stationary. To consider the possibility of structural changes in the DGP, we used the Bai and Perron (2003) multiple structural breaks test. The Bai-Perron (2003) test results given in Table 2.

In Table 2, all of the Bai-Perron (2003) statistics are not significant. That is, the Bai-Perron (2003) multiple structural breaks test showed that there are not any structural breaks in the three time series. Looking at the time series graphs, the data from this situation is unsurprising. Therefore, non-stationarity of the series does not derive from structural breaks.

Table 2: *Bai-Perron (2003) Multiple Structural Breaks Tests Results*

	Logy	Logc	Logi
Tests ¹			
SupF _T (1)	0.0017	0.0005	0.0249
SupF _T (2)	1.0376	1.1120	1.6072
UD _{max}	1.0376	1.1120	1.6072
WD _{max}	1.2331	1.3214	1.9100
SupF _T (2 1)	6.6431	7.1992	9.5208
Number of breaks selected (Sequential) ²	0	0	0

Notes:

¹ The SupF_t(k) tests and the reported standard errors and confidence intervals allow for the possibility of serial correlation in the disturbances. The heteroscedasticity and autocorrelation consistent covariance matrix is

constructed following Andrews (1991) and Andrews and Monahan (1992) using a quadratic kernel with automatic bandwidth selection based on an AR(1) approximation. The residuals are pre-whitened using a VAR (1).

²We use a 5% size for the sequential test $\text{SupF}_t(t+1|t)$.

** Significance at the 5% level.

5.2. Co-integration Analysis

Having established that all variables are integrated in the same order, we proceed with co-integration tests, which allow us to test for long-term relationships among $\log y$, $\log c$ and $\log i$. The results are obtained using the Johansen (1995) test methods and are presented in Table 3. Before undertaking co-integration tests, let us first specify the relevant order of lags (p) of the vector auto-regression (VAR) model. The Akaike Information Criterion (AIC), Schwarz's Information Criterion (SIC) and the Lagrange Multiplier (LM) are used to determine the optimal lag length. The AIC, SIC and LM criteria yield a VAR (4).

Table 3 reports results from the Johansen test for co-integration. In Table 3, we estimate two models. Model A is estimated following the Pantula Principle and we found that Model 4 with a rank equal to 1 is the most appropriate. Model B is estimated following Li and Daly (2009). They did not use a deterministic trend within a cointegrating relationship. They said that the presence of a linear trend within a cointegrating relationship would rule out balanced growth (Li and Daly 2009: 191).

Both Model A and Model B reveal a long-term relationship between the variables. However, although Model A was found to have one cointegrated relationship, Model B has two cointegrated relationships. This situation demonstrates that Model A does not fulfill the requirement for the balanced growth hypothesis, but Model B does provide the necessary conditions. Sufficient conditions for the realization of balanced growth are needed.

Table 3: Cointegration Tests Results^{1,2}

Null hypothesis	Hy-	Model A		Model B	
		Eigenvalue (λ_i)	λ_{trace} -value	Eigenvalue (λ_i)	λ_{trace} -value
$r = 0$		0.9704	88.9620***	0.6255	40.7611**
$r = 1$		0.5684	22.0878	0.5406	22.0989**
$r = 2$		0.2754	6.1205	0.3198	7.3210

Estimating Cointegrating Coefficients

Variables	Model A		Model B
	$\hat{\beta}_1$	$\hat{\beta}_1$	$\hat{\beta}_2$
logc	1.000000	1.000000	0.000000
logi	0.360126*** (0.03566)	0.000000	1.000000
logy	-1.131352*** (0.02854)	-1.015076*** (0.00444)	-0.940202*** (0.01143)
Trend/Constant	-0.130055*** (0.00948)	0.345906*** (0.04814)	0.986698*** (0.12393)

Wald LR Test of Balanced Growth Restrictions

	[logc logi logy]		
	[1 0 -1]	[0 1 -1]	[1 0 -1] and [0 1 -1]
Model A	56.2609***	51.7644***	-
Model B	-	-	4.7571*

Notes:

¹ Johansen (1995) test, the table shows the eigenvalue used in evaluating the likelihood ratio statistics (λ_{trace}) for testing the null hypothesis of no cointegration.

²Critical values for λ_{trace} are obtained by Osterwald-Lenum (1992).

³Numbers in parentheses are standard errors.

*** Significant at 1%, ** significant at 5%, * significant at 10%.

Therefore, we examine the extent of empirical support for the further implication of the neoclassical stochastic growth theory that the 'great ratios' should be stationary stochastic processes. As previously noted, this can be interpreted within the Johansen (1995) framework as a requirement that the normalized coefficients of the two co-integrating vectors for $(\log c \log i \log y)$ should be $[1 \ 0 \ -1]$ and $[0 \ 1 \ -1]$. We carry out likelihood ratio tests to assess whether these restrictions are acceptable. The results are presented in Table 3.

Table 3 shows that, in Model A, the data does not support the parameter restrictions required for the stationarity of $\log(c/y)$. In this sense, the balanced growth hypothesis is rejected even where the co-integration rank is appropriate. In other words, we found that Johansen's method rejects balanced growth, either because the macroeconomic series do not share a common stochastic trend or because the cointegrating vectors do not satisfy the required parameter restrictions.

The situation is different in Model B. Meanwhile, because of the given parameter constraints, the LR statistic is 4.7541 and this value cannot be rejected statistically at the 5% level. Thus, Model B reveals that, to a large extent, the hypothesis of balanced growth is valid in Turkey.

6. Conclusion

Motivated by the stochastic neoclassical growth theory, this study has looked for evidence of balanced growth in Turkey per capita output, consumption and investment. Since 1989, some of the major economic developments in Turkey's long-term growth performance have been analyzed to determine whether they led to structural breaks. We found that the long-term growth path of the Turkish economy is broadly consistent with the balanced-growth hypothesis. These findings can be interpreted as follows: the liberal policies implemented in Turkey, the Customs Union process with the EU and the economic crisis in the years 1994 and 2001 did not cause structural

breaks in the common average growth rate of output, consumption and investment. The aforementioned events mobilized the external dynamics of the internal dynamics of convergence and resulted in a positive scale economy. No structural breaks were found in the process.

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Dengeli Büyümenin Geçerliliği : Türkiye Örneği

Mehmet Çınar*

Sema AY**

Öz

Neoklasik Büyüme Teorisi'ne ait literatürün temelinde çıktı, tüketim ve yatırımın aynı oranda büyümesini öngören “dengeli büyüme” hipotezi yer almaktadır. Ampirik olarak bu hipotez, tüketim ve yatırımın çıktı ile kointegre olmasını ifade etmektedir. Çalışma, söz konusu göstergelerin birim kök testleri ve kointegrasyon teknikleri kullanılarak Türkiye için incelenmesini amaçlamaktadır. Türkiye ekonomisinin uzun dönemli büyüme yolunun önemli bir yapısal kırılma yaşamaksızın dengeli büyüme ile uyumlu olduğu görülmektedir.

Anahtar Kelimeler

Büyük oranlar, dengeli büyüme, birim kök, eştümleşme, içsel yapısal kırılma

* Doç. Dr., Uludağ Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Ekonometri Bölümü - Bursa/Türkiye
mcinar@uludag.edu.tr

** Doç.Dr., Uludağ Üniversitesi, Sosyal Bilimler Meslek Yüksek Okulu, Dış Ticaret Bölümü -Bursa/Türkiye
semay@uludag.edu.tr

Длительность сбалансированного роста: на примере Турции

Мехмет Чынар*

Сема Ай**

Аннотация

В основе литературы о неоклассической теории роста имеет место гипотеза “сбалансированного роста”, предусматривающая одинаковые темпы роста производства, потребления и инвестиций. Эмпирически эта гипотеза подразумевает коинтеграцию потребления и инвестиций с производством. Данная работа, используя тесты единичных корней и методы коинтеграции, призвана изучить эти показатели применительно к Турции. Установлено, что долгосрочный рост турецкой экономики без значительных структурных изменений согласуется с гипотезой сбалансированного роста.

Ключевые слова

Большие объемы, сбалансированный рост, единичный корень, коинтеграция, внутреннее структурное изменение

* доц.док. университет Улудаг, факультет экономических и административных наук, кафедра эконометрии- Бурса/ Турция
mcinar@uludag.edu.tr

** доц.док., университет Улудаг, высшая школа социальных наук, кафедра внешней торговли- Бурса/ Турция semay@uludag.edu.tr