BANK OF ALBANIA

ALTERNATIVE METHODS OF ESTIMATING POTENTIAL OUTPUT IN ALBANIA

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CONTENTS

ABSTRACT

The aim of this paper is to estimate potential output and output gap for Albania, over the period 1996-2006. Potential output is estimated using the methods of linear regression, Hodrick Prescott filter and the production function approach. The results of the three methods are compared using the time domain analyses for measuring economy's cycle and their severity. These tests indicate that the production function approach estimates fewer economic cycles with the lowest variance. Given that it also provides a supply side of the economy, this approach appears to be more relevant in estimating potential output gap in Albania.

JEL Classification Numbers: D24, E31, E32
Keywords: Output gap, capital stock, natural rate of unemployment, production function, Albania.

I.INTRODUCTION

Measuring the potential output of the economy and output gap is essential for assessing macroeconomic policies for many reasons. First, potential output is the best indicator of the capacity utilization in the economy; in other words, it gives the maximum output that an economy can produce without generating inflation. Output gap gives the deviation of output from its potential level. When the actual output is greater than the potential, there is an excess demand in the economy. Given that this situation will cause inflationary pressures, there is a need to reduce aggregate demand by lowering government expenditures or tightening monetary policy. In the opposite case the macroeconomic policies may be used to stimulate aggregate demand.

Second, output gap is useful to derive cyclically adjusted budget balance. A cyclically adjusted budget balance is equal to the actual budget balance corrected for divergences of actual from potential output, and thus provides a measure of the government structural fiscal position. An actual output higher than the potential will support a better budget balance, thus higher growth in revenues and lower expenditures growth (Donders and Kollau 2002).

Finally, potential output and output gap are important indicators in assessing economic growth. In general, economic growth can fluctuate due to cyclical factors or due to changes in the trend of potential output. Output gap helps to determine which of these components explains economic growth.

Many techniques have been developed to measure potential output and output gap; however none of them gives definitive results. A number of empirical studies that use diverse methodologies and assumptions for estimating a country's potential output indicate that different methodologies produce different results (de Brouwer 1998; Dupasquier, Guay and St-Amant 1999; Scacciavillani and Swagel 1999; and Cerra and Saxena 2000). Given that neither potential output nor output gap is directly observable, their performance must be derived from other observable indicators or information, which are hypothesized to be correlated to potential output and

output gap. So we should remember that in spide of the method used, the results will be an estimation of the real performance of potential output and output gap.

The aim of this study is to present some of the main methods of measuring potential output and output gap in Albania. The information derived from these indicators will be useful in conducting economic and econometric analyses. Also, given that Bank of Albania is preparing to launch Inflation Targeting in the near future, there is a need to determine inflationary pressures in the country, since monetary policy has a lagged impact on the economy.

II. REVIEW OF THE MAIN METHODOLOGIES

This section presents the main methodologies of estimating potential output and output gap. Generally, these methods can be classified in two groups: statistical detrending and structural relationships estimation. Statistical methods attempt to separate trend from the actual output, thus deriving potential output and include the linear method and Hodrick Prescot filter. These methods can be applied without any information from the other macroeconomic variables. Regardless of this advantage, these methods are restricted by the need to use long series of actual output. Also, statistical methods can not explain structural changes in the economy, which are common in developing countries like Albania.

Economic methods eliminate part of the problems related with the simple statistical methods. A well known economic method is the production function approach. The production function determines a potential output related to macroeconomic variables of employment and stock of capital in the economy. Unlike the statistical methods, production function gives a non-smoothed series of potential output. Structural changes in the economy are reflected in the variables of the production function, and also in the developments of potential output and output gap. However, production function method is restricted by the availability of data and their quality.

Other well known methods of estimating output gap are unobservable component methods (univariate, bivariate, and common permanent and cyclical components) and SVAR. These methods estimate output gap on the basis of structural and economic relationships of other indicators, or through determining the possible form of the potential output. Their application requires good knowledge of the linkages in the Albanian economy and the restrictions to be applied.

Given the above reflections, this material will estimate potential output using the production function approach, thus contributing to building the supply side of the macro model. The results obtained by this approach will be compared to the linear method and Hodrick Prescot filter.

II.1 METODA LINEARE

The linear method is a simple way to separate trend from the series of actual GDP. This method is based on the assumption that potential output is a deterministic function of time and the output gap is a residual from the trend line. Potential output which is represented by the trend may be estimated as below:

$$Y_t^* = \alpha_0 + \alpha_1 \cdot trend \qquad (1)$$

where Y_t^* is potential output, α_1 is estimated coefficient from the regression of the actual output on time trend variable and output gap is given as:

$$G_t = Y_t - Y_t^* \qquad (2)$$

where G_t is output gap, Y_t is actual output and Y_t^* is potential output measured according to model (1) and t=1,2,.....,T is time index.

The main advantage of the linear method is its simplicity as it uses only the information from the actual output series. However it has

many drawbacks. First, by assuming that the long-run development of the time series is deterministic it results that potential output is perfectly predictable. Beveridge and Nelson (1981) argue that if indeed the changes in economic series are a random process, then the deviation of the series from any deterministic path would grow without bound. Second, output gap measured by the linear method is sensitive to the sample period used in the regression estimation. Therefore, one should be careful in choosing the right moment in time to use for estimation, as it affects the final results. Third, the assumption that potential output increases by a constant growth rate does not generally hold (de Brouwer 1998). Given that output growth can be decomposed by the contribution of factors of production, one can not assume that these factors are constant over time, especially when the country undergoes technological changes or improvements.

II.2 HODRICK PRESCOTT METHOD

The Hodrick Prescott method or as it is known in literature, the HP filter, is widely used to estimate potential output and output gap. HP filter decomposes times series Y_t in two components: growth component (Y_t^*) which can be interpreted as potential output, and cyclical components (G_t) which is the output gap:

$$Y_t = Y_t^* + G_t \tag{3}$$

This method is based on the assumption that the cyclical components fluctuate around the growth components with time diminishing amplitudes. Therefore, the average of the deviations of Yt from Y_t^* is assumed to be near zero over a long period of time. HP filter minimizes variances according to a given λ weight, as it is expressed below:

$$MinL = \left\{ \sum_{t=1}^{T} G_t^2 + \lambda \sum_{t=2}^{T} (\Delta Y) \right\} \tag{4}$$

The parameter λ is a positive number, which penalizes variability in the growth component series. A small value of λ gives a potential output which fluctuates following developments in the actual output, while a large value of λ reduces the elasticity of trend from short term developments of actual output. As λ approaches infinity, the long run trend derived from the HP filter will be a linear time trend.

The value of λ can be determined according to desired level of smoothness of the final trend series. In general, a value of 1600 is used for quarterly data and from 100 to 10 for annual data. By applying different λ values one can note that the larger the value of λ, the larger the difference between actual output series and trend.

The HP filter has been widely used in the literature. The main advantage is that potential output is time varying and output gap is stationary. Therefore, potential output will be affected by different shocks in the economy but the sources for such outcome can not be determined. Also, the HP filter is easily applicable because it requires little information from the data.

On the other side, HP filter has some drawbacks. It gives good results if it is used on data from a stable economy, which has not undergone strong shocks. In this case, HP filter and other econometric methods of estimating potential output are in advantage compared to the linear method. However, developing countries are characterized by different shocks which affect economic growth rate and not necessarily are reflected on potential output.

Another disadvantage of HP filter is the high end-sample biases. The minimization problem which derives the trend series, aims to penalize deviations from trend and smooth the trend series. At the end of sample, this penalization is missing; Therefore, the trend will react more to transitory shock at the end of the sample than at its middle.

Also, De Brouwer 1998 concludes that HP filter is sensitive to different values of λ parameter. Lower smoothing factor produces a

'smaller' estimate of the gap. De Brouwer also finds that the cycles in output are sensitive to the smoothing weight. Thus, it is difficult to identify an appropriate smoothing parameter λ.

Regardless of these disadvantages, HP filter continues to be used for measuring potential output due to its simplicity in practice.

II.3 PRODUCTION FUNCTION METHOD

The above mentioned statistical methods do not use other macroeconomic variables; Therefore, they can not measure the impact of structural shocks on potential output. As a result, output gap may be biased. An alternative method is the production function approach which uses information from capital stock, labor force and technological changes. According to this method, potential output is measured as a supply side and gives the potential level of the economy if all production factors are fully utilized. Cobb Douglass is a simple functional form that uses data on employment and labor force, capital stock and elasticity of production factors. The mathematical form is given below:

$$Y = TFP \cdot L^{\alpha} \cdot K^{1-\alpha} \tag{5}$$

where TFP is total factor productivity, L labor production factor, K is capital stock and α is labor elasticity of production (also labor share income). The characteristics of this production functions are: production is proportional to employment of production factors, the production elasticity of labor and capital is positive and they sum up to one. The linearization of the function is presented below:

$$log(Y) = \alpha\, log(L) + (1-\alpha)\, log(K) + tfp \tag{6}$$

where total factor productivity (tfp) is obtained as residual of the equation:

$$tfp = log(Y) - [\alpha\, log(L) + (1-\alpha) log(K)] \quad (7)$$

According to equation (7) output Y can be decomposed as the sum of two components: explained factor and unexplained factor. The explained part is given by the square brackets while the unexplained part is given by the variable tfp. The unexplained factor is known in the literature as "Solow residual".

Potential output is obtained when production factors, labor and capital, are fully utilized, and when technological development follows its long run trend, as it is presented below:

$$log(Y^*) = \alpha\, log(L^*) + (1-\alpha)\, log(K^*) + tfp^* \quad (8)$$

where* gives the potential level of the variables.

The next step is to determine the potential levels of the production factors. Potential employment is given by economy's employment when unemployment rate is in equilibrium. The equilibrium unemployment rate is given by the NAWRU (Non Accelerating Wage Rate of Unemployment), that is, when wage inflation is constant. Equilibrium unemployment rate can also be determined as NAIRU, Non Accelerating Inflation, but R.Torres showed that in the NAWRU approach there is a better consistency between the labor market and the goods market.

The equilibrium unemployment rate changes over time but generally follows the actual unemployment rate (due to hysteresis and labor market inelasticity). To measure a NAWRU varying in time we refer to J. Elmeskov's method. According to Elmeskov (1993) the equilibrium unemployment rate can be determined by following these basic assumptions:

i) Logarithmic differences of wage inflation are proportional to the gap between actual unemployment rate and equilibrium one.

ii) The change in equilibrium rate of unemployment between two periods is so small that it can be ignored.

These assumptions can be summarized in a loglinear Philips curve stable in the short run:

$$D^2 log(W) = -\beta (un - un^*); \beta > 0 \quad (9)$$

where D is the difference operator, W is wages, *b* is a positive constant, un is actual unemployment rate and un* is NAWRU. Ignoring the changes between two periods and obtaining the lagged values, the equation is written as:

$$D^2 log(W_{-1}) = -\beta (un_{-1} - un^*) \quad (10)$$

Taking the difference between (10) and (9):

$$D^3 log(W) = -\beta (un - un_{-1}) = -\beta D(un) \quad (11)$$

$$\therefore \beta = \frac{-D^3 log(W)}{Dun} \quad (12)$$

Substituting (12) to (9) the equilibrium rate of unemployment is given as:

$$\text{NAWRU} = un - \frac{Dun}{D^3 log(W)} D^2 log(W) \quad (13)$$

Therefore, NAWRU is equal to the actual unemployment rate adjusted by changes in unemployment rate and wage inflation. The NAWRU calculated in this way is not smooth enough and the HP filter is applied to increase its smoothness. As a result, potential employment is calculated as follows:

$$L^* = P_{wa} \cdot Part^* \cdot (1 - NAWRU^*) \quad (14)$$

where the trend of labor force results from multiplying P_{wa} (working age population) and Part* (trend of participation rate) and NAWRU* is the smoothed series of equilibrium unemployment rate.

The actual value of capital stock is used as a substitution for its potential value, as capital stock cannot fluctuate substantially. It is common to assume that the capital stock available is always used at its potential.

$K^* = K$

Potential value of *tfp* is obtained through the HP filter assuming that potential total factor productivity follows its own trend.

The production function approach enables a deeper analysis of the contributors to potential growth of the economy compared to other methods. However, it uses some simplified assumptions, such as the functional form of production or potential employment that may not always hold. Also, the data employed may give a biased estimation. Given that the method uses aggregated data on capital and labor, it may be difficult to obtain good results as these variables may be at different stages of utilization, have different natures etc. Moreover, it is difficult to determine which is the full utilization of production factors. For example, the capital stock that has become out of date due to technological advances must be gradually replaced and also labor must be trained in operating new technologies. This indicates that full capacity utilization of capital stock is impossible. Finally, Solow residual is economicly unexplained, thus hard to interpret.

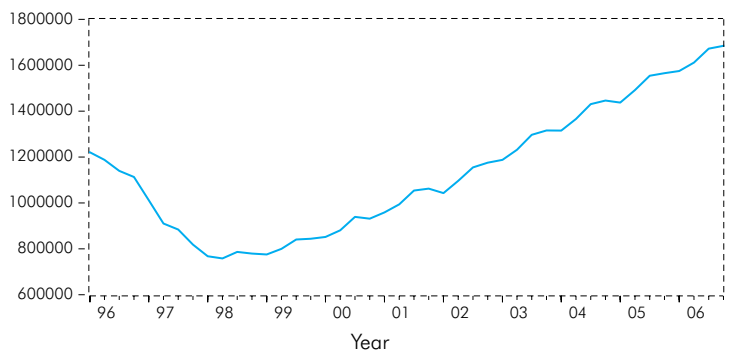
However, the production function approach enables using information from the economy to estimate its potential output, and can be useful to different analyses.

III. DATA

We use quarterly data for the period of 1996 to 2006. Quarterly data on GDP are obtained by disaggregating annual data following Dushku (2007) and 2006 is a forecast from IMF. In Albania data on capital stock are missing. Therefore, we use an estimation for capital stock[1] for 1996 and then add quarterly investments to this stock to obtain quarterly data on capital. We assume the annual rate of capital depreciation is 8 percent.

As chart 1 shows, capital stock after the crisis of '97 has constantly increased, however, starting from 2005 its growth rates are diminishing in time. As a matter of fact, annual investment share of actual production is also declining. As a result, capital output ratio is decreasing from the value of around 3 at 1996, to about 2 at the end of 2006.

Chart 1 Capital stock in million lek 1996-2006



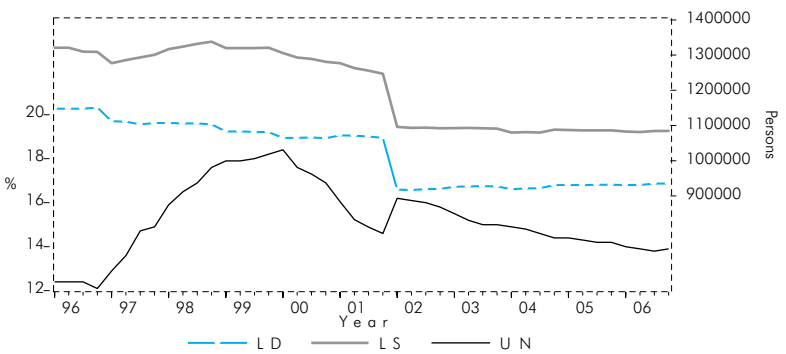
Source: Authors calculations

Quarterly data on employment in Albania are given by INSTAT. The total number of employed persons is an indicator of demand for labor factor, while labor supply is given by labor force. The difference between the two indicators gives the official unemployment rate, that is all the persons that during the reference period fulfill three criteria: are unemployed, are actively searching for a job (by registering as unemployed), and are available to start

a work. However, official data on unemployment do not include informal market and may be over/under estimated. In 2001 INSTAT recalculated labor market data according to a new methodology and this is reflected as a structural break in this period.

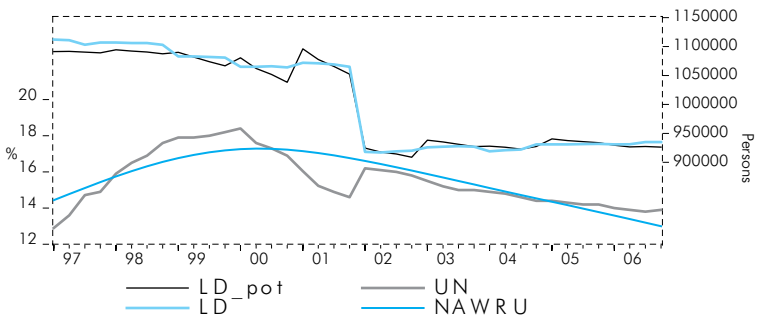
Chart 2 gives the labor supply and demand and unemployment rate. Before 2001, high unemployment rate is caused be a decrease in labor demand, while after 2001, the increase in labor demand decreases unemployment.

Chart 2 Labor demand (LD) and supply (LS) and unemployment rate (un) for the period 1996-2006



Source: INSTAT

Chart 3 Actual and potential levels of employment and unemployment rate for the period 1996-2006



Source: INSTAT for actual labor demand and unemployment; authors' calculations for potential values

According to Chart 3, before 2001 actual unemployment rate is on average higher than the equilibrium, thus indicating that the country could produce more. After 2001, on average equilibrium rate is higher than actual unemployment and their difference decreases in time, and turns negative after 2005. However, it appears that labor demand in Albania is close to the potential, thus it doesn't increase the risk of wage inflation from the labor market.

IV. POTENTIAL OUTPUT AND OUTPUT GAP IN ALBANIA

This section presents the results of estimating potential output and output gap according to the three methods. First we present potential output calculated using the linear method. The estimated equation is given below:

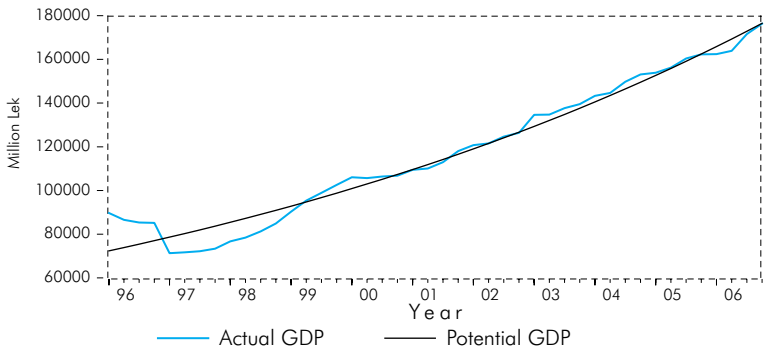
LOG(Y) = 11.2 + 0.02*TREND (5)
t-stat (31.6) (28.6) R2= 0.94 DW= 0.28

According to this method, annual potential growth is around 8 percent. However this result also indicates the drawbacks of the linear method. The method assumes that potential economic growth is constant over the whole period, which can not hold as a persistent increase in actual output, thus the base for calculating growth rate indicates that potential growth can not be constant. Also, the low value of DW indicates autocorrelation. However there may be an explanation for this, as output gap is closely related to economic cycles, thus to its past values. Finally, the linear method does not include shocks or structural changes in the estimation.

The second method of estimating potential output is the Hodrick Prescot filter. The HP filter is applied for 2 values of λ, respectively 800 and 1600 (Chart 5). When λ=1600, the assumption is that there are no substantial changes in the Albanian economy, while λ =800 gives a potential output which should be closely related to

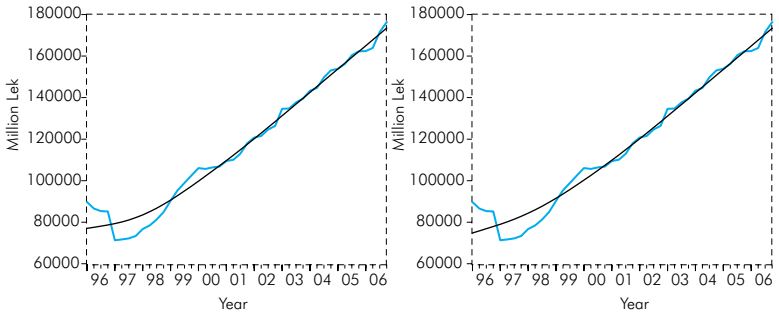
actual output. The results do not indicate significant changes, thus as it is suggested by literature, $\lambda=1600$ is chosen to be used.

Chart 4 Actual and potential GDP according to the linear method for 1996-2006



Source: Authors' calculations

Chart 5 Actual and potential GDP according to HP filter 1996-2006



Source: Authors' calculations

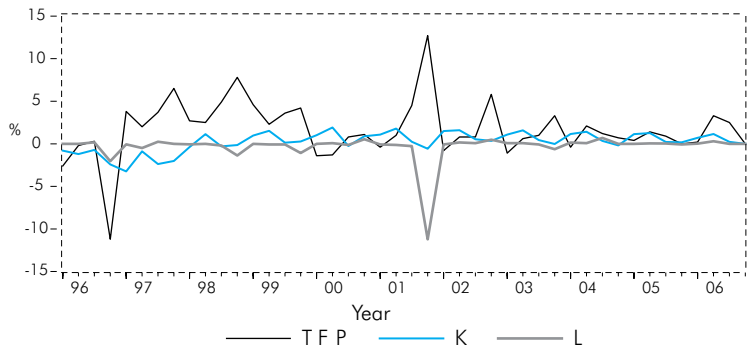
According to the HP filter method, annual potential economic growth rate ranges from 5.3 percent in 1997 to 9.3 percent in 2002. For the last two years, potential growth is around 7 percent.

The last method being introduced is the production function approach. Following equation 6, production function for Albania (assuming that $\alpha=0.7$) is:

$$Log(GDP)= 0.7*log(L) +0.3*log(K) + tfp \quad (6)$$

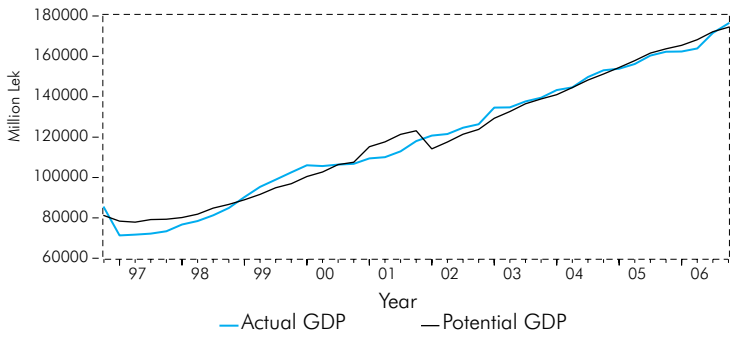
Total factor productivity is the largest contributor to GDP growth thus indicating that other "unexplained factors" have contributed to economic growth rather than labor and capital.

Chart 6 Contribution of tpf, labor and capital to GDP growth



Source: Authors' calculations

Chart 7 Actual and potential output measured with the production function for 1996-2006



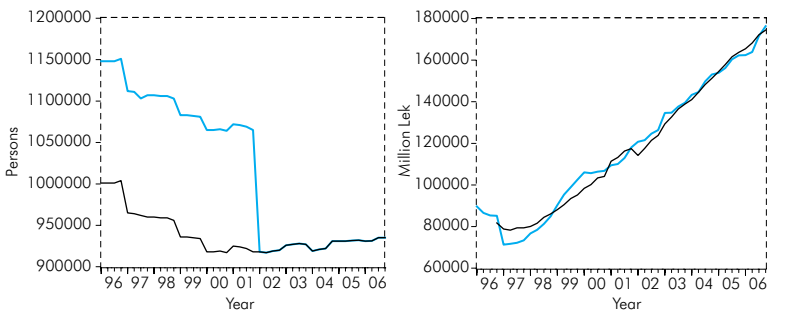
Source: Authors' calculations

Chart 7 shows the potential output of the economy if the production factors are fully employed. The results indicate that potential output measured with the production function approach is more volatile compared to other methods. However, due to the structural shock caused by methodology change of INSTAT, there is a break of potential output during 2001-2002.

Annual growth of potential GDP by production function approach is higher than by other methods. It ranges from 6 percent in 1998 to 12.6 percent in 2003 and this last chart is mainly due to the huge decrease, because of the structural shock in 2002. For the last two years, annual growth of potential GDP has been on average 7.8 percent. This growth rate can be decomposed in the contribution of total factor productivity, labor and capital, which is one of the advantages of this method.

One problem that we should take care of, is the structural change during 2001-2002 due to data issues. This period is not characterized by substantial changes in the economy, thus the break shown in Chart 7 can be misleading and cause problems if this series is used for economic or econometric analyses. One solution is to use a dummy that takes care of the problem every time this potential output is used for econometric estimation, or use the series starting from 2002. Another measure is to adjust the labor market

Chart 8 Labor demand and Labor demand recalculated, actual and new potential GDP, for 1996-2006



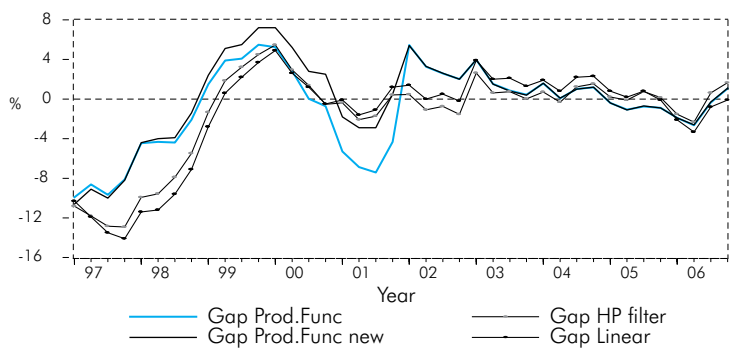
Source:Authors' calculations

data for the period 1996-2001 and recalculate potential output for this period. The idea is to keep the original growth rates for each of the labor market indicators but shift the series, so there will be no substantial difference of the indicators prior and post the new methodology. We followed this simple exercise to check whether we can take care of the structural problem. Chart 8 shows the changes applied to labor demand and the new potential output.

As the Chart shows, potential output fluctuates around the actual level and the strong structural break of 2001-2002 is somehow eliminated. Annual growth of potential GDP according to the new production function ranges from 4 percent in 2002 to 13 percent in 2001. For the last two years potential output growth is on average 6 percent.

Chart 9 summarizes the output gap measured with the three methods and also with the new production function approach. According to the chart, the country has experienced significant economic growth. However during 2005 there is a decline of actual output below the potential level. In general, the two statistical methods provide reasonably similar results, while the production function approach (specially the new one) indicates large amplitude of expansions during 1999-2000 and contractions during 2001-

Chart 9 Output gap according to the three methods and the new production function



Source: Authors' calculations

2002. However, production functions also provide less volatile output gap as it has the lowest standard deviation of output gap.

V. COMPARING THE OUTPUT GAPS

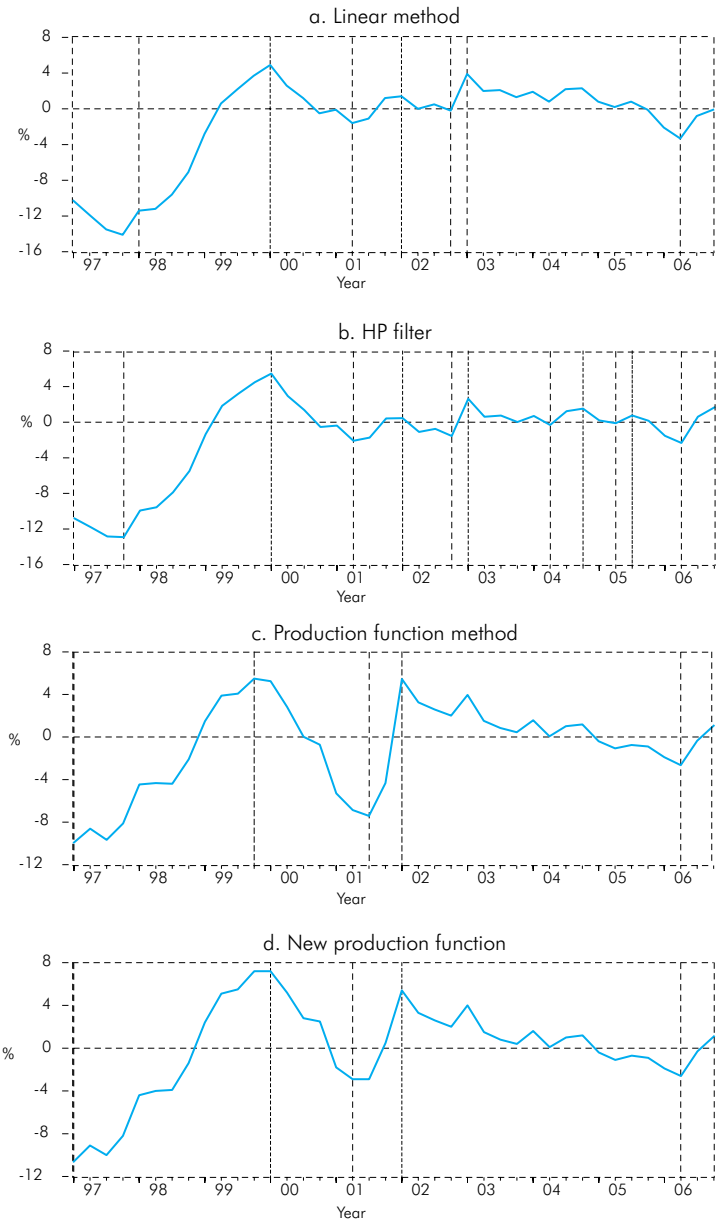
Given the different estimates of output gap, it is useful to compare their properties. A number of analytical techniques can be used to show whether the different estimates of output gap commove or have important differences. Our work is based on Scott (2000b) who uses time domain analyses to provide comparison of how different output measures evolve in time.

TIME DOMAIN ANALYSES

This section presents a number of statistics which are used to illustrate different properties of the cycles for different output gap measures. These statistics are useful to estimate differences in the average length and magnitude of cycles and also check whether they exhibit a regular periodicity, are symmetric or have the same turning points.

We start by determining what a full cycle of the economy is and pinpoint the peaks and troughs of the output gaps. For simplicity, we establish as a peak the highest point in the period during which output is above its trend. The opposite is applied for troughs. This is a very naïve dating rule as in practice policymakers would not follow such a rule. Chart 10 presents the HP, Linear and Production Function output gap estimates, with peaks and troughs dated according to the naïve dating rule.

Chart 10 Peaks and troughs in output gap measures



The output gap from HP filter suggests the existence of five cycles, while the linear method three cycles and production function approach only two cycles (trough-peak-trough). Also the output gap from the production function approach has the lowest variances compared to the other methods, where the linear method has the highest.

AVERAGE DURATION AND MAGNITUDE OF CONTRACTIONS AND EXPANSIONS

Table 1 presents the average duration, magnitude and magnitude per quarter of contractions and expansion phases. Duration is the length of time from trough to peak for a contraction phase and from peak to trough for an expansion phase. The magnitude of a contraction (expansion) is the distance from the trough (peak) to the peak (trough). The magnitude per quarter is the average magnitude of the contraction or expansion divided by its average duration.

The average duration of expansion cycles is in the range of 3 to 7.5 quarters and 4 to 12 quarters in the case of contractions. In both cases, the production function approach provides cycles with the longer duration, while the new production function has the lowest magnitude per quarter for both expansion and contraction phases.

Table 1. Average duration, magnitude and magnitude per quarter of expansion and contraction phases.

	Expansion			Contraction		
	Duration (quarters)	Magnitude (% points)	Magnitude per quarter	Duration (quarters)	Magnitude (% points)	Magnitude per quarter
Linear	4.3	8.7	2.0	7.0	-5.1	-0.7
HP	3.2	5.6	1.7	3.6	-3.7	-1.0
Prod.Func	6.5	14.1	2.2	12	-10.5	-0.9
New Prod. Func.	7.5	8.6	1.2	11.0	-6.4	-0.6

Source: Author's calculations

THE SYMMETRY AND SEVERITY OF CONTRACTIONS AND EXPANSIONS

The different output gap measures are approximately symmetric. This is supported by the results presented in table 2, where about 50 percent of the time the output gap estimate positive. To measure severity of the cycles, we show the maximum magnitudes of contraction and expansion phases. The statistics indicate that the three measures do not show significant differences, as the maximum magnitude for expansion is on average 6 percent and contraction magnitude -12 percent. The linear method gives larger contraction magnitudes, while new production function is much more optimistic in case of expansion than the other methods.

Table 2. Maximum magnitudes of expansion and contraction.

		Expansion	Contraction
	% of time positive	Max. Magnitude (% points)	Max. Magnitude (% points)
Linear	52.5	4.9	-14.06
HP	50	5.5	-12.9
Prod.Func	50	5.5	-9.9
New Prod. Func.	55	7.2	-10.6

Source: Author's calculations

TESTS FOR CO-MOVEMENTS

If output gap will be used in economic analyses and policy decisions, it is important to know if the different measures of the output gap consistently agree on whether the output gap is positive or negative. Two statistics are used to check whether output measures tend to agree on the sign of the gap: the correlation statistic and the concordance statistic.

Table 3. Correlation coefficients

	Linear	HP	Prod.Func	New Prod. Func.
Linear	1.00	0.98	0.79	0.86
HP		1.00	0.81	0.89
Prod.Func			1.00	0.94
New Prod. Func.				1.00

Source: Author's calculations

The table above presents the correlation matrix. It appears that the different estimations of output gap always commove as correlation coefficients are always close to 1. However, the correlation coefficients include both the amplitude and the duration of cycles. As shown in McDermott and Scott (1999) the amplitude that is common in both series may dominate the covariance of the series. Following their work, we estimate the concordance statistic. This is a non-parametric statistic that measures the proportion of time that two time series, x_i and xj are in the same state.

Let {Si,t} be a series equal to 1 when gap measure of x_i is positive and zero if negative. The series {Sj,t} is defined in the same way using xj. The degree of concordance is calculated as below:

$$C_{ij} = N^{-1}\left\{\sum\left(S_{i,t}\cdot S_{jt}\right)+\left(1-S_{it}\right)\cdot\left(1-S_{jt}\right)\right\}$$

where N is the sample size. The values of C_{ij} are bounded between 0 and 1. Results from the concordance analysis are given in table 4. The table indicates that the concordance statistics range from 0.75 to 0.875, suggesting that the various measures of output gap tend to provide the same signal.

Table 4. Concordance statistics

	Linear	HP	Prod.Func	New Prod. Func.
Linear	1.00	0.83	0.83	0.83
HP		1.00	0.75	0.75
Prod.Func			1.00	0.95
New Prod. Func.				1.00

Source: Author's calculations

CONCLUSIONS

This material summarizes some of the main methods of measuring potential output and output gap and applies the linear method, HP filter and the production function approach for Albania. It appears that most of the time, the three measures commove, thus determining the general trend that potential output might follow. The

production function approach provides a potential output, which is closely related to technological improvements, employment and capital stock of the country. It also gives a potential output with the lowest variance. Therefore, it appears that production function approach could be used as the main method to calculate potential output in Albania. Also, this method provides a supply side of the economy, thus being useful in applying different economic and econometric analyses.

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NOTES

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[1] These data is an estimation and is available upon authors' request from Geoffrey B.Oestreicher.

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