

BANK OF ALBANIA

MACRO ECONOMETRIC MODEL OF ALBANIA: A FOLLOW UP

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ABSTRACT

This paper follows up on the previous paper titled “A macro econometric model approach for Albania”. The objective is to present the progress of the macro-model during 2007. Actually, the model is enriched with the supply side and fiscal sector and includes the main channels of the transmission mechanism of the monetary policy. We have applied a new method of disaggregating annual to quarterly data and also some new definition of key variables, such as disposable income. The results indicate that the model is stable, it converges in the long run to its desirable path and it may be suitable for different policy scenarios. On the other hand, the forecast performance of the model was so far not analysed.

INTRODUCTION

As the Bank of Albania is preparing to launch the Inflation Targeting strategy in the near future, the policy meetings will have to use all of the available information that actual data and econometric evaluation provide. In this context, the macro-econometric model of Albania (MEAM) will be an important part of this process. MEAM is not only useful for giving an overall view of the main linkages and channels of the economy, but also to amount the impact of different shocks that the economy might be going through and also foretell the possible developments following a given policy choice.

When providing information useful for the monetary policy, one can distinguish between three main periods: actual developments, medium term and long run information. Knowledge of the current economic situation of the country is crucial for assessing future developments which are important for a forward looking monetary policy.¹ A macroeconomic model will be a useful tool in this connection. The actual developments of the economy include both evolutions that will have a long run impact in the economy and also information about current short run developments. In this context, MEAM will be useful because it allows determining the long run relationships of the economy and providing information of these linkages. So as soon as actual information becomes available, the model links it to all the long run relationships of the economy, and also evaluates the short run impact of these developments. Therefore, when the Bank of Albania determines its medium term projects, short term developments will be linked to long run assessments and the model can function as a bridge.

Moreover, MEAM can ensure consistency between important economic variables. Even though the model is not a mechanical tool which provides an answer to every possible scenario, it serves as a reference and a guide for the framework of the economy. It is also useful to asses the possible risks of different policies, and to analyze the response of monetary policy to various shock. When analyzing the policies and the possible

risks, we want to look at the results obtained as a consequence of alternative assumptions about the key variables of the economy. Such analyses of the macro variables using different scenarios must be based on a macro model.

In order to have a useful macroeconomic model, it is important to construct a transmission mechanism which can be interpreted and communicated easily for the internal users and also outside the Bank of Albania. The framework of the model should include all the necessary channels of the monetary policy, the various disturbances of the economy and the most important sectors. The model should be flexible such as when analyzing different shocks, we must be able to change the transmission mechanism as needed. Also, any new investigation on different individual channels or any new information on macroeconomic data that becomes available should become easily part of the macro econometric model. A purely econometric approach which aims at constructing a set of equations to fit the data does not generally result in a useful model. Data series are usually short and subject to structural change while the economy is characterized by a high degree of simultaneity. As a result, the estimated parameters are not fully reliable. Moreover, purely empirically based models do not allow the analysis of different possible scenarios about how the economy works. By summarizing we can conclude that the model should first be estimated so that the single equations have a clear economic interpretation; then make use of all the possible information and knowledge to help parameterize a structural macroeconomic model.

During 2007, we have worked on constructing a macro model which fulfils the above-mentioned needs and gives a good representation of the Albanian economy. The long-term properties of the model can be qualified as neoclassical, i.e. production is determined by the supply of input factors. While in the short run, the model behaves as neokeynesian: production is determined by demand; monetary policy influences interest rates, thus output and employment by changing prices and wages. While making use of the VECM method as the basic econometrical approach, many efforts have been put on

calibrating and quantifying the model using our insight on different transmission channels.

However this is an ongoing process. Our work on completing the model and quantifying all the parameters is not finished. MEAM is still in the development process as further information becomes available, and other empirically based analyses are carried out to understand the relationships in the Albanian economy. Nevertheless, MEAM should continue to be an important tool to combine empirical and theoretical insights serving as a valuable instrument for the monetary policy.

II. DEVELOPMENTS DURING 2007

The first version of MEAM presented at the second Round Table aimed to capture the basic macroeconomic relationships of the economy. The purpose was to show a simple and consistent framework of the Albanian economy, and how basic macroeconomic variables such as real output, inflation, interest rate and exchange rate behave under different scenarios and explain the short term dynamics return to equilibrium. In this first version, a number of limitations were identified. These related both to the estimations and specification of some blocks and equations and also to the quality of the time series used.

The model mainly followed the New Keynesian theory that demand changes affect output. This was also augmented by a Phillips curve that relates inflation rates to unemployment. At this stage the supply side consisted only of the labour market which affected wages and unemployment but not output. Finally, the model also included a rule for setting monetary policy interest rate based on inflation deviations and output gap, which in turn affects interest rates. Concerning the quality of the data, the model made use of statistically interpolated data and proxies for missing variables.

The main tasks during 2007 consisted on estimating and calibrating the model, by adding missing channels and new information, reevaluating the existing ones and improving the

database with better interpolation techniques. The new model developed to a more representative tool of the Albanian characteristics and theoretical considerations. The econometric methodology used is the cointegration framework, where the error correction mechanisms are estimated in two steps. First, we estimate the long run relations based on the theory and if needed, parameter restrictions are imposed. The short run equations are estimated individually, taking into account the long run coefficients of the first step. All the equations are backward-looking as long as no expectations are modelled explicitly.

One of the shortcomings of the first version of MEAM was using Linsman interpolation method to disaggregate annual to quarterly data. This method is mainly a mathematical approach and is commonly used to disaggregate annual data. It typically assumes that the unknown quarterly trend can be conveniently described by a function of time and minimizes the discrepancy between known annual values and quarterly estimated data. In the new version of MEAM we use the method of two steps adjustment as presented by Denton (1971), to disaggregate the series of GDP and consumption. This technique uses other indicators with quarterly frequency to disaggregate annual data to quarterly ones. Index of Total Volume of Sales and Retail Sail Index are used respectively for GDP and consumption. The final quarterly estimates are obtained by minimizing a quadratic loss function that involves the preliminary estimates and that is subject to the aggregation constraint. This method of temporary disaggregation of data uses all the available information in the best possible way and provides a logical relationship of high frequency data to low frequency ones².

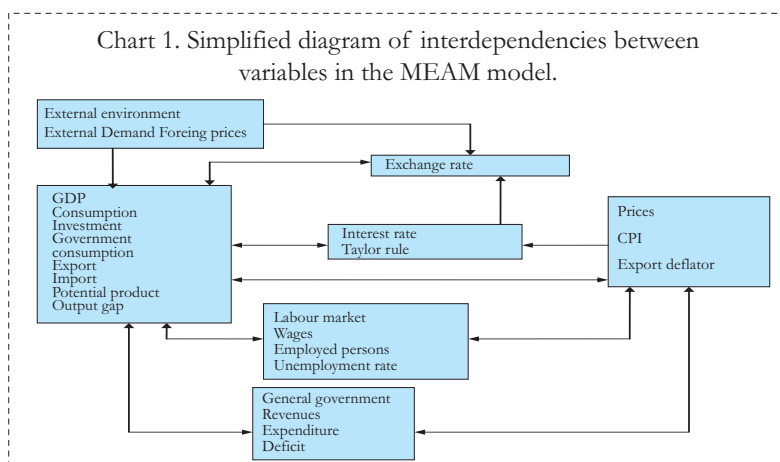
Currently the model includes a full supply side of the economy, a well integrated fiscal sector and the main transmission channels. The model is functional, it convergences in the long run and it includes more stabilizers such as the interest rate, labour market, prices, etc. One should emphasis, however, that the linkages between the supply and the demand side are more calibrated than estimated: the output gap's and the NAWRU's effect on price and wage dynamics is rather limited, so far.

Below we will present the main features of the new version of the model, our new approach to interpolation and proxies for missing variables and some possible scenarios.

III. THE NEW SCHEME OF TRANSMISSION MECHANISM

The structure of the demand side of the model is basically the same as the previous version. The model is backward-looking, so only adaptive expectations are presented by including current and lagged values of the variables. The current version of the model includes a full supply side which represents a long run approach. The demand side includes the impact of interest rate, exchange rate and foreign sector in the economy. The model is equipped with a detailed description of the fiscal sector however there is no fiscal rule. Domestic prices are determined endogenously, while foreign prices are exogenous. Taylor rule is supposed to describe the main developments of the monetary policy. And finally, the model also includes exchange rate pass-through given its importance in the Albanian economy.

Chart 1 presents a new and simplified version of the structure of MEAM providing the most important linkages between variables. Below we will give a short description of the main features of the model and the developments during 2007.



The supply block gives the long run path of the model, and is determined by a production function with two inputs, labour and capital. The functional form is a Cobb Douglas. In the long run, potential labour demand is determined by the working age population and Non Accelerating Wage Rate of Unemployment (NAWRU). The demands for production factors are derived assuming cost minimization by firms.

The demand side of the model is relatively standard: Consumption is re-estimated using a new approach for disposable income. Disposable income is income generated from Gross Domestic Product or Net domestic product subtracting direct and indirect taxes, adding social and health insurance benefits. Disposable income for Albania is calculated as below:

$$YDN = GDP + GTR_X + REM_LEK - GHSIC_R - GDIT_R - GDT_R - GO_R (1)$$

Where, GDP is Gross Domestic Product, GTR_X is transfers expenditures, REM_LEK is remittances in Lek, GHSIC_R is social institutions contribution revenues, GDIT_R is government indirect tax revenue, GDT_R government direct tax revenue and GO_R is other revenues.

Consumption also includes a substitution effect in the short run, as interest rate increases lowers consumption.

Investment (capital demand) is directly affected by interest rate and domestic product in the economy. Export and imports are estimated using the impact of foreign and domestic demand and of relative export and import prices. A full pass-through of exchange rate to export prices in LEK gives an important impact on exports. We have included a new approach to import prices which are defined as weighted average of export prices of the main trade partners of Albania³. This new measure allows dividing exchange rate impact on import prices from the impact of foreign prices.

The link between the real and nominal side of the model is described by the price and wage structure. Prices in the economy, as constructed in the model, are mainly driven by the exchange rate pass-through and developments in the labour market. Also, domestic inflation is affected by the output gap. Wages reflect the outcome of a bargaining process, and so they are determined as a function of the levels of productivity and unemployment in the economy.

Fiscal policy is modelled with four revenue items and five expenditure items. The fiscal side has been constructed on the basis of nominal quarterly data, published by Ministry of Finance for the years 1998-2006. We have not included a fiscal rule but we model the volumes of the general government revenues and expenditures and the resulting deficit debt. One should note, however, that currently fiscal variables only serve as additional variables, they do not have direct impact on wages, employment etc.

Monetary policy is assumed to follow a standard Taylor-rule policy, thus deviations of the inflation rate and actual output from the desired level, will cause changes in the policy of the central bank. The rule is currently backward-looking. Throughout the simulations we held interest rate constant. The new approach of estimating output gap helps in better explaining the dynamic of the repo rate.

Exchange rate is estimated taking into account the combination of uncovered interest rate parity with purchasing power parity. We have assumed a constant risk premium reflected in the unit coefficient of domestic and foreign interest rate. Assuming that exchange rate follows past developments and changes only due to alterations in relative prices and interest rate differentials, we argue that changes will be determined only by these indicators. In future work, we plan to insert a more forward looking monetary policy.

IV. SIMULATIONS

The structure of the model presented above gives the impact of the single equations that we have estimated. However, in order to assess the overall dynamic performance of the model we need to run some simulations which reflect the response of the model to the different shocks that the Albanian economy may face. We carry out four simulations: a permanent depreciation of the exchange rate, a permanent increase in government consumption, a permanent decrease in total factor productivity and a permanent increase in external demand. The simulations were run over a period of ten years (over 1997-2006). We did not incorporate in the model any endogenous policy response, that is, the policy rate and the exchange rate were kept fixed, and there was no fiscal policy reaction considered either.

IV.1 DEPRECIATION OF THE NOMINAL EXCHANGE RATE

In this simulation we generate a 1 percent permanent depreciation of the nominal exchange rate against the euro. The effects of this shock in Albanian economy are illustrated in the charts 2.a, 2.b and 2.c.

Depreciation of the nominal exchange rate increases the competitiveness of the domestic producers, but on the other hand higher import prices cause an increase in the CPI and in the nominal wages. Investment also increases in the first year, but government consumption doesn't change, by assumption. During the first three years, a drop in consumption and the slight increase in exports is mostly offset by increase in investments and imports and thus, GDP does not react to the shock in the short run. In the longer run, exports react significantly and the positive consequence on GDP appears after the shock becomes persistent (Chart 2.b). Chart 2.c illustrates that due to the depreciation of the exchange rate, unit labour cost and labour demand increase, but the unemployment rate does not respond to the shock.

Chart 2.a Response to a 1 percent permanent depreciation of the exchange rate

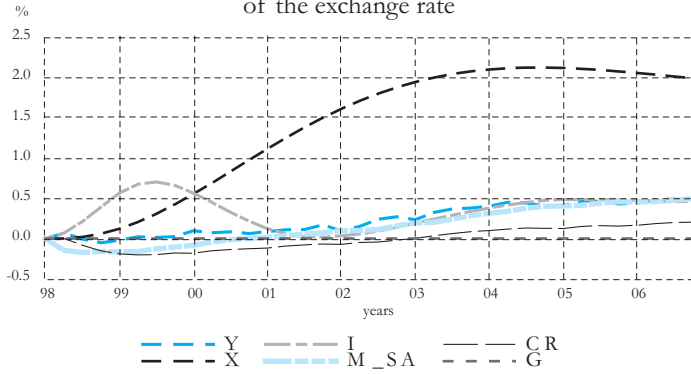


Chart 2.b Response to a 1 percent permanent depreciation of the exchange rate

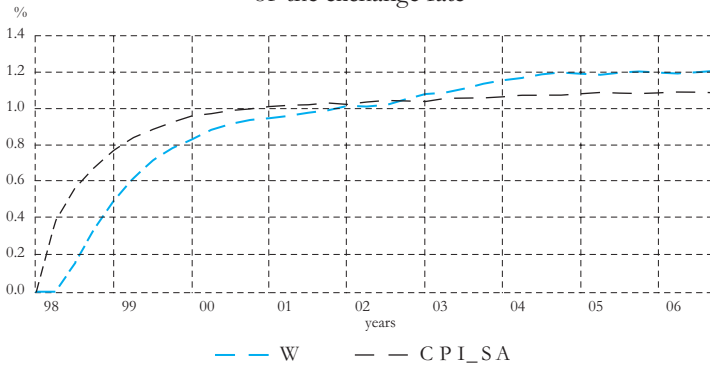
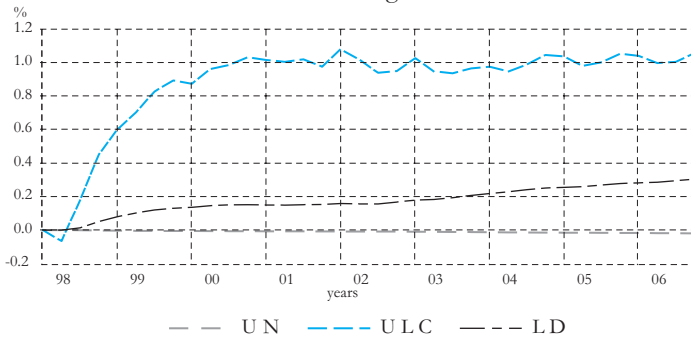
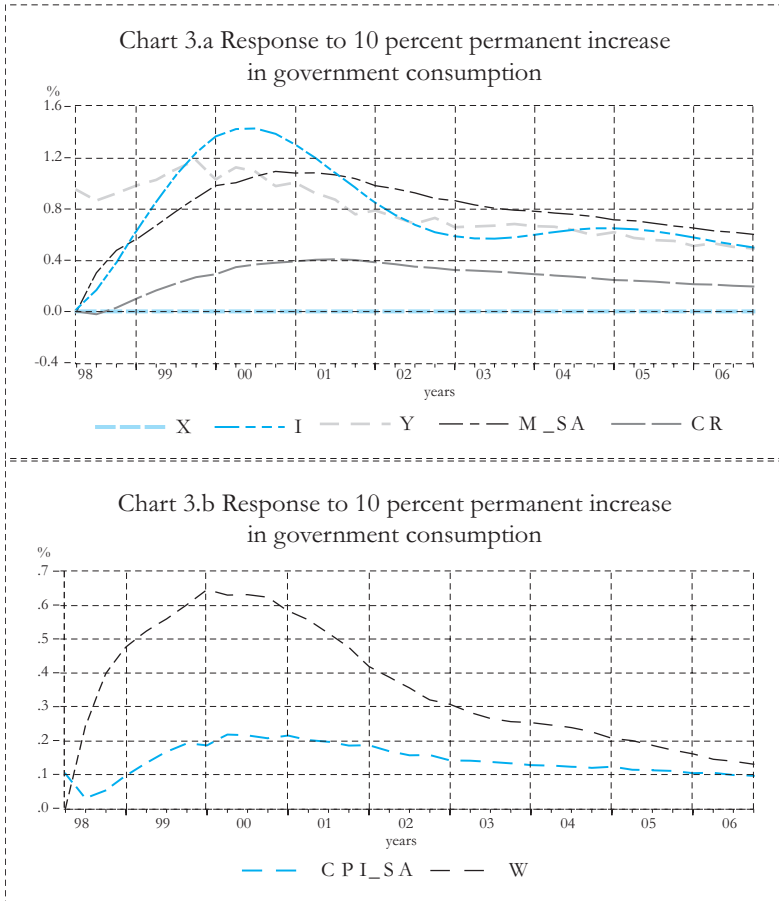


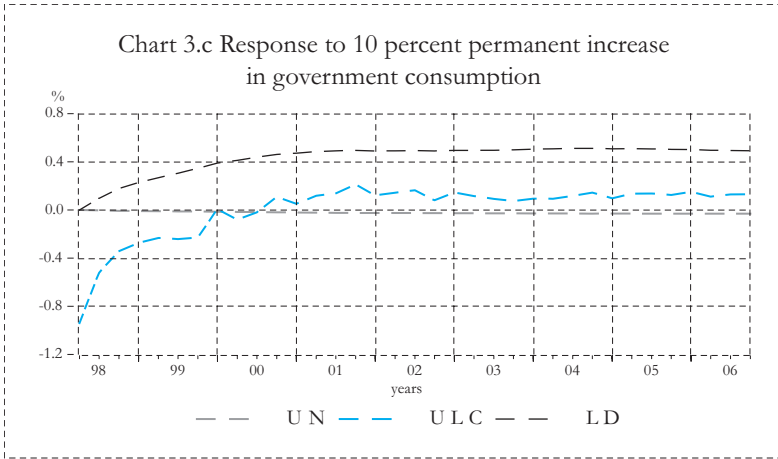
Chart 2. c Response to a 1 percent permanent depreciation of the exchange rate



IV.2 INCREASE IN GOVERNMENT CONSUMPTION

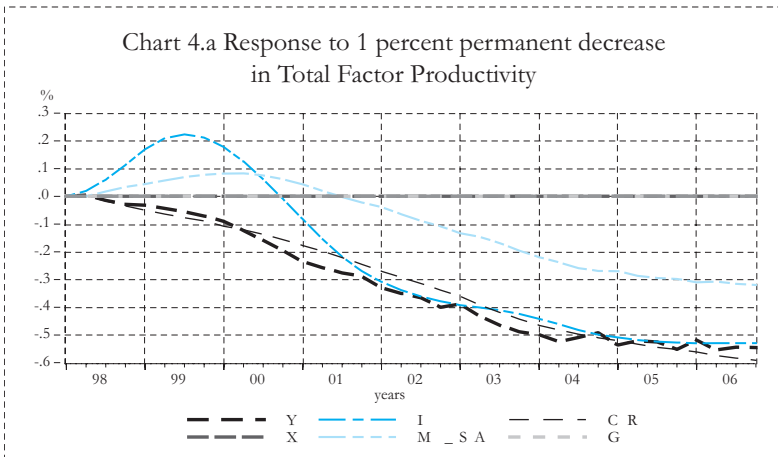
Charts 3.a, 3.b and 3.c present the macroeconomic effects of a 10 percent permanent increase in government expenditures (consumption). This simulation shows that a positive increase in government consumption raises GDP in the first year with 0.9 percent as a primary effect. This positive effect stimulates production and higher investment for all the period of simulation. Nominal wages and prices go up, but prices adjust slower than wages. Higher employment (LD) and nominal wages lead to higher disposable incomes and this will cause consumption to rise. So, in the model non-Ricardian behaviour dominates. Higher domestic demand increases the level of imports, while exports do not react to this shock. The string import reaction makes GDP response fading away, which is expected in a small open economy.



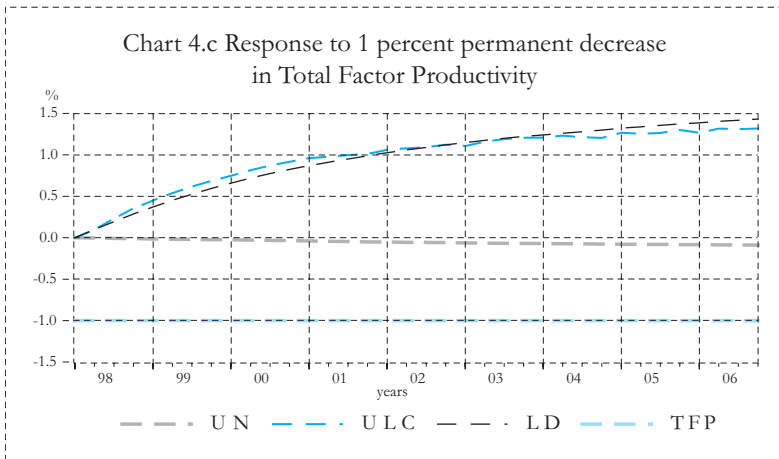
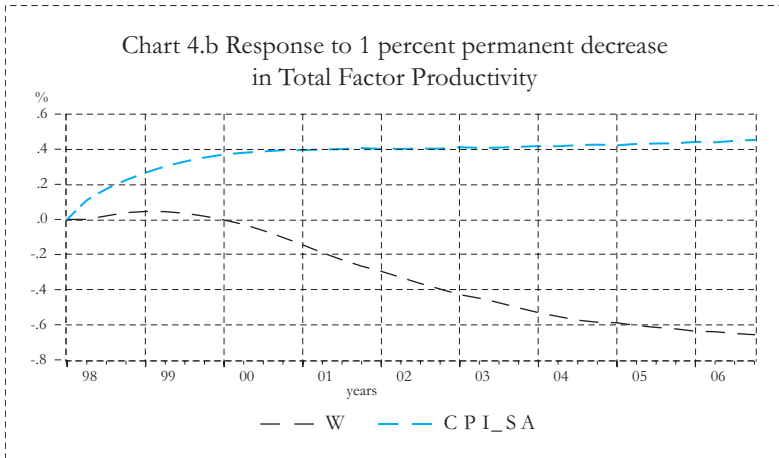


IV.3 NEGATIVE SUPPLY SHOCK

The permanent negative supply shock results in lower GDP for all the period of simulation. Lower aggregate demand and disposable income cause a decrease in imports and real consumption. Nevertheless we notice that exports increase supported by higher investment (chart 4.a), both due to their large reliance on persistence. Lower production will cause a decrease in nominal wages thus increasing labour demand. Lower real wages resulting in higher employment but lower production, will cause an increase in unit labour cost (chart 4.c).



In other words, the substitution effect dominates: a negative supply shock leads to an increase in labour demand. Due to higher domestic cost, there will be an increase in the aggregate price level (chart 4.b).

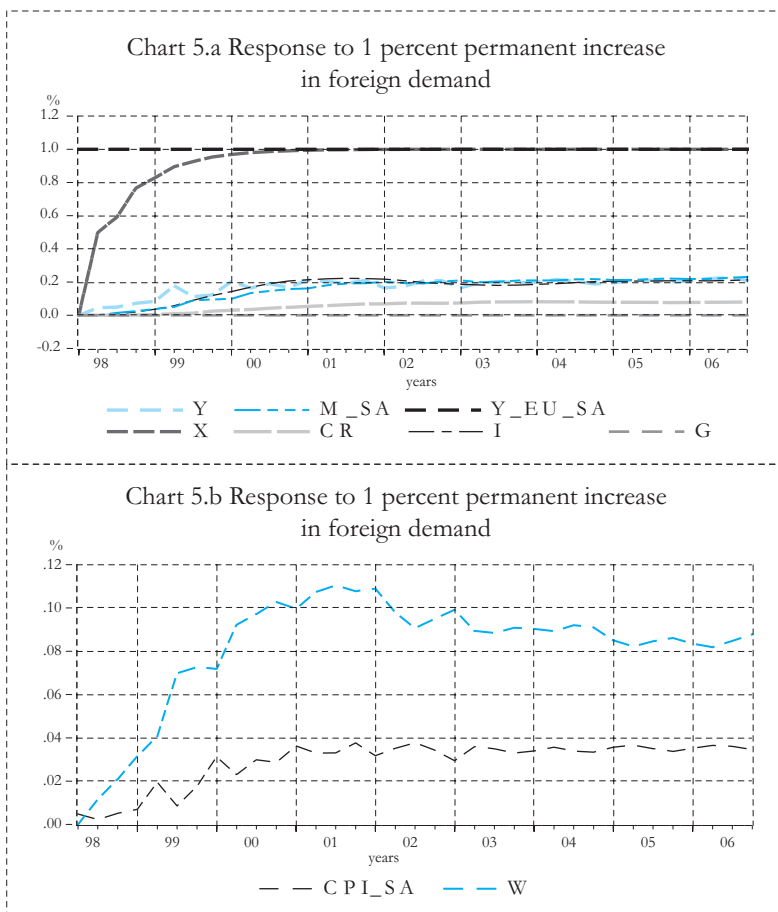


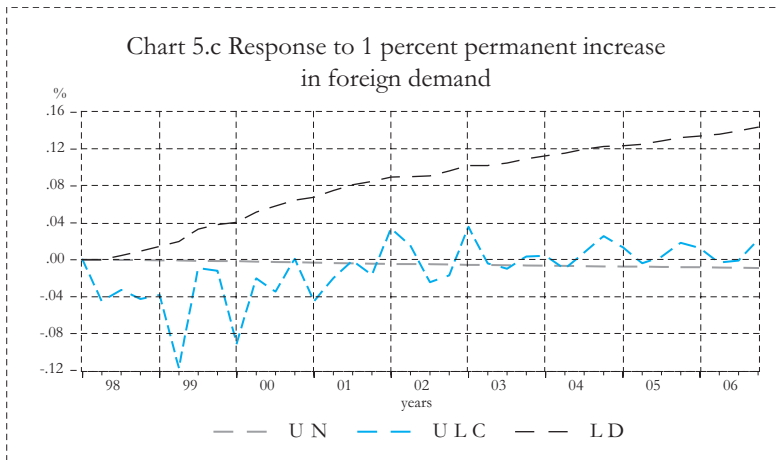
IV.4 INCREASE IN WORLD DEMAND

The permanent 1 percent increase in world demand causes an increase of exports by 0.8 percent within the first year (chart 5.a). Given that exports are high import content, higher exports will result in higher imports, so that the net effect on GDP is positive.

Higher aggregate demand increases also investments, which are needed to back up the increase in exports. Real disposable income increases causing also an increase in consumption.

On the other side, output gap will increase due to higher demand, and this will drive up the aggregate price level (chart 5.b). The intensified economic activity generates higher labour demand and higher wages; however GDP growth compensates part of that increase so that unit labour cost growth fluctuates around zero (chart 5.c). Given that an increase in production especially exports is supported by higher labour demand, this may indicate a tendency of Albanian production for abroad to be labour intensive.





CONCLUSIONS

This paper develops the current version of the Macro Econometric Model of Albania (MEAM). The main aim is to present the new scheme of transmission mechanism and the performance of the model as a whole. The impact of different scenarios the Albanian economy might encounter on the macroeconomic variables shows that the model is well developed and provides reasonable results. Therefore, given that the current form of MEAM performs well in running different simulations and scenario analyses, it will be a very appropriate tool for the policymaking at the Bank of Albania in the near future.

Nevertheless, this paper should be considered as a short presentation of the latest version of the model. The process of building the model is ongoing as it is being improved continuously. The main aim is to develop a model which is consistent with the theory in the long run as well as provides a good representation of the Albanian economy. Therefore, future research on different parts of the macro model and new data and developments, will be very useful in providing a good outlook of the macroeconomic channels of the economy.

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ENDNOTES

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¹ One should note, however, that for policy analysis, more micro founded models with expectations are more useful than the standard macro econometric models, such as the MEAM.

² Refer to "Main temporary disaggregating methods", Dushku (2007)

³ Refer to "Index of foreign unit values/prices of Albanian imports", (2007), Risan Shllaku.

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