I. EXAMPLES OF NEW MACROECONOMIC MODELLING AND SIMULATION TECHNIQUES: HOW THEY COULD IMPROVE DECISIONS AND PUBLIC PERCEPTION

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Abstract

Macroeconomic forecasting started around the Second World War as a way to test economic theories, but it also has a number of very concrete uses, playing an increasing role as an input in decision-making. The first macroeconomic models were produced by two famous economists, Tinbergen in 1939 and Klein in 1950, further recompensed with the Nobel Prise in Economics. During the last decades, the economic forecasting and macroeconomic modelling have taken on an increasingly important role in elaborating various economic policies and medium- and long-term development strategies. In the first part of this article, we are presenting synthetically the last trends in forecasting and macroeconomic modelling. The next part is devoted to show how new models and simulation techniques could improve the actions of decision makers and public perception.

Keywords: forecasting, macroeconomic models, simulation models, spatial distribution, convergence

JEL Classification: E17, E37, J21, O11

1. Introduction

In the last years, mainly due to the global crisis, the published forecasts and, generally, the economic analyses lost much of their credibility. In order to recover, the economists should improve their analysis methods and forecasting models, especially the techniques to present the results of their work. Finally, their work should materialise in increasing the quality of decisions and public perception.

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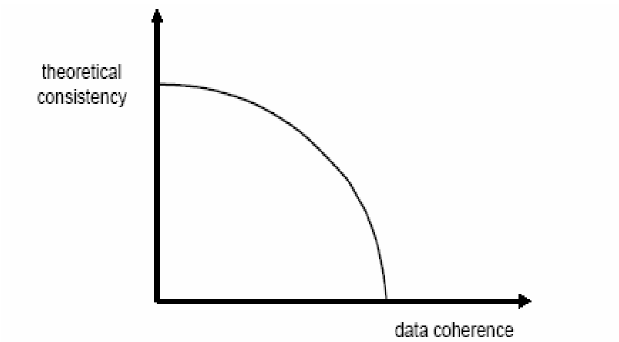
2. Forecasting and macroeconomic models

Forecasting requires some solid economic and econometric expertise, and in particular specialised knowledge of several techniques. Growth trend and cycles play a key role in macroeconomic analysis and forecasting. A synthesis of the main characteristics of the presently used forecasts is done by Carnot, Koen and Tisst (2005). Usually, the economic forecasting could include: a) a view of the economic future, consisting of quantitative estimates for the main macroeconomic variables within various horizons; b) an underlying analytical framework, including an exposition of the assumptions underpinning the forecast, and an investigation of some possible risks; c) a discussion of the implied options for the user of the forecast. Regarding horizons, forecasting is taking into account: the very short run, from the latest observations to two quarters ahead; the short run, from six months to two years down the road; the medium run, generally understood as two to five years ahead (or sometimes ten years); the long run, beyond the five- or ten-year horizon. Coming from the basic mechanisms, forecasting relies on the analysis of economic facts in the light of economic theory, with the exact combination depending on the time horizon: 1) in the short run, stock variables are more or less fixed and therefore the analysis focuses on flow variables, with most forecasters sharing relatively similar assumptions; 2) in the medium run, economic structures are not deemed to change much, therefore, a natural approach is to examine what happens when the trends that are forecasted on a two-year horizon are prolonged; 3) in the long run, economies can undergo substantial structural transformations.

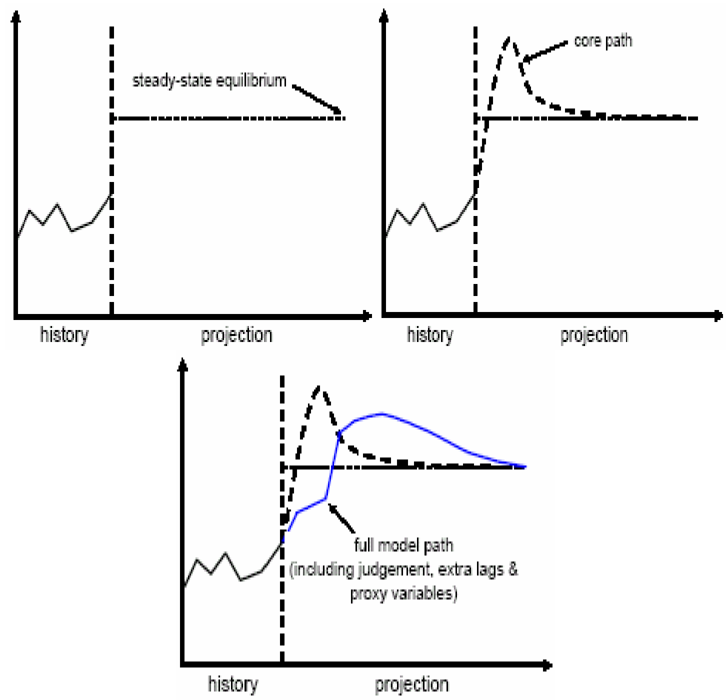
Figure 1



Generally, building a macroeconomic model involves consideration of at least three challenges, as follows: to incorporate theory that is rich enough to be able to analyse a wide range of economic issues, while remaining tractable, internally consistent, coherent and easily understood in the context of a relatively simple model; to make this theoretically tight model match the data at least as well as the previous model; to make the model reliable and efficient under different forecasting assumptions, and amenable to the imposition of judgemental adjustments and conditioning paths. In Figure 1 it is shown a stylised version of this trade-off, such that the current state of the art describes a ‘frontier’ between the axes.

Correspondingly, forecast paths are combinations of three types of information: 1) theoretical insight from a structural nucleus model; 2) data-driven evidence on historical correlations of endogenous variables with other factors, especially those that are not formally accounted for in the structural nucleus model; and 3) a direct application of judgement, informed by other models and staff expertise. The profile for a given endogenous variable is built up from the core (nucleus) model and supplemented in the full model by additional variables, dynamics or judgement, as illustrated in the stylised sequence in Figure 2 (see for details Harrison et al., 2005).

Figure 2



In the last time, there are, explicitly or implicitly, two tendencies in macroeconomic analysis having a major impact on the elaboration of forecasts and the achievement of economic policies:

- Extending the data in the elaboration process of forecasts from annual time series to quarterly time series, monthly time series, and even to higher frequency in time series, signifying the tendency to increase the time resolution.
- Extending the data on the national budget from annual time series to multiannual time series in the elaboration process of forecasts, signifying this time the tendency to decrease the time resolution. This extension means a change from one year to two, three or four years as time unit. Thus, it becomes very close to the standard dimension of the business cycle, moreover tending to coincide with the electoral cycle in most of countries.

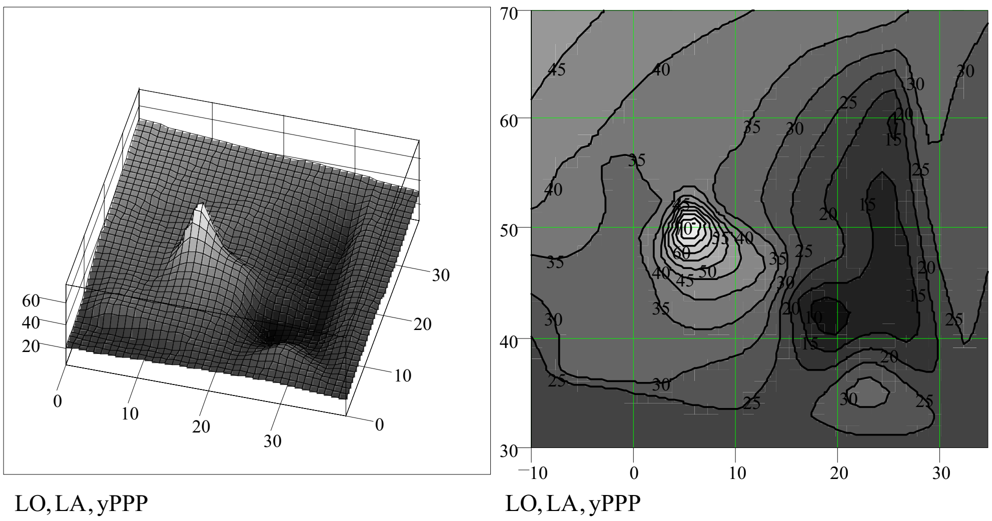
3. Examples of simulation models

Certain adequate simulation models based on the so-called computer assistance and 3D representations could be useful in order to demonstrate suggestively to the policy makers and to the public opinion some relevant correlations among variables. Moreover, they could show how even small changes in level of certain fundamental variables could provoke dramatic movements in the behaviour of the whole economic system.

In the context of the present convergence policy in the EU, it is useful to analyse the spatial distribution of some basic macroeconomic indicators. Moreover, according to recent available data for EU countries we are presenting as output of simulation models some significant 3D graphical representations and their so-called geodesic maps or contour plots.

Among selected macroeconomic variables, the most significant is GDP per inhabitant. Figure 3 shows its spatial distribution in 2009, as a stylised map of the EU, where LO is longitude (on its left side relating to the origin, 0 meridian, we changed West longitude, as it is marked usually on geographical maps, in negative values), LA – latitude, and yPPP – level of GDP per capita in thousands USD PPP. On the stylised map of the EU we can see some distinct groups of regions delimited by different contour lines, lighter and darker grey tones, representing highest and respectively lowest GDP per capita levels. As two general rules, GDP per capita level is increasing from the right side of the EU stylised map (Eastern EU regions) to the left side (Western EU regions) and from the bottom (Southern EU regions) to the top (Northern EU regions), respectively.

Figure 3



The spatial distributions of shares in labour force of agriculture, industry, and services in the EU are presented in Figures 4-6 and those in GDP in Figures 7-9.

Figure 4

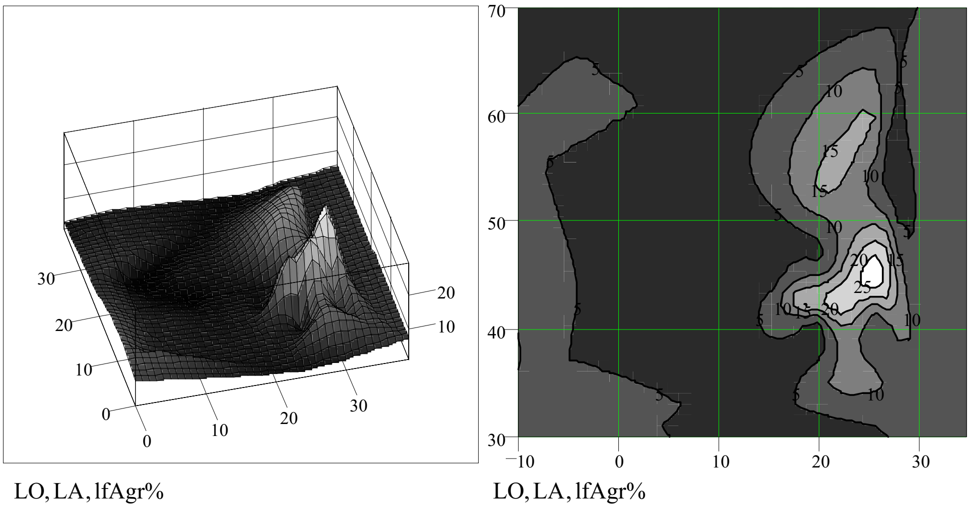


Figure 5

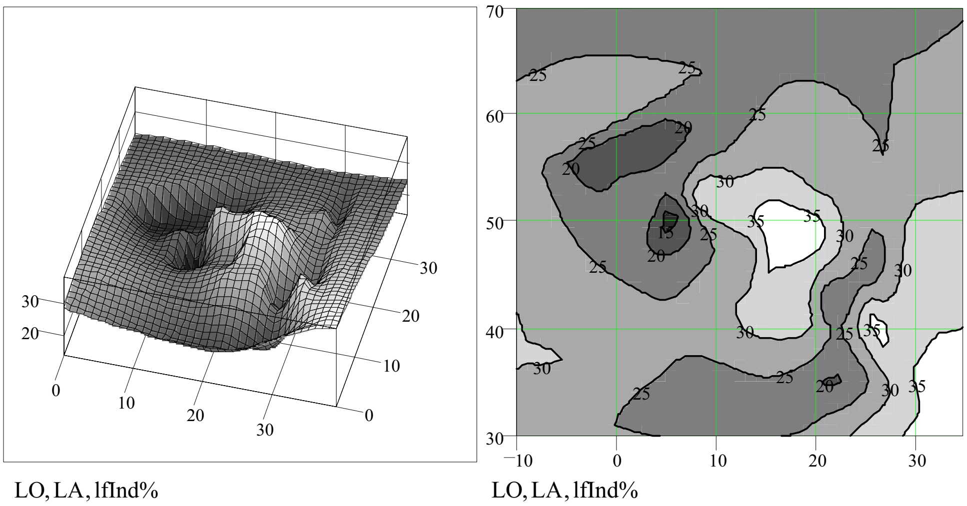
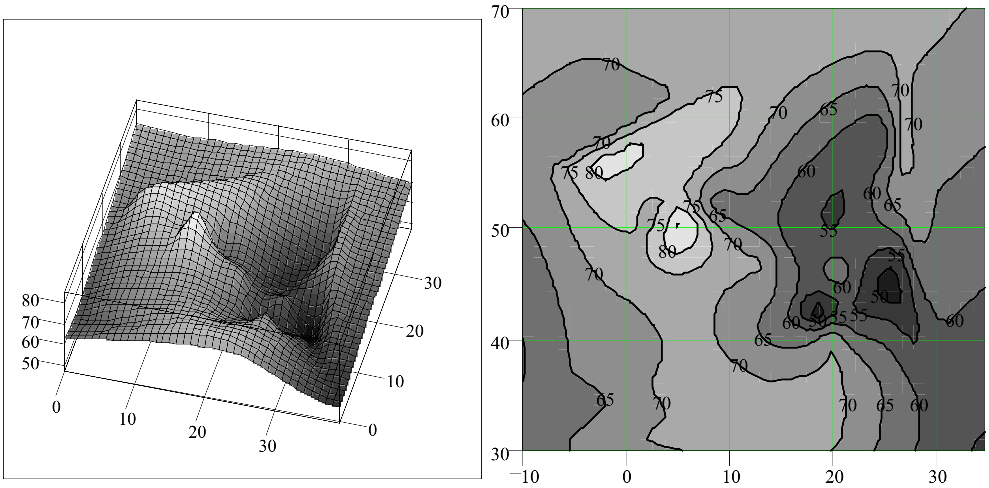
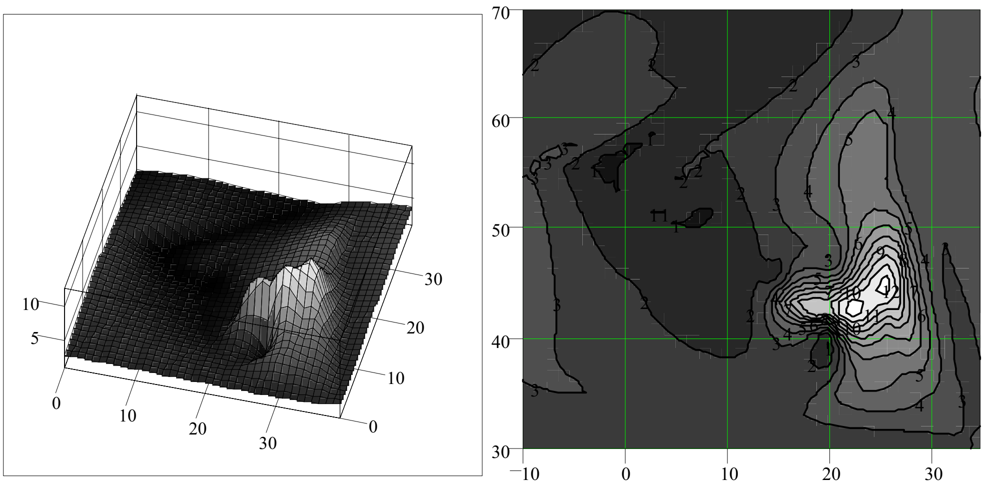


Figure 6



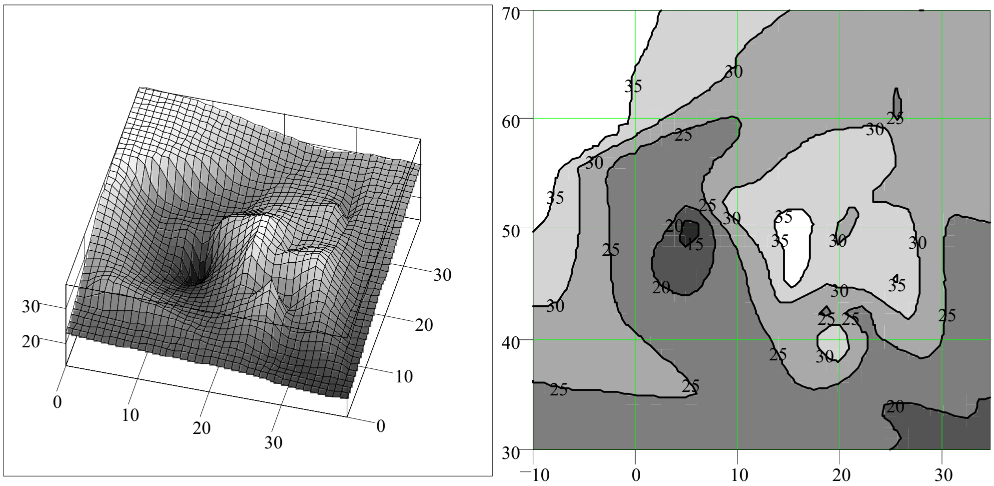
LO, LA, lfServ%   LO, LA, lfServ%

Figure 7



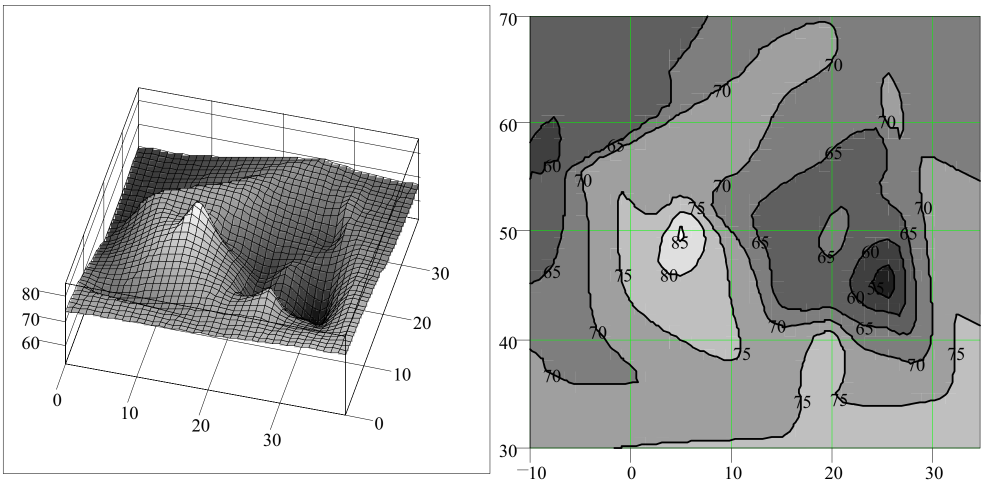
LO, LA, yAgr%   LO, LA, yAgr%

Figure 8



LO, LA, yInd% LO, LA, yInd%

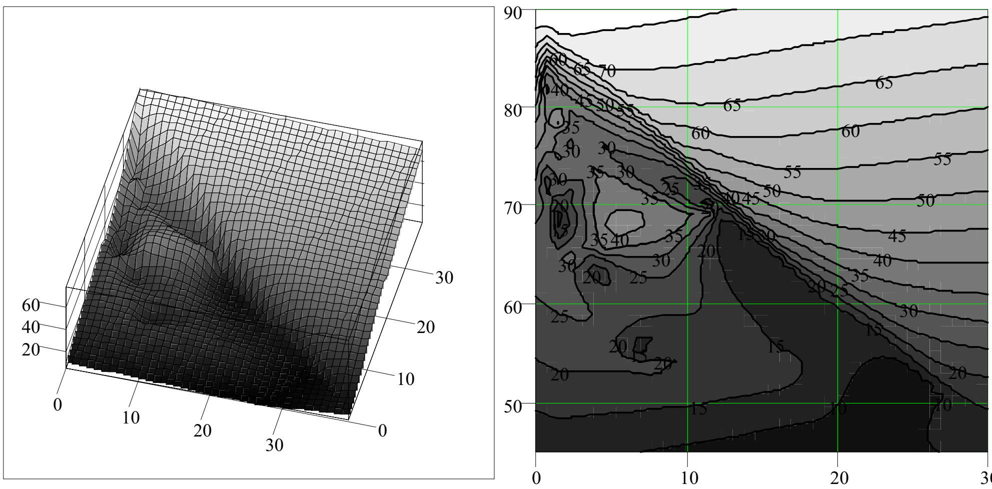
Figure 9



LO, LA, yServ% LO, LA, yServ%

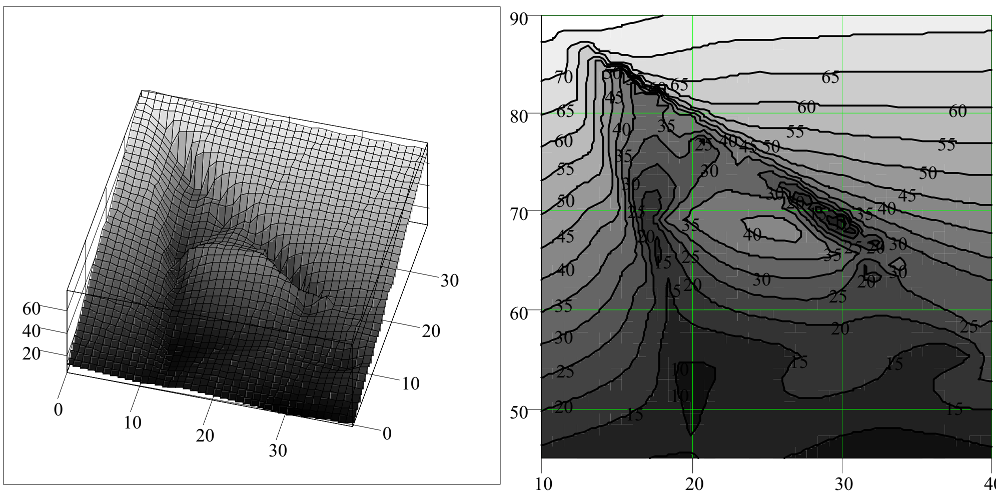
Under the convergence programme, the expected movement in labour force (or structural changes) in the EU could be highlighted by the following 3D representations: the agriculture-services relationship (lfAgr% - lfServ% - yPPP), the industry-services relationship (lfInd% - lfServ% - yPPP), and the industry-agriculture relationship (lfAgr% - lfInd% - yPPP). These correlations in the EU area are presented in Figures 10-12.

Figure 10



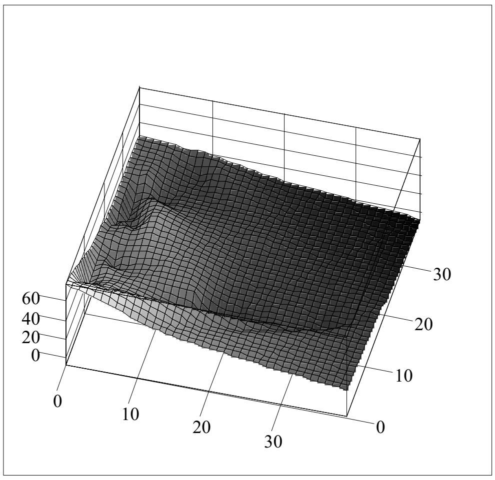
lfAgr%, lfServ%, yPPP   lfAgr%, lfServ%, yPPP

Figure 11

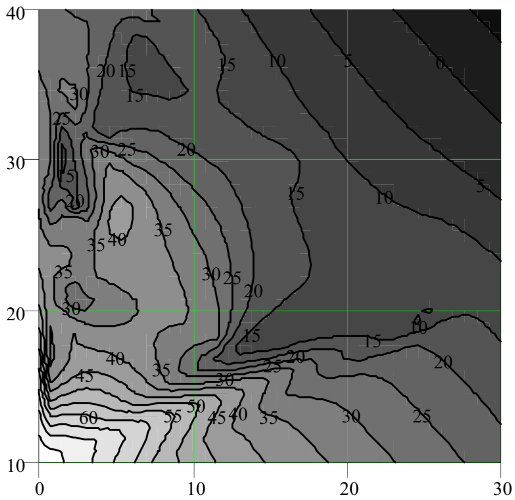


lfInd%, lfServ%, yPPP   lfInd%, lfServ%, yPPP

Figure 12



lfAgr%, lfInd%, yPPP



lfAgr%, lfInd%, yPPP

Using NUTS-2 database, at the EU level, GDP per capita is strongly positively correlated with the share of services in total labour force – correlation coefficient (lfServ%, yPPP) = +0.750 and negatively correlated with the shares of agriculture – correlation coefficient (lfAgr%, yPPP) = -0.563 and industry – correlation coefficient (lfInd%, yPPP) = -0.466. Thus, in case of less developed countries in the EU, for the next period one of the most important factors to increase the real GDP per capita level, in the context of real convergence, is to diminish the share of agriculture in labour force and to concomitantly extend the share of services up to the standard level in the EU. For instance, in 2009, with 47.1% Romania was on the last position in EU as the share of services in total labour force (comparing to 54.9% in Poland, 55.9% in Slovakia, 56.0% in Lithuania, 56.1% in Bulgaria, 58.3% in Czech Republic, 63.4% in Hungary, etc.). At the same time, by share of agriculture in total labour force (29.7%) it is on the first position in the EU.

3. Conclusions

By using some adequate simulation models and techniques, the results of the forecasting and economic modelling intensive work could have an increasing positive impact on the decisions of policy makers and public perception. One way is to use a set of simulation models, more suggestive and friendly presented.

References

Albu, L.-L., 2008. Trends in Structural Changes and Convergence in EU. *Romanian Journal of Economic Forecasting*, 9(1), pp. 91-101.

Albu, L.-L., 2008. *How new modelling and simulation techniques could improve the decisions of policy makers and public perception.* Paper presented at ECCS, The 5th European Conference on Complex Systems, Global system dynamics and policies, Hebrew University of Jerusalem.

Ball, L. and Mankiw, G., 2002. The NAIRU in Theory and Practice. *NBER Working Paper Series, 8940*, Cambridge: National Bureau of Economic Research.

Barro, R. J. and Sala-i-Martin X., 1995. *Economic Growth*, New York: McGraw-Hill.

Carnot, N. Koen, V. and Tissot, B., 2005. *Economic Forecasting*. London: Palgrave MacMillan.

Harrison, R. Nikolov, K. Quinn, M. Ramsay, G. Scott, A. and Thomas, R., 2005. *The Bank of England Quarterly Model*, London: Bank of England.

Heijdra, B.J. Ploeg, F., 2002. *The Foundations of Modern Macroeconomics*. Oxford: Oxford University Press.

Henry, D.F. Ericsson, N.R. (eds.) 2003. *Understanding Economic Forecasts*, MIT Press, Cambridge, Massachusetts, London.

Klein, L., 1950. *Economic Fluctuations in the United States: 1921-1941*. New York: Wiley.

Ngai, R. Pissarides C., 2004. *Structural Change in a Multi-Sector Model of Growth*. London: London School of Economics, Centre for Economic Performance, CEPR and IZA.

Pindyck, R.S. Rubinfeld, D.L., 1998. *Econometric Models and Economic Forecasting*. Boston, Massachusetts, New York, and San Francisco: Irvin McGraw-Hill.

Tinbergen, J., 1939. *Statistical Testing of Business Cycle Theories*. Geneva: League of Nations.