Models for labor force analysis

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ABSTRACT

Economic policy measures are generally fundamented on a system of indicators which allows both a static and a dynamic analysis of the complex processes taking place at macroeconomic level, especially when dealing with structural changes or dependences between population and economy.
Labor market development and functioning is one of the key issues of Romania's transition to the market economy. This requires the total reconsideration of the employment policy and of the use of labor in general, as well as of the mechanisms regulating demand and supply of labor.

Keywords:
labor force indicators, unemployment rate, employment indicators

1. INTRODUCTION

The analysis of labor supply must be done in close connection with the size and structure of the population, which in turn is directly influenced by the economic development of the country, as well as by social factors characterizing the population. These relationships are highlighted by a series of specific econometric models.

2. LABOUR FORCE INDICATORS

The main labor force indicators, as well as the links between them, are shown in Fig 1.

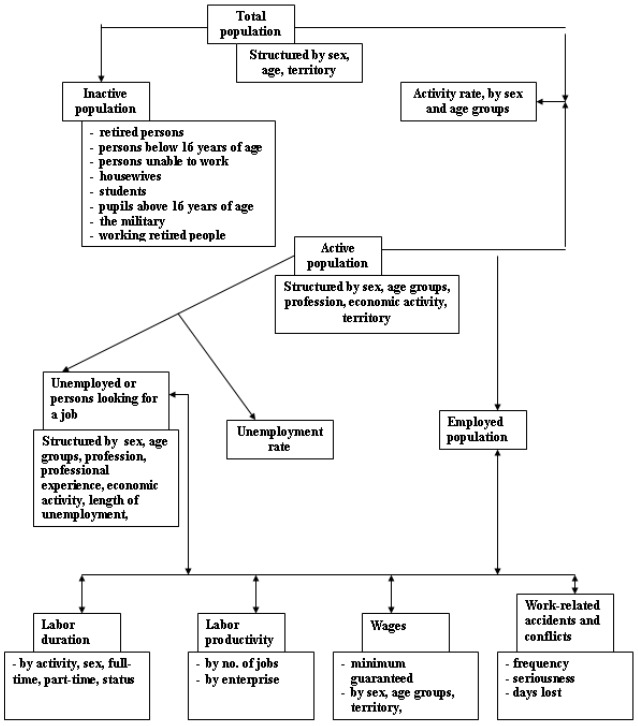

Fig 1 Labor force indicators

As shown in Fig. 1., the number and structure by gender, age group and territorial distribution determine the total active population and inactive population respectively, segmented by various criteria. In turn, the size and structure of the active population influence employment and unemployment. This reflects further in labor productivity, wages, work conflicts, level of economic development and standard of living.
Due to these links, it is difficult to provide a balance between providing qualified and educated labor force, employment and withdrawal from active life.
Skill mismatch on the labor market lead to manifestations such as:

- Increase or reduction of competition in the labor market;
- Increase or decrease in salaries;
- Higher or lower costs for the organization of training and retraining;
- Internal reorganization of work in enterprises;

- Increase or decrease of investments; Relocation of activities
- Development of new forms of activity; Implementation of new schedules;
- Underutilization of the remaining production capacities;
  The use of low skilled labor;
- Challenging society values
- Increase of unemployment;
- Enhancing emigration or immigration.

To be closer to steady state or to minimize imbalances and their effects, the society (state, the businesses, unions) must understand, accept and adopt measures for regulating the supply of labor. This is necessary for socio-political stability of any country. In the study of the work and structure of interest by age group population. Comparing current rates with those of previous periods, trends can be observed. By extrapolation, forecasts can be performed for the future.
The rapid evolution of the society raises problems in explaining and controlling the evolution of negative economic phenomena that may arise. It is therefore necessary to develop effective tools for explaining and correcting the negative effects of the economic phenomena that occur within a certain period.

3. MODELS FOR ANALYSING ECONOMIC PHENOMENA

The model is a simplified picture of the relationships between economic variables, which regards both the variables and the connections between them.
Fig. No. 2 presents the schematic drawing up the model and the effects it generates when using such a model in a macroeconomic system. Presented by equations, the econometric model renders the essentials of the studied economic phenomenon, linking cause to effect. Thus, the econometric model is based on knowledge of the process of transformation of variable factors into the results (variable effect). For this purpose, they are initially assumptions, consisting of a model or more equations. For such a model, solutions are obtained in conditions of maximum verisimilitude, starting from a sample of data In a summarized form, the model appears as follows:

$$f (y, x_i, a_i, u_i) = 0$$

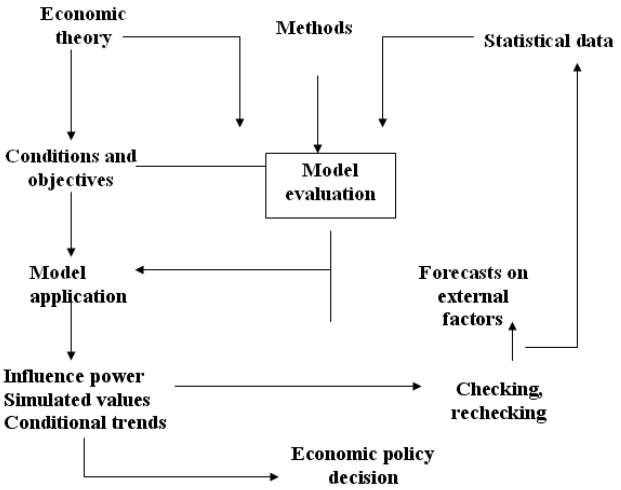

Fig. No. 2. Elaborating an econometric model

In relation to the above we used the following symbols:

f = function for obtaining the endogenous variable (y) when x_i and a_i are known;
y = endogenous variable (output);
x_i = exogenous independent variable (input);
a_i = regression model parameters ;
u_i = random variable

Identifying the essential elements of the mechanisms of functioning of the labor market in Romania, we have developed a practical example of the econometric model based on regression equations.
Starting from the fact that generally the phenomena on the labor market manifest as trends, we will examine the main dependent, by expressing the quantity and type and intensity of links between indicators which describe the labor market and essential factors of influence using the unisectorial multifactorial linear Econometric model, with synchronous influences, to outline the evolution of dependency which determines the country's total population, the evolution of the population occupied and unemployment rates. This type of model is built from a single regression equation based on a linear function of several factors observed at the same time (t). The model is validated using ANOVA.

The complexity of interdependent relationships within the Romanian society makes difficult for some qualitative factors to be directly assessed. As with all social phenomena, subjective factors occur and influence the general evolution, which can change to a greater or lesser extent the relations of interdependence.
That is why they have to be identified, selected and ranked, all the more so given the fact that some factors cannot be directly identified or quantified. Basically, identifying the link between the phenomena can be achieved only through a qualitative analysis.

4. Econometric model for assessing labor resources in Romania

Given the above, we propose to formulate the equations for an econometric model intended simulate the evolution labor resources in Romania during 1990-2008. The models are based on a series of statistical data for the period 1990-2008, provided by the National Institute of Statistics, taken from "Statistical Yearbook of Romania."

I. Total population model considers that the evolution of the population is influenced by demographic factors, represented the natural growth of population and the number of immigrants, as well as by economic factors, resulting in gross domestic product index, which reflects the macroeconomic evolution. To ensure comparability of data and to remove the inflationary aspects emphasized during the period of the analysis, we used the GDP index with 1990 as base year.
Economic development represented by the evolution of the gross domestic product will have a direct impact on the population by improving the quality of life and reducing the poverty threshold, by creating opportunities for new investments that will be generating jobs. The social implications of economic development will be reflected in the demography, by reducing emigration and by promoting entrepreneurship.
Primary analysis of data found a decrease in the total population of the country during 1990-2001; after 1992 a negative natural growth was recorded, while emigration diminished after 1993. Also, the gross domestic product fell until 1992.
Mathematical formalization of this model is the following:

$$P_t = f (SN_t, E_t, I^{90}_{PIB}) + u$$

where:

P_t = total population at moment “t”;
SN_t = natural population growth at moment “t”;
E_t = emigrant sat moment “t”;
I^{90}_{PIB} = GDP index against 1990.

After determining the estimators and testing the model, we found an inverse relationship between the evolution of the total population and the number of immigrants, and a direct relationship between population growth and natural, relationships which are also sustained by the demographic theory. The total population of the country is also in direct relation with the GDP index which is justified by the economic theory and by practice which claims that economic growth is accompanied by demographic growth, as GDP growth translates in an increase in the quality of life of the population.
Based on Fisher-Snedecor test, the model can be considered useful for economic practice (with a 95% probability) and can be used in forecasts and in determining the economic and demographic policies.
The Student test confirmed that the country's total population is significantly influenced by natural growth and the GDP index.

II. Employed population model. The model shows the evolution of employed population in correlation with the demographic factor, the total population of the country at the time "t", with the rate of activity of the population at time "t" as well as in relation to economic factors represented by the households savings rate defined as percentage of the gross saving and household gross disposable income. This model is of interest in economic analysis and for shaping economic and employment policies, relationship between the total population, the segment of active population and employed population, as the entire population depends on the volume of employed people and from the active population category it is desirable that as

many as possible fall within the "employed" category in order to have a relaxation of economic and social tensions. Household savings rate of the population, as it was defined, indicate the savings and income ratio. As this rate is higher, it indicates an improvement of the economic prosperity of the population, hence the incomes will increase, the purchasing power will increase, and an oversupply of money will be created for the people to be saved. So usually, in terms of economic growth, if the number of employed people will increase and the rate of productivity will increase, the population savings rate will have an upward trend.

POt = f (Pt , RAt, REc.pop.t)
where:
POt = occupied population in moment "t";
Pt = total population in moment "t";
RAt= activity ratio at moment "t";
REc.pop. = households savings rate.

It can be noticed that between the occupied population and the total population, the activity ratio and households savings ratio there is a direct evolution link.
The determination coefficient indicates a strong dependency between occupied population and endogenous variables (total population, activity ratio and households savings ratio) that are included in the model. As well, the "F" test indicates that the econometric model provides viable solutions for the economic analysis. The "t" test suggests that the occupied population is not significantly influenced by activity ratio.
III. Unemployment ratio model has as starting point the English economist Arthur Philips's theory, identifying the inverse relation between the level and dynamics of the wages and the demand and supply of labor**.** Extrapolating, one can notice that in order to have sustainable economic growth a certain level of inflation has to be controlled, a level considered "moderate", where the unemployment has a low level. Starting from this economic theory, we considered that the unemployment rate is closely dependant on the consumer price indexes (that are used to measure the inflation levels), GDP indicators per capita (that are connected with the evolution of the national economy as a whole), real wage increase indicators and social pressure ratio (the ratio of effective social contributions to the public administration on the GDP), as economic effort of the population. In order to assure data compatibility, year 1990 was considered as base year for calculating IPC, GDP indexes per capita and real wage increase indicators, eliminating the distorting effects of inflation.

$RS_t = f\ (IPC_t, I^{90}_{PIB/\ loc}\ , I^{90}_{SR}\ , R_{pres.soc.}\ )$

where:
RS_t = unemployment ratio in moment "t";
IPC_t = Consumer Price Index compared to 1990;
$I^{90}_{PIB/\ loc}$ = GDP indexes per capita compared to 1990;
I^{90}_{SR} = real wage increase indexes compared to 1990;
$R_{pres.soc.}$= social pressure ratio.

The determination coefficient over 81% indicates a strong relation between the unemployment ratio and IPC, GDP indexes per capita, real wage increase indexes and social pressure ratio. The "Student" test shows that the unemployment ratio is significantly influenced in its evolution not only by the social pressure ratio.
This generates the need of an analytic study regarding the above correlation and for formulating improvements of the model regarding the age category, knowledge levels, studies and socio-professional analysis, even the introduction of qualitative variables like "political stability" (yes/no) or "financial or legislative incentives" (permissive/restrictive).
In those situations where the model is dedicated to getting precise predictions, it is recommended to verify the quality of model specifications in accordance to the ex-post predictions precision. This type of predictions is referring to timeframes that have real data known, hence being able to test the prediction precision.
Usually, the last "s" timeframes from the whole "n" timeframe interval represents the "witness" time period, dedicated for checking the prediction precision. The test prediction is based, in conclusion, on estimates developed for "n-s" values and it is in relation with the future evolution of the last "s" values of the endogenous variable.
For a clearly specified model, that is not affected by systemic distortions, we can expect the prediction error to have the characteristics of a random, normally distributed, low dimension

variable. it would be generated due to the inherent sampling error and incident random factors intrusions.

5. CONCLUSIONS

Even with all the difficulties connected with the identification of the behavioural relations specific for the market economy transition, or through the conversion to economic effects of all aspects defining the quality of life, the econometric modeling is one of the key instruments in approaching the study of labor market. All these obstacles will be overcome by accepting the economic criterion as the only one worth taking into consideration in modeling the social field. Next, we have to find the conversion solutions that would provide the compatibility of the economic criterion with all other criteria (cultural, ecological, technological, and so on), with the main objective the maximization of the living standards and the life quality improvement.
The final utility of the econometric modeling is the development of relevant trajectories regarding life standard improvement in a given socio-economic context; the anticipation of short-term consequences on this topic and identification of economy management strategies, as well as adequate economic policy measures.

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