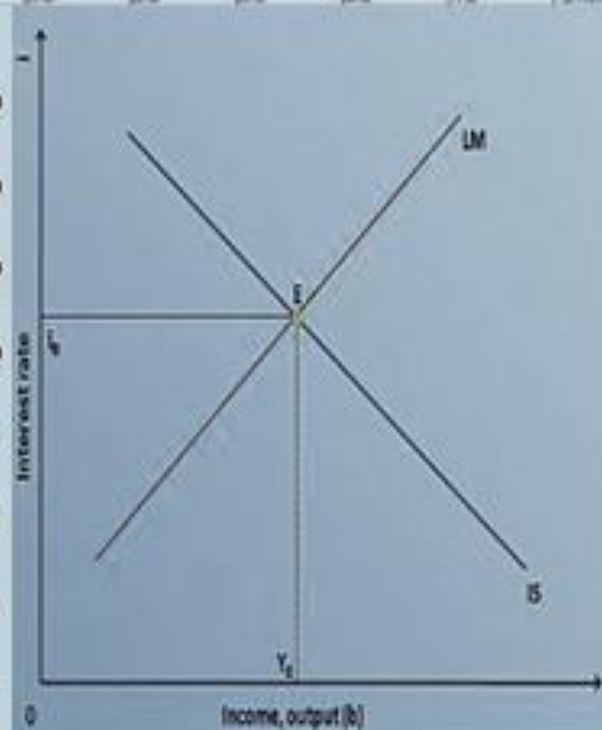


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## Economic growth, openness and foreign direct investment in oil-rich countries

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**Abstract:** *In this study, the effects of trade openness and foreign direct investment on economic growth through the transfer of technology have been examined. To investigate this issue, we use a sample of 19 oil-rich countries over the time period 1991-2006.*

*We estimate two models to investigate this issue. At first, we estimate a model including TO (the ratio of import plus export to GDP) as trade openness, the ratio of FDI to GDP and some other variables as independent variables. The result of this model implies that FDI has positive and significant effect on economic growth while trade openness has negative and significant effect. To examine the negative coefficient of trade openness more, another model is estimated. Export to GDP and Import to GDP were separately considered as trade openness in second model and other variables were same. The result of second model indicates that FDI has positive and significant effect while both trade openness indices have insignificant effect on economic growth.*

**Keywords:** Economic Growth, Trade Openness, Foreign Direct Investment, Technology Transfer

**JEL Classification:** O40, F21, F41

### 1- Introduction

Economic growth is an important economic goal for all economies. Some researchers consider two main reasons for this. The first reason is that countries want to satisfy the needs of their people and improve their living standards. The second is that countries want to obtain and protect their international competitiveness. For this reasons, investigation of the variables that affect economic growth and development is very important.

Nowadays, one of the most important variables affecting economic growth is openness. So, investigation of openness indices which affect growth is necessary. In this paper, the effects of trade openness and FDI on economic growth are studied and compared.

There exist many studies on this issue. Some empirical studies on trade openness and FDI interaction on growth (Borensztién et al, 1998; Kohpaiboon, 2004; Mansouri, 2005; Karbasi et al, 2005), FDI-growth nexus and trade-growth nexus (Lipsey, 2000 and Pahlavani et al, 2005) have mostly concluded that both FDI inflows and trade openness promote

economic growth. Nevertheless, there is some clear evidence that the growth enhancing effects of FDI inflows and trade vary in different countries. For some countries FDI and trade can even affect the growth process negatively (Borensztein et al., 1998; De Mello, 1999; Lipsey, 2000; and Xu, 2000). Indeed, the growth enhancing effects of FDI and trade interaction are not state independent but depend on various country specific factors such as the kind of openness.

In this paper, we want to compare the impact of trade openness and foreign direct investment on economic growth through the technological effects in 19 oil-rich countries over the time period 1991-2006. The outline of this paper is as follows. The next section explains the effect of openness on growth. Section 3 describes the model and estimation results for oil-rich countries. Section 4 concludes the paper.

## 2. The effect of openness on growth

In the neoclassical growth model, the growth rate of technology that determines the growth rate of per capita economic variables is exogenous. So, in this model, the growth rate of per capita economic variables in the long-run is exogenous whereas in the endogenous model, technology growth and economic growth are endogenous.

Trade openness and FDI provide appropriate base for technology growth. Thus, the explanation of the effect of the trade openness and FDI on economic growth in the context of endogenous growth models is more appropriate.

Primarily, we show a simple model for explaining how trade openness and FDI affect production and growth. Consider the following production function:

$$Y_t = A_t \cdot K_t^{\beta_1} \cdot L_t^{\beta_2} \cdot D_t^{1-\beta_1-\beta_2} \quad (1)$$

Where  $Y_t$  denotes the total output of the economy (real GDP) at time  $t$ ,  $K_t$  is capital,  $L_t$  is labor and  $D_t$  denotes a homogeneous function of the factors of production related to trade at time  $t$ . The variable  $A_t$  captures the total factor productivity at time  $t$ . According to this function, a change in any of the variables on the right hand side of the above equation can change the total output. We introduce the function  $D$  as follows:

$$D = \sum_{i=1}^n x_i^a \quad 0 < a < 1 \quad (2)$$

Where  $x_i$  is  $i$  – th factor of production that is dependent on trade.

Also, it can be seen that technology is a function of openness as follows:

$$A = \alpha_0 \cdot S_{TO}^{\alpha_1} \cdot S_{FDI}^{\alpha_2} \cdot L^{\alpha_3} \cdot K^{\alpha_4} \quad (3)$$

Where  $S_{TO}$  denotes factors associated with trade openness that influences technology and  $S_{FDI}$  is an index of factors associated with FDI that influence technology.

According to the above relation, it is observed that trade openness and FDI can affect economic growth via technological progress.

Now, according to the above relationships that are based on endogenous growth model and Nowak- Lehman (2000) article, we can explain the effects of international economic relationships on output growth rate via three channels:



First, endogenous technical progress makes the economic growth permanent. Innovation, imitation and adaptation are driven by the profit-maximizing behaviour of firms. Even though externalities might be connected with those activities, the costs of innovating, imitating or adapting new products and/or new technologies are covered by temporary profits that allow to set prices correspondingly (mark-up pricing), an idea already propagated by Schumpeter (Romer, 1990; Aghion and Howitt, 1992). Openness could enhance technological progress which, in turn, makes the long-run growth permanent. A speed up in technological progress could be caused by stronger capital goods imports, increased transfer of technology, higher foreign direct investment and/or more incentives to imitate and innovate, factors which are all positively correlated to trade liberalization as far as the empirics are concerned.

Second, according to the AK model an increase in savings and investment does not curb the incentives to accumulate capital. Crucial for this result is the assumption of constant returns to scale of the produced and accumulated factor (which comprises physical and human capital) and the 'unimportance' of non-reproducible factors, such as land. Capital accumulation becomes thus a profitable long-run business (Rebelo, 1991; Jones, 1995). If openness positively influences on savings and capital accumulation, then an adequate trade policy can promote growth in the long-run.

Third, positive externalities linked to capital accumulation (in a broader sense) lead to constant or even increasing returns of the produced factor (Romer, 1986, 1987). Positive externalities suspend the assumption of diminishing returns to capital (which is a crucial assumption in the neoclassical model) and thus make permanent increases in the growth rate of output possible.

Externalities lead to the result that one-time improvements in efficiency (as induced by openness) can permanently increase the rate of economic growth (U. S. International Trade Commission, 1997).

### 3- Model and empirical results

In this section, we examine whether the trade openness has more significant and positive effect on growth or FDI. We use a panel data of 19 oil-rich countries for 16 years to estimate the following regression:

$$\text{Growth}_{it} = c_i + \alpha_1 \log \text{GDP}_{it-1} + \alpha_2 \text{FDI}_{it} + \alpha_3 \text{TO}_{it} + \alpha_4 \text{Capital}_{it} + \alpha_5 \text{Labor}_{it} \quad (4)$$

Where Growth denotes economic growth, FDI is the ratio of Foreign Direct Investment to GDP, TO is the trade openness index (import plus export divided by GDP), Capital is the ratio of capital formation to GDP, Labor is Labor growth and  $\log \text{GDP}_{t-1}$  denotes gross domestic product in last period. The result of the estimation of the above relationship is as follows:

Table 1: Estimated Regression(the ratio of import plus export to GDP as the trade openness index)

Variable	Coefficient	Std. Error	t-statistic	Probability
TO	-0.011215	0.005060	-2.216202	0.0275
FDI	0.165750	0.060302	2.748691	0.0064
CAPITAL	0.236415	0.029980	7.885828	0.0000
LABOR	-0.253822	0.111503	-2.276372	0.0236

LNGDP <sub>t-1</sub>	0.089663	0.165433	0.541990	0.5883
C	-2.927871	1.795213	-1.630932	0.1040

According to the above results, FDI and capital have positive and significant effect on economic growth. On the other, the coefficient of trade openness is negative and significant. As it is shown, the coefficient of  $\log \text{GDP}_{t-1}$  is positive but not significant and implies the lack of convergence among the oil-rich countries. The coefficient of labour is negative and significant. Lack of skill and less labour intensive industry of oil in these countries could be one of the reasons for this result.

Although the coefficient of FDI is positive with a value 0.165750 and also significant, the coefficient of trade openness is -0.011215 that is negative and significant. The above results imply that FDI could be a stronger channel through which the transfer of technology is done.

In order to investigate more deeply the negative effect of the trade openness variable on growth, we divide TO into two variables. So, equation (5) including EX (exports to GDP) and IM (imports to GDP) instead of TO (imports plus exports divided by GDP) is estimated. Indeed, this model is estimated to see whether it is imports or exports that cause this negative effect.

Therefore, equation (5) is considered as follows:

$$\text{Growth}_{it} = c_i + \alpha_1 \log \text{GDP}_{it-1} + \alpha_2 \text{FDI}_{it} + \alpha_3 \text{EX}_{it} + \alpha_4 \text{IM}_{it} + \alpha_5 \text{Capital}_{it} + \alpha_6 \text{Labor}_{it} \quad (5)$$

Where EX denotes the ratio of exports to GDP and IM denotes the ratio of imports to GDP. In this model, EX and IM are considered as the trade openness indices.

The estimation of equation (5) based on panel data of the same period and countries has the following results.

Table 2: Estimated Regression( exports to GDP and imports to GDP as the trade openness indices)

Variable	Coefficient	Std. Error	t-statistic	Probability
EX	-0.003445	0.020396	-0.168910	0.8660
IM	-0.021731	0.027213	-0.798534	0.4252
FDI	0.170323	0.061502	2.769374	0.0060
CAPITAL	0.238315	0.030412	7.836337	0.0000
LABOR	-0.257140	0.111991	-2.296077	0.0224
LNGDP <sub>t-1</sub>	0.087955	0.165742	0.530672	0.5961
C	-2.909143	1.798579	-1.617467	0.1069

As the above table shows, exports and imports are now insignificant. Again FDI and capital formation have positive and significant effects on economic growth. labour coefficient is negative and significant as before. The coefficient of lag of GDP is positive and insignificant, implying the lack of convergence among the countries under study. Again, the above results imply that FDI could be a stronger channel for the transfer of technology and the promotion of economic growth.

According to table 1 and 2, FDI has is more effective than trade openness in increasing economic growth in oil-rich countries. One reason for this result is that most of the

export volume of these countries is oil and, in most of these countries, foreign exchange incomes from oil are spent on consumer imported goods. These goods do not influence economic growth.

#### 4- Conclusion

In this study, the effects of trade openness and foreign direct investment on economic growth through the technological effects have been examined. So, the significance of effect of FDI and trade openness on transfer of technology has been compared for a sample of 19 oil-rich countries over the time period 1991-2006.

Initially, in order to investigate this issue, we estimate one model including TO (imports plus exports to GDP) as trade openness, FDI and several other variables. The result of this model suggests FDI has positive and significant effect on economic growth while trade openness has negative and significant effect. In order to investigate more deeply the negative effect of the trade openness on economic growth, we divide TO into two variables in another model. So, the ratio of exports to GDP and the ratio of imports to GDP were separately considered as trade openness in the second model and other variables were same. The result of the second model indicates that FDI has positive and significant effect while both of trade openness indices have insignificant effects on economic growth.

According to regressions estimated, FDI is more important than trade openness in promoting economic growth in oil-rich countries. One reason for this result is that most of the exports is oil and, in most of these countries, most of oil incomes are spent on consumer imported goods which could not promote economic growth and is not important for the transfer of technology.

#### 5- References

1. Aghion Ph. and Howitt P. (1992) - "A model of growth through creative destruction", *Econometrica* LX, 323-351
2. Borensztein E., Gregorio J. And Lee J. (1998) - "How does foreign direct investment affect economic growth", *Journal of International Economics* 45 , PP. 115-135
3. Frimpong J.M and Oteng-Abayie E.F. (2006) - "Bounds Testing Approach: An Examination of Foreign Direct Investment, Trade and Growth Relationships"; MPRA Paper No. 325, Posted 09, October 2006
4. Jones Ch. (1995) - "Time series tests of endogenous growth models", *Quarterly Journal of Economics* 110(2), 495-525.
5. Karbasi A., Mahamadi E., and Ghofrani S. (2005) - "Impact of Foreign Direct Investment on Economic Growth." Paper presented at the 12th Economic Research Forum Conference, 19th-21st December, 2005, Egypt.
6. Kohpaiboon A. (2004) - "Foreign Trade Regime and FDI-Growth Nexus: A Case Study of Thailand", Working paper, Australian National University.
7. Lipsey R.E. (2000) - "Inward FDI and Economic Growth in Developing Countries", *Transnational Corporations*, 9(1), 61-95.
8. Luiz R. de Mello jr. (1999) - "Foreign direct investment-led growth: evidence from time series and panel data", *Oxford Economic Papers* 51, pp.133-151
9. Mahdavi A. (2004) - "An Analysis Of The Role Of Foreign Direct Investment In Economic Growth", *Journal of Economic Research (Tahghighat-e-Eghtesadi)*, NO:66, fall 2004, pp 181-208
10. Mansouri B., (2005) - "The Interactive Impact of FDI and Trade Openness on Economic Growth: Evidence from Morocco", Paper presented at the 12th Economic Research Forum (ERF) Conference, Cairo. December, 2005



11. Nowak- Lehman F. (2000) - "Trade Policy and Its Impact on Economic Growth: Can Openness Speed Up Output Growth?", << <http://www.iai.wiwi.uni-goettingen.de/content/pdf/iai-db75.pdf> >>
12. Pahlavani M., Wilson E. and Worthington A.C. (2005) - "Trade-GDP Nexus in Iran: An Application of Autoregressive Distributed Lag (ARDL) Model." American Journal of Applied Sciences 2(7): 1158-1165.
13. Rebelo S. (1991) - "Long-run policy analysis and long-run growth", Journal of Political Economy 99(3), 500-521.
14. Romer Paul M. (1990) - "Endogenous technological change", Journal of Political Economy XCVIII, 71-103.
15. Shahabadi A. (2001) - "Determinants of economic growth in Iran", Nameh-Ye-Mofid, NO.27, pp.169-199
16. U.S. International Trade Commission. 1997. "The dynamic effects of trade liberalization: an empirical analysis". Investigation No. 332-375. Publication 3069. Washington D.C.

## The Application of a Grey Markov Model in Forecasting the Errors of EIA's Projections in Gas Production and Energy Intensity

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**Abstract:** Grey system theory looks for realistic patterns based on modeling with a few available data. In this paper, a Grey-Markov prediction model which is the combination of the GM(1,1) and Markov model was studied; Moreover, its applications in energy system were presented. The average errors of Energy Information Administration's predictions for Natural Gas production and Energy intensity from 1985 to 2008 and 1985 to 2007 respectively were used as two forecasted examples. Comparing with GM(1,1) prediction model, we showed that the Grey- Markov prediction model improves the forecast accuracy.

**Key words:** Grey Theory, Grey-Markov, EIA, Gas Production, Energy Intensity

**JEL Classification:** C15,C53

### 1. Introduction

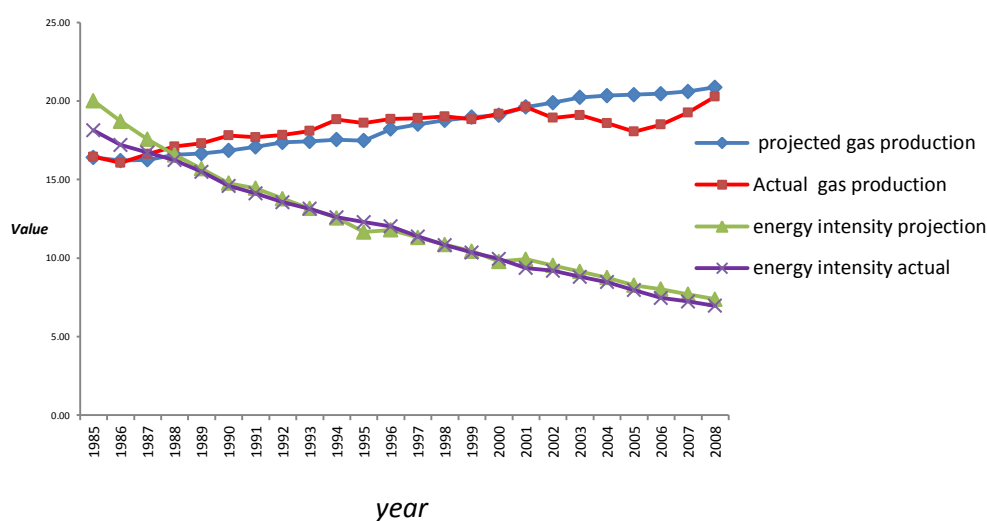
In prediction field, predictions should be accurate and reliable. Forecasting methods are composed of quality and quantitative ones. Qualitive forecasting methods have Delphi method, trend method, prediction method, market research and the expert system etc. while the quantitative forecasting methods consist of Grey model (GM), neural networks, time series, econometric models, regression models, statistical methods and casual model etc. Finding reliable patterns according to modeling by poor information is the main function of GM. The advantage of the Grey models is their ability in evaluating the performance of unexplored systems with a restricted amount of data which is at least only 4 but the regression method, simple exponential and box Jenkins require at least 10 to 20, 5 to 10 and 50 data, respectively. The Grey model can be applied for both equal and not equal gaps while simple exponential method and box Jenkins only be applied for equal gaps, regression model for same and regular trend data and time series method for mixture and regular data. Another advantage of the GM is its usage in short, mid and long term predictions while the regression model and time series can be used only for short and middle term predictions. GM is the core of Grey system theory. Random variables in the Grey theory are considered as inconstant numbers that change with time parameters; The level of uncertainty is denoted by "color" in

this model. The order series is transformed to the differential equation in the GM. The application of the Grey models have been very broad: In predicting gross national product, inflation index and stock price (Kotil et al.,2005; Ma and Zhand,2009), business failure(Cheng and Chen,2009),energy issues(Lin & Yang ,2003; Li, 2006; Zheng & Wang, 2011; Ma and Zhand,2009; Kordnoori & Mostafaei,2011;Kumar & Jain,2011), voyaging systems and networks (Zhang et al,2008;Xue et al.,2011), output values of industries (Ficherr et al.,2008).

A probability model which is a sequence of independent random variables is a Markov chain. It's advantage is the ability of modeling the uncertainties in systems which fluctuate dynamically in time. The transition probabilities demonstrate the importance of all random aspects. In Grey-Markov model, the Markov model is applied to predict the stochastic alternations and the GM for predicting the trend of data sequence. A stationary and non-stationary time sequence can be forecasted by the Grey-Markov model.

Energy is one of the indispensable factors for continuous development and economic growth; Moreover Energy predictions have a fundamental influence on improving energy and environmental plans. The growth and development of the economic activities depend on energy fore castings. Therefore it is vital for governments to plan according to the reliable forecasts. There are some organizations which regularly predict energy statistics. Their predictions are applied in budget forecasting, energy planning's, investing procedures, political decisions, economic activities and etc. The most important agencies are EIA, BP, IEA, OPEC and Exxon-Mobil which publish and forecast energy data. As these energy forecasts play important roles in world economic, politics, governmental policies, it is important to evaluate the accuracy of these predictions. By choosing and comparing the actual and forecasted values of EIA errors, we recognize that some errors exist in their predictions. As seen in Figure 1, there are some errors in predicting and actual values of EIA. We display these errors only for natural gas production and energy intensity in this figure as they are the cases which we analyze in this research. In all energy forecasting these errors exist. Therefore modeling and predicting these errors are essential.

**Fig.1: The differences between actual and EIA's projection values for natural gas production and energy intensity**



-Unit of Gas production is trillion cubic feet;unit of Energy intensity is quadrillion Btu/\$ Billion Nominal(GDP)

The researchers pay much attention to various energy predicting models in recent years. There are some related works which analyzed the accuracy and the errors of energy

forecasts (Soldo, 2012 ; Sanders et al., 2008 ; Joutz & Trost , 1992; Huntington, 1994; Linderoth, 2002; Craige et al., 2002; Smil, 2000; Asher, 1978). More specifically, Several independent analyses have been published over the past years which examine the accuracy of Energy Information Administration (EIA)'s projections. Neil and Desai analyzed and assessed the EIA projections of U.S. energy consumption (Neill & Desai, 2005; Neill & Desai, 2003). Fischer et al. (2008) investigated the potential for systematic errors in the EIA's widely used annual energy outlook. Valex Lekat and Larry Dale (2005) evaluated the accuracy of AEO's forecasted price and Henry Hub compared to U.S. wellhead future price. Winebrake and Sakva (2006) explored U.S. energy forecasts through the EIA and its predecessors in order to uncover potential systematic errors in U.S. forecasting model. Test of rationality of EIA's projections was studied by Auffhammer (2005). Shlyakhter and et al. (1994) found the distribution of error of EIA's projections. Cohen and et al. (1995) studied the EIA's projections.

In this paper first we introduce the GM(1,1) and Grey-Markov model. In section 3 we apply these methods in modeling the errors of EIA's projections for natural gas production and energy intensity. We compare the results of these models and forecast the errors of EIA's projections for future. In section 4 we end this paper with our conclusions and future works.

## 2. The Mathematical Method

In this part we review the procedure of our mathematical prediction model. Suppose we have  $X^{(0)}(k) = \{X^{(0)}(1), X^{(0)}(2), \dots, X^{(0)}(n)\}$  as the initial data sequence. A new series  $X^{(1)}$  is set up through accumulated generating as follows:

$$X^{(1)}(k) = (X^{(1)}(1), X^{(1)}(2), \dots, X^{(1)}(n)) \quad (1)$$

Where

$$X^{(1)}(k) = \sum_{i=1}^k X^{(0)}(i), k = 1, 2, \dots, n.$$

The first-order difference equation of GM(1,1) is defined as:

$$\frac{dX^{(1)}(k)}{dk} + aX^{(1)}(k) = b \quad (2)$$

The solution of (2) is:

$$\hat{x}^{(1)}(k) = \left(x^{(0)}(1) - \frac{\hat{b}}{\hat{a}}\right)e^{-\hat{a}k} + \frac{\hat{b}}{\hat{a}} \quad (3)$$

Where

$$\begin{pmatrix} a \\ b \end{pmatrix} = (B^T B)^{-1} B^T Y_n \quad (4)$$

and

$$B = \begin{pmatrix} -\frac{1}{2}(X^{(1)}(1) + X^{(1)}(2)) & 1 \\ -\frac{1}{2}(X^{(1)}(2) + X^{(1)}(3)) & 1 \\ \vdots & \vdots \\ -\frac{1}{2}(X^{(1)}(n-1) + X^{(1)}(n)) & 1 \end{pmatrix} \quad (5)$$

$$Y_n = \begin{bmatrix} X^{(0)}(2) \\ X^{(0)}(3) \\ \vdots \\ X^{(0)}(n) \end{bmatrix} \quad (6)$$

By inverse accumulative generating operation, the predicted equation is:

$$\hat{X}^{(1)}(k) = \left(X^{(0)}(1) - \frac{b}{a}\right)(1 - e^{-ak}) + \frac{b}{a} \quad (7)$$

Suppose

$$\hat{Y}(k) = \hat{X}^{(0)}(k+1) \quad (8)$$

We consider the states of a Markov chain  $\hat{Y}$  which are alongside the regulation curve as follows:

$$H_i = [\hat{H}_{1i}, \hat{H}_{2i}] \quad i=1, 2, 3, \dots, n \quad (9)$$

Where

$$\hat{H}_{1i} = \hat{X}^{(0)}(k+1) + A_i \quad i=1, 2, 3, \dots, n \quad (10)$$

$$\hat{H}_{2i} = \hat{X}^{(0)}(k+1) + B_i \quad i=1, 2, 3, \dots, n \quad (11)$$

where  $A_i$  and  $B_i$  are the differences between the original data and predicting curve. The top and lower borderlines are assumed as  $\hat{X}^{(0)}(k+1) + A$  and  $\hat{X}^{(0)}(k+1) - B$ , respectively.  $A$  and  $B$  are obtained by using the least square method as

$$A = \sum_H X^{(0)}(H+1) - \sum_H \hat{X}^{(0)}(H+1) / p \quad (12)$$

$$B = \sum_L X^{(0)}(L+1) - \sum_L \hat{X}^{(0)}(L+1) / q \quad (13)$$

Where  $X^{(0)}(H+1)$  and  $X^{(0)}(L+1)$  are the data above and below the forecasting curve and  $p, q$  correspond to the number of such data respectively. Let  $\hat{X}^{(0)}(k+1) + C$  and  $\hat{X}^{(0)}(k+1) - D$  as the top and bottom borderlines, respectively where

$$C = \max \{ X^{(0)}(k+1) - \hat{X}^{(0)}(k+1) \} \quad (14)$$

$$D = \max \{ \hat{X}^{(0)}(k+1) - X^{(0)}(k+1) \} \quad (15)$$

The states of our Markov model are obtained as follows:

$$H_1 = [\hat{X}^{(0)}(k+1) + A, \hat{X}^{(0)}(k+1) + C]$$

$$H_2 = [\hat{X}^{(0)}(k+1), \hat{X}^{(0)}(k+1) + A]$$

$$H_3 = [\hat{X}^{(0)}(k+1) - B, \hat{X}^{(0)}(k+1)]$$

$$H_4 = [\hat{X}^{(0)}(k+1) - D, \hat{X}^{(0)}(k+1) - B] \quad (16)$$

Similarly, each zone can be classified into more subzones.

A Markov chain  $\{X_n; n \geq 0\}$  is a stochastic process with the property that for all  $i, j, k, l$  in state space

$$p_{ij} = P[x_{n+1} = j | X_n = i] = P[x_{n+1} = j | X_n = i, X_{n-1} = k \dots X_0 = l] \quad (17)$$

The transition probabilities  $p_{ij}$  for all  $i, j$  in state space satisfy in:

$$p_{ij} \geq 0, \sum_{j=0}^m p_{ij} = 1 \quad (18)$$

The future trend of systems can be forecasted by the transition probability matrix. We can get this matrix in  $m$  th step as :

$$P(m) = \begin{bmatrix} p_{11}(m) & p_{12}(m) & \dots & p_{1n}(m) \\ p_{21}(m) & p_{22}(m) & \dots & p_{2n}(m) \\ \vdots & \vdots & \ddots & \vdots \\ p_{n1}(m) & p_{n2}(m) & \dots & p_{nn}(m) \end{bmatrix} \quad (19)$$

Where

$$p_{ij} = \frac{M_{ij}(m)}{M_i} \quad i, j=1, 2, 3, \dots, n \quad (20)$$

When we cannot certainly distinguish the next path of the system, the matrix  $P(2)$  or  $P(m)$  ( $m \geq 3$ ) must be calculated. At last the final predicted value can be obtained as

$$\hat{Y}'(k) = \frac{1}{2} (\hat{H}_{1l} + \hat{H}_{2l}) \quad (21)$$



Applying (10), (11) and since the forecast is most probably in zone  $H_l$ , then  $\hat{Y}'(k)$  can be expressed as

$$\hat{Y}'(k) = \hat{X}^{(0)}(k+1) + \frac{1}{2}(A_l + B_l) \quad (22)$$

For evaluating the accuracy of our model we compute the relative percentage error by

$$RPE = \frac{|x^{(0)}(k) - \hat{X}^{(0)}(k)|}{x^{(0)}(k)} \quad (23)$$

and whence find the precision by  $(1-RPE) \times 100$ . If the precision is more than 90% we can conclude that the model is reliable and accurate.

### 3. Applications

A superior statistical analytical organization which presents helpful energy information is Energy Information Administration (EIA). Developing history and activities of EIA was studied (Kent,1993). This paper deals with AEO's natural Gas production and energy intensity projection errors. Natural gas is one of the most abundant energy sources in the world and a major energy source of industrial and electrical section; EIA forecasted that the greatest increase in gas production up to 2035 is for Middle East; Furthermore, energy intensity is used an energy conservation index for a country. It is calculated as units of energy per unit of GDP. The average absolute differences between the AEO's projections and actual for natural Gas production and energy intensity from 1985 to 2008 and 1985 to 2007 (table1 and 2)( Department of Energy Washington,2010), are applied here. By applying the Grey - Markov predicting model the projection errors of EIA are modeled and forecasted.

**Table 1: Average absolute differences (errors) of EIA's natural Gas production projections**

Year	1985	1986	1987	1988	1989	1990
Gas production error	0.82	0.86	0.80	0.73	0.73	0.96
Year	1991	1992	1993	1994	1995	1996
Gas production error	0.61	0.73	0.70	1.28	1.20	0.77
Year	1997	1998	1999	2000	2001	2002
Gas production error	0.69	0.63	0.78	0.82	0.52	1.03
Year	2003	2004	2005	2006	2007	2008
Gas production error	1.16	1.75	2.35	2.01	1.53	1.23

**Table 2: Average absolute difference errors of EIA energy intensity projection**

Year	1985	1986	1987	1988	1989	1990
Energy intensity	1.87	1.51	0.85	0.54	0.57	0.65
Year	1991	1992	1993	1994	1995	1996
Energy intensity	0.47	0.59	0.71	0.81	1.08	0.61
Year	1997	1998	1999	2000	2001	2002
Energy intensity	0.68	0.72	0.75	0.83	0.58	0.45
Year	2003	2004	2005	2006	2007	
Energy intensity	0.46	0.46	0.60	0.64	0.59	

We forecast the natural Gas production error of 2009 and energy intensity error of 2008 by the Grey Markov model. According to our method we obtained:

$$\text{Natural Gas production error: } \hat{X}^{(0)}(k+1) = 0.5615 e^{0.046024k}$$

$$\text{Energy intensity error: } \hat{X}^{(0)}(k+1) = 0.8902 e^{-0.023171k}$$

By (12) to (15), it follows that

$$\text{Natural Gas production error: } A=0.3373, B=0.2392, C=0.94 \text{ and } D=0.65$$

$$\text{Energy intensity error: } A=0.2208, B=0.1518, C=0.9798 \text{ and } D=0.3046$$

Therefore four zones are compartmentalized as follows:

*Natural Gas production error:*

$$\begin{aligned} H_1 &= [\hat{X}^{(0)}(k+1) + 0.3373, \hat{X}^{(0)}(k+1) + 0.94] \\ H_2 &= [\hat{X}^{(0)}(k+1), \hat{X}^{(0)}(k+1) + 0.3373] \\ H_3 &= [\hat{X}^{(0)}(k+1) - 0.2392, \hat{X}^{(0)}(k+1)] \\ H_4 &= [\hat{X}^{(0)}(k+1) - 0.65, \hat{X}^{(0)}(k+1) - 0.2392] \end{aligned}$$

*Energy intensity error:*

$$\begin{aligned} H_1 &= [\hat{X}^{(0)}(k+1) + 0.2208, \hat{X}^{(0)}(k+1) + 0.9798] \\ H_2 &= [\hat{X}^{(0)}(k+1), \hat{X}^{(0)}(k+1) + 0.2208] \\ H_3 &= [\hat{X}^{(0)}(k+1) - 0.1515, \hat{X}^{(0)}(k+1)] \\ H_4 &= [\hat{X}^{(0)}(k+1) - 0.3046, \hat{X}^{(0)}(k+1) - 0.1518] \end{aligned}$$

Figure 2 shows these four zones  $H_1, H_2, H_3, H_4$  from the top down and their border lines for the natural Gas production. We find that for these errors  $M_1=4, M_2=7, M_3=7$  and  $M_4=5$  and the number of the original data by one step from  $H_4$  to  $H_1, H_2, H_3$  and  $H_4$  respectively is 0,0,1 and 5. Therefore, the one step transition probability matrix is calculated as:

$$P(1) = \begin{bmatrix} 1/2 & 1/4 & 1/4 & 0 \\ 0 & 5/7 & 2/7 & 0 \\ 2/7 & 0 & 3/7 & 2/7 \\ 0 & 0 & 1/5 & 4/5 \end{bmatrix}$$

All the fluctuation and transitions of gas production error forecasting's can be seen in figure 2. By recognizing the next state from this representation and find the maximum probability of transitions of that state we can forecast the next EIA's prediction error of gas production. So From this figure, we can see that the error of natural Gas production of 2008 is in  $H_4$ . Therefore By examining the fourth line of  $P(1)$  we realize that  $p_{44}$  is the maximum probability, so the most probable state which the system may transfer to is from  $H_4$  to  $H_4$ . Finally, the error of EIA's natural gas production projection for 2009 can be obtained as follow:

$$\hat{Y}'(24) = \frac{1}{2}(\hat{H}_{14} + \hat{H}_{24}) = \hat{X}^{(0)}(25) - \frac{1}{2}(B+D) = 1.25$$

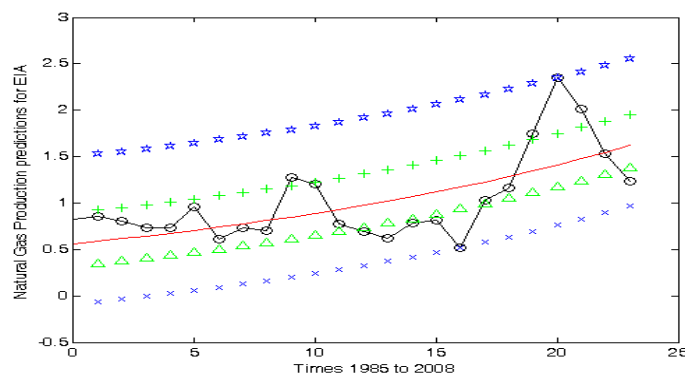
Figure 3 show the four zones  $H_1, H_2, H_3, H_4$  from the top down and their borderlines for error of energy intensity. We conclude that for these errors  $M_1=3, M_2=8, M_3=7$  and  $M_4=4$  and the raw number of data from  $H_2$  to  $H_1, H_2, H_3$  and  $H_4$  by one step is 1,5,1,1, respectively. Hence, the one step transition probability matrix is:

$$P(1) = \begin{bmatrix} 1/3 & 1/3 & 1/3 & 0 \\ 1/8 & 5/8 & 1/8 & 1/8 \\ 0 & 3/7 & 3/7 & 1/7 \\ 0 & 0 & 1/2 & 1/2 \end{bmatrix}$$

The upper and lower borderlines and transitions of energy intensity are shown in this figure. Therefore, We realize that the error of energy intensity of 2008 is in  $H_2$ . As a result we examine the second line of  $P(1)$  and see that  $p_{22}$  is the maximum probability. Hence most likely the state which the system may transfer to is from  $H_2$  to  $H_2$ . The error of EIA's energy intensity projection for 2008 can be obtained as follow:

$$\hat{Y}'(23) = \frac{1}{2}(\hat{H}_{12} + \hat{H}_{22}) = \hat{X}^{(0)}(24) + \frac{1}{2}(A) = 0.6328$$

**Fig. 2: Four zones and forecasting regulation curve of EIA's error projections for Natural Gas production during 1985 to 2008**



**Fig.3: Four zones and forecasting regulation curve of EIA's error projections for energy intensity during 1985 to 2007.**

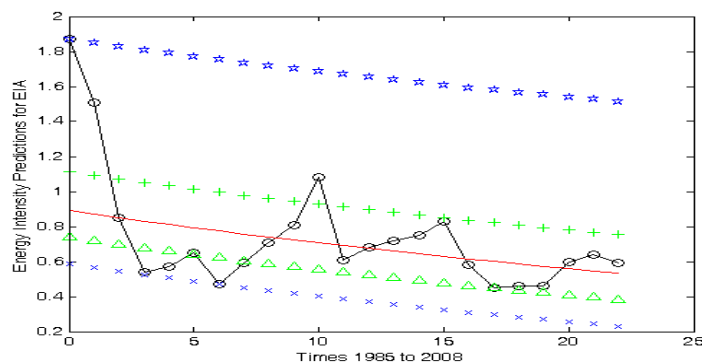


Table 3 shows the forecast value and the precision of EIA's forecasting errors by GM(1,1) and the Grey-Markov model. By comparing the results we conclude that the predicting values obtained by Grey Markov model are more accurate than GM(1,1). All the obtained precisions by the Grey markov model are more than 90% and prove the efficiency of our model.

**Table 3: The resulting forecasts and precisions by GM(1,1) and Grey-Markov model.**

Year	Actual average absolute difference (error) of natural Gas production of EIA	GM(1,1)		Grey-Markov model	
		Forecast value	precision	Forecast value	precision
2009	1.38	1.69	77.20%	1.25	90.58%
2008	0.60	0.52	87.07%	0.63	94.53%

As a result, the error of all EIA's projections in future for gas production and energy intensity can be obtained by Grey Markov model with high precisions.

#### 4. Conclusion

Some organizations give forecasting energy information. It is important to recognize their prediction errors; moreover, these errors are fluctuated over time. Therefore a Grey-Markov model which is the combination model of GM and Markov chain is suitable for modeling these errors. We applied the GM(1,1) and Grey-Markov model for the absolute average error of EIAs projections for natural Gas production and energy intensity. By comparing the results of these methods, we obtained that the Grey Markov model gives more accurate and certain projections. In future, researchers can model and forecast the errors of other energy organizations such as IEA, BP, Exxon-Mobil and OPEC by the Grey-Markov model and compare the results to realize that which agency's predictions has a lower error and are more realistic; Moreover, the Grey Markov model can be compared to other modified Grey models.

#### 5. Bibliography

- [1] B. Neill, M. Desai (2005) - "Accuracy of past projections of us energy consumption", Energy Policy 33: 979-993
- [2] B. Neill, M. Desai (2003) - "The accuracy of past projections of U.S. energy consumption", interim report
- [3] B. Soldo (2012) - "Forecasting natural gas consumption", Applied Energy, 92: 26-37
- [4] C. Fischerr, E. Herrnsstadt, and R. Morgenstern (2008) - "Understanding error in EIA projections of energy demand"
- [5] Ch. Lin, Sh. Yang (2003) - "Forecast of the output value of Taiwan's optoelectronics industry using the Grey forecasting model", Technological Forecasting and Social Change 70: 177-186
- [6] C. Kent, (1993) - "An analytical history of EIA", Government Information Quarterly, 10(1): 3-24
- [7] C. Li (2006) - "Study on theory of the Grey Markov Chain method and its application", IMACS multi conference on "Computational engineering in systems applications" CESA, China
- [8] Cohen Barry, G. Peabody, M. Rodekohr, S. Shaw - "A history of midterm energy projections: a review of energy outlook projections. Washington D.C.: Energy Information Administration, U.S. Department of energy.
- [9] D.R. Sanders, M.R. Manfredo, K. Boris (2008) - "Accuracy and efficiency in the U.S. department of energy's short term supply forecasts, Energy economics, 30(3): 1192-1207.
- [10] E. Kotil, SaclikCukut, ResulERY, GIT. (2005) - "A Grey model study of forecasting selected Turkish macro economic variables", Economic Yaklasim, city:16, sayi:s6: 34-42.
- [11] F. Joutz, R. Trost.(1992), " Using stochastic simulation to test the effect of seasonal adjustment on forecast standard errors of motor gasoline demand", International journal of forecasting, 8(2):219-231.
- [12] G. Zheng and T. Wang.(2011) , "A new model for information fusion based on Grey theory , information technology journal ", Gabrielle wong-parodi, 10(1):189-194.
- [13] H. Ma and Z .Zhang.(2009), Grey prediction with markov chain for crude oil production and consumption in China , springer , AISc,56: 551-561.
- [14] H. Ma , D. Zhang.(2009), "A Grey forecasting model for coal production and consumption", proceedings of 2009 IEEE International conference on Grey systems and intelligent services, China.

- [15] H. Huntington.(1994), "Oil price forecasting in the 1980s: What went wrong?", The energy journal, 15(2): 1-22.
- [16] H. Linderoth.(2002), "Forecast errors in IEA countries' energy consumption", energy policy, 30:53-61.
- [17] J. J. Winebrake , D. Sakva.(2006)," an evaluation of errors in U.S. energy forecasts" : energy policy,vol. 34 (18):3475-3483.
- [18] J. Cheng , H. Chen , K. Cheng.(2009), "Business failure prediction model based on Grey prediction and rough set", Wseas Transactions on information science and applications,6(2).
- [19] L. Zhang ,Y. Lu, L. Chen, D. Deng.(2008), "Evaluating strategy with Grey theory utilized in wireless sensor networks" , proceeding of the world congress on engineering , vol I.
- [20] M. Auffhammer.(2005), " The Rationality of EIA forecasts under symmetric and asymmetric loss", University of California Berkeley.
- [21] P. Craig, A. Gadgil, J. Koomy.(2002), "what can history teach us? A retrospective examination of long term energy forecasts for the United States", The annual review of energyand environment,27: 83-118.
- [22] Retrospective Review Annual Energy Outlook 2010 U.S. Department of Energy Washington, DC 20585 .
- [23] Sh. Kordnoori, H. Mostafaei.(2011), " Grey Markov model for predicting the crude oil production and export in Iran" , international journal of academic research,3(2) .
- [24]Shlyakhter,A.I.,D.M.Kammen,C.L.Broido,WILSON(1994),"Quantifying credibility of energy projections from trends in past data", energy policy, 2:119-130.
- [25] U. Kumar, V.K. Jain. (2010), "Time series models( Grey markov, Grey model with rolling mechanism and singular spectrum analysis) to forecast energy consumption in India": 1709-1716.
- [26] V. Lekat and L. Dale.(2005), "Natural gas prices forecast comparsion AEO U.S. Natural gas markets".
- [27] V. Smil.(2000), "Perils of long range energy forecasting: reflection on looking far ahead", Technological forecasting and social change,65: 251-264.
- [28] W. Ascher.(1978), "Forecasting: An appraisal for policy makers and planners. Baltimore: John Hopkins university press.
- [29] Y. Xue, Z. Cao and L. Xu.(2011), "The application of combination forecasting model in energy consumption system", energy proceida,5, 2566-2603.



## The Effects of Oil Price Shocks on real GDP in Iran

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**Abstract:** *In this paper, the asymmetric effects of oil price shocks on GDP have been investigated by co-integration analysis in Iran economy during the period 1960-2010. We used Hodrick-Prescott filtering to separate positive shocks from negative shocks. The results showed that in long run the negative shocks have stronger effects on output than positive ones that can have damaging repercussions on economic growth. The findings have practical policy implications for decision makers in the area of macroeconomic planning. The use of stabilization and savings funds and diversification of the real sector seems crucial to minimize the harmful effects of oil booms and busts.*

**Key words:** Lead, Real GDP, Iran economy, asymmetric effects, oil price shocks, Johansen cointegration test

**JEL classifications:** C13, C22, E31

### 1. Introduction

Oil production usually accounts for a large share of the GDP of oil-exporting countries and oil price increases directly increase the country's currency value (total oil production increases because the value of oil production increases: the income effect). However, the total effect of oil price shocks on economic performance mostly depends on what the oil producers (mostly governments) do with this additional revenue. High oil prices increase real national income through higher export earnings (Kornonen et al., 2007). As a result, wealth will be transferred from oil-importing countries to oil-exporting countries, leading to greater purchasing power for economic agents of oil-exporting countries (M. Hakan, 2010). Oil price is very instable. Instability is very costly, as economies and budgets adjust asymmetrically. (Mehrrara and Oskoui, 2007) Oil price fluctuations are a major source of disturbance for the economies of oil-exporting countries given the relative importance of the oil sector in production and exports and uncertainty in the world oil markets (Mehrrara, 2008; Behbudi and et.al, 2010). Oil revenue is the major part of government income and it recently has played an important role in reimbursing government expenditures in Iran. The Iranian economy is heavily dependent on oil revenues, with about 15 percent of nominal GDP originating in the oil sector during the period 2000-2009. Moreover about 50 percent of the government's revenues and 70-75 percent of exports are derived from the oil sector (Mehrrara et.al, 2010). Although the topic is the same for oil exporting and importing countries, theoretical model

and effecting mechanisms in oil exporting countries are completely different from those in oil importing countries. This paper studies the asymmetric effect of oil price shocks on Iran economic growth during 1960-2010 using Johansen cointegration test. The paper is organized in five sections. Section two discusses the methodology and the mechanisms through which oil price or revenues influence asymmetrically economic activities in oil exporting countries. Section three reviews the empirical literature in brief. Section four presents the econometric model and empirical results. Finally section five concludes.

## 2. Literature Review

Increases in the level of oil prices have a positive effect on GDP in the short run, but increased volatility in oil prices reduces the short-run growth in real GDP. In contrast, real GDP has a positive short-run impact on the other three endogenous variables with an increase in GDP driving up government revenues, government consumption and investment. Thus, changes in oil prices have an indirect effect on these three variables through their impact on real GDP. In addition, oil prices have a direct dynamic effect on government revenues. An increase in oil prices raises government revenues, but an increase in the variance of oil prices actually reduces government revenues. Finally, investment is positively affected by an increase in oil price volatility. (Anshasy, 2006; Cunado and Fernando, 2004; Farzanegan and Markwardt, 2009; Hui and Kevin, 2005; Keqiang, 2009; Sandrine and Valerie, 2006).

Oil prices have a positive effect on government consumption in the long run. In addition, in the short run, oil prices will have an indirect effect on government consumption, through their direct impact on real GDP. Higher oil prices induce higher growth rates and the latter leads to higher government consumption. Higher variance in oil prices has a negative impact on short-run economic performance. Both real GDP and government revenues are negatively influence by a higher conditional variance in oil prices. This is partially offset by a positive response in investment to a higher conditional variance in oil prices. (Anshasy, 2006; Cunado and Fernando, 2004; Farzanegan and Markwardt, 2009; Hui and Kevin, 2005; Keqiang, 2009; Sandrine and Valerie, 2006). If appreciation of currency hurts the competitiveness of non-energy sectors, appreciated local currency that stems from higher oil revenues may stimulate investment and provide lower-priced imported intermediary products, which may stimulate production. Lastly, higher oil prices will also likely increase the profitability of the energy sector. This provides an opportunity for the investment and business sectors, with increased demand for labor and capital (Hilde, 2008; M. Hakan, 2010).

However a large literature suggests that there is a 'resource curse': natural resource-abundant countries tend to grow slower than resource-scarce countries. The literature offers six candidate explanations for the resource curse effect: Dutch disease, governance, conflict, excessive borrowing, inequality, and volatility. (Devlin and Lewin, 2004; Mehrara, 2009; Mehrara and et.al, 2008; Mehrara and Oskui, 2007; Gaskari and et al, 2005).

The oil price volatility can be transmitted to the economy through the large fluctuations in government revenues. The uncertainty about future oil revenues and the variability of such revenues would result in changes in spending. Therefore, the resulting procyclicality of government spending can ultimately lower growth rates. Carefully looking into some of the potential expenditure mechanisms, one can identify the following: (Anshasy, 2006). A positive revenue shock that is perceived as permanent typically leads to higher government spending, especially on non-tradable, creating incentives to shifting resources away from the (non-oil) tradable sector to the non-tradable sector. Such resource movements would lead to higher unemployment, output losses, and ultimately the de-industrialization of the economy; a phenomenon known as the "Dutch disease". (Anshasy (2006)) In an oil-dependent economy, the variability of the oil rent will, in the absence of countermeasures;

spill over into the real exchange rate. An oil price boom will lead to a real appreciation and a decline in non-oil exports. This is often taken as the main symptom of the Dutch disease, but is not in and of itself a cause of reduced welfare (Mehrara and Oskoui, 2007; Mehrara, 2009; Mehrara and Sarem, 2009). Government budget and expenditures are one of the most important channels through which oil shocks affect aggregate demand, and without devising some mechanisms to stabilize government budgets; oil shocks would have serious effects on government budgets. One of the important reasons for asymmetric effect of positive and negative oil price shock on economic growth is related to the major role of government investments in oil exporting countries and the way it responds to these shocks. When a positive shock occurs, the welfare and consumption expenditure as well as less productive investments rapidly increase. Increase in government expenditures will lead to decrease in quality of spending and economic efficiency, increase in unfinished projects, and rent seeking (Ricardo and Roberto, 2002; Mehrara and Oskoui, 2007; Delavari and et.al, 2008). If a positive shock is perceived as temporary, accumulating the budgetary surpluses in developing economies is politically unpopular and the government will be subject to pressures to increase spending, especially on public projects. Many studies found that most of the large surges in public capital spending during boom times are non-productive and typically have a very low return (Talvi and Vegh, 2000; Anshasy, 2006).

But when a negative shock occurs, long term investments and economic activities shrinks first, due to non-refunding of a major part of a productive spending with useful impacts on growth, and immediate decrease of intermediate and capital imports. Because of, negative oil shocks might be responsible for decrease of economic growth than positive ones (Mehrara and Oskoui, 2007; Delavari and et.al, 2008). A negative shock, on the other hand, typically induces downward adjustments in government expenditures. This adjustment could be very costly. On the one hand, cutting current expenditures is usually unpopular because of its negative social consequences. On the other hand, cutting capital expenditures would disrupt public projects, reducing the productivity of the initial investment and causing high social costs (Anshasy, 2006).

If the government spends more on investment when oil prices rise, then, theoretically, it can increase growth – assuming that the implementation capacity exists and the investments are indeed productive. Governments will also typically increase consumption, such as wages and salaries, and outright subsidies and transfers, as well as expenditures on health and education. This could have permanent impact, in terms of raising public expectations and ratcheting up current and future expenditure commitments limiting the government's ability to amend fiscal policy when revenues decrease. In the smaller exporting countries in particular, government expenditure will constitute a large share of total spending and have a profound influence on aggregate demand (Devlin and Levin, 2004).

The positive development in oil prices, which is resulted in higher levels of government expenditures and income per capita, pushes the effective demand upward. Furthermore, the limited capacity of domestic supply and inefficiencies as well as time lags in response to increased demand may push the general consumer prices upward, fueling inflation (Farzanegan and Markwardt, 2009; Frzanegan, 2011).

When oil revenues fall because of negative oil price shocks, the level of imported raw and capital intermediaries, which is mainly financed through oil revenues, will decrease. Thus, domestic production will decrease. This means a shift of the supply curve to the left. Because of deficit spending through borrowing of the government from the central bank (or recently withdrawals from oil stabilization account), which raise the base money and money supply, the demand curve shifts to the right. A combination of these two shifts in demand and supply curves leads to increased prices and to a reduction of the production level in the economy (Farzanegan and Markwardt, 2009; Frzanegan, 2011). Lower oil rents resulting

from an oil price shock cause a temporary shift in the production function, leading to decrease in real output. The decrease in output, *ceteris paribus*, leads to an excess demand for goods and an increase in the interest rate. This decrease in output and interest rate lead to decrease in the demand for real cash balances, and given a nominal quantity of money, the price level increases. Therefore, we would expect an oil price shock lead to decrease in GDP and increase in price level (Gordon, 1984; Philip and Akintoye, 2006).

In other side some researchers believe that oil revenues could be positive until a certain level. But after this level the effect turns to be negative. During the oil busts, with the low (or negative) growth rate of oil revenues, the oil-dependent economies suffer from under-capacity with their access to capital and intermediate imports restricted, particularly in the presence of capital market imperfections (Ricardo and Roberto, 2002). So, more oil revenues can be a blessing during the busts or moderate booms. But when oil revenues are excessively high, the real exchange rate becomes highly overvalued. So, too much oil revenues exert a negative effect on growth, turning to be a curse (Mehrra, 2009).

### 3. Empirical Results and Model Estimation

In this section empirical model of asymmetric effects of oil price shocks on production, is specified and estimated. In production growth equation, in addition to positive and negative oil price shocks, the effect of other variables, including investment are considered. In this study, growth equation is specified as follow:

$$\Delta \log y_t = \alpha_0 + \sum_{j=0}^n \delta_j pos_{t-j} + \sum_{j=0}^n \gamma_j neg_{t-j} + \beta X_t + \varepsilon_t$$

where  $\Delta$  indicates the first difference,  $\log$  is natural logarithm,  $Y_{it}$  is gross domestic output (without oil),  $pos$  is positive oil price shock,  $neg$  is negative oil price shock,  $X$  is explanatory variables and  $\varepsilon$  is error term. In addition, asymmetry hypothesis implies:

$$H_0 : \delta_j = \gamma_j \quad j = 1, \dots, n$$

In growth model, various variables are used as control variables in vector  $X$ . Some of these variables are: physical investment, human capital, free trade, inflation rate, population, government expenditures, geographical variables, foreign direct investment, exchange rates premium, abundant natural resources, institutions and the quality of macroeconomic policy. In this study, due to the limited sample size, availability of data and diagnostic test, different combinations of variables, such as government expenditures growth, ( $\Delta \ln G$ ), Liquidity growth, ( $\Delta \ln M2$ ), inflation rate, ( $\Delta \ln P$ ), real money supply growth ( $\Delta \ln M2/P$ ), the percentage changes in real exchange rate, ( $\Delta \ln EX$ ), investment to GDP ratio ( $inv/y$ ) or investment growth ( $\Delta \ln inv$ ), as control variables in vector  $X$  are used. In fact, government expenditures, money balance and inflation variables as the demand side factors and investment ratio as the supply side factor affect the production.

One of the important and considerable factors in this model is estimation method of positive and negative oil price shocks. The methodology of estimation of positive and negative oil price shocks is as follows.

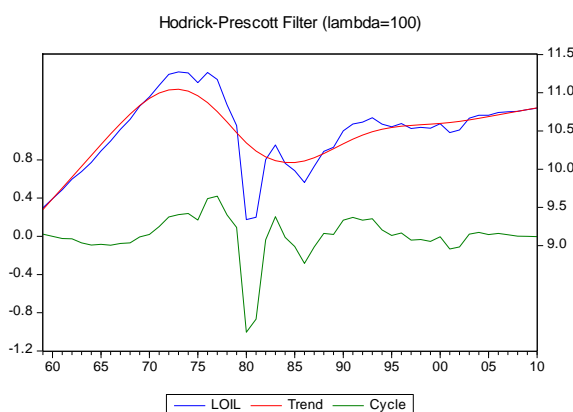
#### 3.1. Positive and Negative oil price Shock

In empirical studies, any unanticipated change is considered as the shock. Researchers used different techniques for differentiation between positive and negative shocks. For example, Mishkin (1982), Cover (1992), Karras (1996) considered the residual of the money supply growth equation ( $M2$ ) as monetary shocks. In fact, in these studies money growth is divided into anticipated and unanticipated ones, and the residual from the estimated equation of money growth is used as unanticipated monetary shock.

Another method of decomposing positive and negative shocks is using univariate filtering of Hodrick- Prescott (1997). This smoothing filtering is widely used in real business cycle theory to separate the cyclical component of a time series from raw data. Let  $X_t$  denote the logarithms of a time series variable. The series  $X_t$  is made up of a trend component, denoted  $\tau_{x,t}$  and a cyclical component given an adequately chosen, positive value of  $\alpha$ , there is a trend component that will minimize

$$\text{Min} \sum_{t=1}^T (X_t - \tau_{x,t})^2 + \alpha \sum_{t=2}^{T-1} [(\tau_{x,t+1} - \tau_{x,t}) - (\tau_{x,t} - \tau_{x,t-1})]^2$$

The first term of the equation is the sum of the squared deviations which penalizes the cyclical component. The second term is a multiple  $\alpha$  of the sum of the squares of the trend component's second differences. This second term penalizes variations in the growth rate of the trend component. The larger the value of  $\alpha$ , the higher is the penalty. Hodrick and Prescott advise that, for annual data, a value of  $\alpha = 100$  are reasonable. In this article we use Hodrick Prescott technique (Figure1).



**Figure1:** Hodrick Prescott (HP) filtering

### 3.2. Data and unit root tests

Time series data required to this research include non-oil GDP(Y), real oil revenue (OILREV), money supply(M2), aggregate price level(P), exchange rate(EX), government expenditures(G) and fixed capital formation or investment to GDP ratio (INV/GDP). The sources for data are balance sheets of the Central Bank of Iran during the period 1960-2005. The cointegration analysis is subject to the integration order of time series. The integration orders of variables are examined by Augmented Dickey – Fuller (ADF) and phillips-Perron (PP) unit root tests.

According to ADF and PP tests in Table (1), it can be seen that all variables except the investment to GDP ratio, INV/GDP, are integrated of order one so that when first differenced, all would be stationary.

**Table 1:** PP and ADF test statistic variables in level and 1st difference

Variable	ADF test statistic	1% Critical Values	PP test statistic	1% Critical Values
Dlog y	-4.11***	-3.57	-4.15***	-3.57
Dlog oil	-5.45***	-3.57	-5.05***	-3.57
Dloginv	-4.66***	-3.57	-4.37***	-3.57
Dinv/y	-5.20***	-3.57	-4.95***	-3.57
DlogG	-2.56	-3.57	-4.27***	-3.57
DlogM2	-3.72***	-3.57	-3.71***	-3.57



DlogP	-2.22	-3.57	-2.11	-3.57
DlogM2P	-3.48***	-3.57	-3.38	-3.57
Dlogex	-5.17***	-3.57	-5.31***	-3.57

Notes: \*\*\* respectively show the significance in 1% level

### 3.3. Cointegration test

As the level variables are non-stationary, the cointegration among the levels of the variables should be tested. It is expected that the real oil revenue, investment, and GDP have an equilibrium relationship. If there is long run relationship between these variables, the residuals from the cointegrating relationship will be considered as non-oil GDP imbalance affecting GDP symmetrically or asymmetrically. Therefore, the cointegration among these variables is tested by using the Johansson methodologies. The test results are presented in Table (2). As it can be seen in the table, Johansson test confirms one long run equilibrium relationship between these three variables. According to Granger representation theorem, a long run equilibrium relationship implies error correction mechanisms. The error correction mechanism ensures the long run relationship. Thus at least one variable in the relationship should react to non-oil GDP imbalances or the residuals of long run relationship, namely ECM. In the next section we examine the importance of non-oil GDP imbalances along with other variables on the production growth. Also, these imbalances may affect the production linearly (symmetric) or nonlinearly (asymmetric).

**Table 2:** Maximal eigenvalue and trace test for cointegration vectors

Variables in long-run relationship: $\ln(\text{oil})$ , $\ln(y)$ , $\ln(i)$							
A: cointegrating space							
Maximal eigenvalue test				Trace test			
Null	Alternative	LR statistic	95% critical value	Null	Alternative	LR statistic	95% critical value
$r=0$	$r=1$	35.97	25.82	$r=0$	$r \geq 1$	64.37	42.91
$r \leq 1$	$r=2$	20.76	19.38	$r \leq 1$	$r \geq 2$	28.40	25.87
$r \leq 2$	$r=3$	7.63	12.51	$r \leq 2$	$r=3$	7.63	12.51
B: cointegrating vector							
		Loil	ly			li	
ECM		-1	0.06 (3.11)			0.06 (2.71)	

Notes: Trace test and Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level and t-ratios in parentheses.

### 3.4. Estimating the short run non-oil GDP and asymmetric test

In this section, the effects of positive and negative oil shocks as well as the supply and demand side factors on the production growth in Iran economy will be studied. For this purpose, we estimate various specifications according to the Table (3). The estimates in columns one to eight are based on linear or symmetrical specifications. In other words, in these equations it is assumed that the effects of positive and negative oil shocks on real production are symmetric so that the relationship is linear.

**Table3:** Estimation of model with different specification

Variable	1	2	3	4	5	6	7
c	0.03 (0.91)	0.00 (-0.01)	0.01 (1.38)	0.03 (3.23)***	0.03 (4.20)***	0.00 (0.28)	0.00 (0.28)

$D(LY(-1))$	-0.04 (-0.33)	0.07 (0.73)	0.05 (0.60)	-0.03 (-0.30)	-	0.01 (0.14)	0.01 (0.13)
$D(LOIL)$	0.06 (2.32)***	0.03 (1.67)*	0.03 (1.62)*	0.03 (1.79)**	0.04 (1.85)**	0.05 (2.38)***	0.05 (2.38)***
$D(LG)$	-	0.13 (2.35)***	0.13 (2.32)***	-	-	-	-
$D(LI)$	-	0.199 (6.59)***	0.20 (6.54)***	0.20 (6.56)***	0.20 (6.49)***	0.21 (6.94)***	0.21 (6.94)***
$IY$	0.45 (3.71)***	-	-	-	-	-	-
$IY(-1)$	-0.38 (-3.47)***	-	-	-	-	-	-
$D(LEX)$	0.01 (0.23)	0.05 (1.75)*	0.06 (1.99)**	-	-	0.05 (1.45)	0.05 (1.45)
$D(LM2)$	-	0.19 (2.65)***	-	-	-	0.25 (3.37)***	0.25 (3.37)***
$D(LP)$	-	-0.12 (-1.78)*	-	-	-	-0.17 (-2.64)***	-0.17 (-2.64)***
$D(LM2P)$	-	-	0.15 (2.30)***	0.17 (2.89)***	0.15 (2.36)***	-	-
$ECM(-1)$	0.08 (4.45)***	0.03 (1.72)*	0.03 (1.99)**	0.04 (3.05)***	0.04 (3.28)***	0.04 (2.92)***	0.04 (2.93)***
$\bar{R}^2$	0.63	0.83	0.83	0.79	0.76	0.81	0.81
$AIC$	-3.51	-4.21	-4.22	-4.11	-4.04	-4.13	-4.13
$SIC$	-3.24	-3.87	-3.91	-3.88	-3.85	-3.82	-3.82
$DW$	2.08	2.14	2.06	2.08	2.05	2.22	2.22
$AR\chi^2(2)$	1.08	1.08	1.32	1.31	1.10	2.46	2.46
$RESET$	1.39	3.10	6.03 **	6.25 **	5.54 **	2.18	2.18
$HET$	7.40	6.12	5.34	5.78	10.93	5.49	5.49
$NORM$	0.68	1.31	1.39	0.29	1.21	1.99	1.99

Notes: t-ratios in parentheses and \*\*\*, \*\*and \* respectively show the significance in 1%, 5% and 10% levels.

**Table3:** Estimation of model with different specification (continued)

variable	8	9	10	11	12	13	14	15	16	17	18	19	20
$C$	0.02 (2.43)***	0.02 (0.74)	0.01 (0.75)	0.02 (2.50)***	0.01 (1.31)	0.01 (1.60)	0.01 (1.38)	0.02 (2.76)***	0.01 (1.45)	0.01 (1.12)	0.01 (1.05)	0.03 (2.60)***	0.01 (0.29)
$D(LY(-1))$	0.23 (2.09)**	0.07 (0.64)	0.03 (0.42)	-0.02 (-0.25)	0.18 (1.57)	0.06 (0.63)	0.03 (0.40)	0.07 (0.85)	0.05 (0.57)	0.03 (0.48)	0.19 (1.62)*	0.05 (0.44)	-0.00 (-0.00)
$POS$	0.26 (3.16)***	0.20 (2.34)***	0.13 (2.15)**	0.09 (1.43)	0.27 (3.26)***	0.19 (2.62)***	0.14 (2.34)***	0.13 (2.08)**	0.12 (2.53)***	0.09 (2.58)***	0.27 (3.29)***	0.28 (3.01)***	0.25 (2.55)***
$POS(-1)$	-0.26 (-3.00)***	-0.09 (-1.08)	-0.05 (-0.89)	0.03 (0.44)	-0.26 (-3.11)***	-0.10 (-1.24)	-0.06 (-0.90)	-0.05 (-0.78)	-	-	-0.26 (-3.00)***	-0.27 (-3.12)***	-0.27 (-3.12)***
$NEG$	0.05 (1.49)	0.06 (2.18)**	0.05 (2.63)***	0.05 (2.40)***	0.04 (1.35)	0.06 (2.29)***	0.06 (2.66)***	0.06 (2.48)***	0.07 (2.89)***	0.07 (3.34)***	0.05 (1.50)	0.04 (1.29)	0.05 (1.36)
$NEG(-1)$	0.04 (1.30)	0.03 (1.11)	0.03 (1.36)	-	0.03 (0.96)	0.03 (1.30)	0.03 (1.39)	0.04 (1.71)*	-	-	0.03 (0.84)	-0.07 (-1.10)	-0.07 (-1.16)
$D(LG)$	0.32 (6.33)***	0.22 (4.2)***	0.18 (4.17)***	-	0.25 (4.11)***	0.22 (4.29)***	0.18 (4.22)***	0.24 (6.32)***	0.21 (4.04)***	0.17 (3.98)***	0.26 (3.59)***	-	-

<i>D(GY)</i>	-	-	-	0.30 (1.30)	-	-	-	-	-	-	-	-	-
<i>D(LI)</i>	-	-	0.20 (6.76)***	0.22 (6.69)***	-	-	0.20 (6.86)***	0.20 (6.37)***	-	0.21 (8.09)***	-	-	-
<i>D(IY)</i>	-	-	-	-	-	0.38 (3.89)***	-	-	0.44 (5.04)***	-	-	-	-
<i>IY</i>	-	0.37 (3.38)***	-	-	-	-	-	-	-	-	-	-	0.08 (0.77)
<i>IY(-1)</i>	-	-0.40 (-3.67)***	-	-	-	-	-	-	-	-	-	-	-
<i>D(LEX)</i>	0.07 (1.68)*	0.09 (2.38)***	0.09 (2.95)***	-	0.08 (1.84)*	0.09 (2.47)***	0.09 (3.07)***	0.07 (2.05)**	0.07 (2.88)***	0.03 (0.73)	0.08 (1.85)**	-	-
<i>D(LEX(-1))</i>	-	-	-	-	-0.01 (-0.29)	-	-	-	-	-	-	-	-
<i>D(LM2)</i>	-	0.18 (2.19)**	0.15 (2.41)***	-	-	-	-	-	-	-	-	-	-
<i>D(LP)</i>	-	-0.19 (-2.22)**	-0.14 (-2.44)***	-	-	-	-	-	-	-	-	-	-
<i>D(LM2P)</i>	-	-	-	0.21 (3.80)***	0.15 (1.90)**	0.17 (2.67)***	0.15 (2.80)***	-	0.19 (2.89)***	0.16 (3.01)***	0.15 (1.89)**	0.22 (2.64)***	0.20 (2.21)***
<i>ECM(-1)</i>	-	-	-	-	-	-	-	-	-	-	-0.00 (-0.07)	-	-
<i>ECM1(-1)</i>	-	-	-	-	-	-	-	-	-	-	-	0.03 (1.09)	0.02 (0.50)
<i>ECM2(-1)</i>	-	-	-	-	-	-	-	-	-	-	-	0.07 (1.74)*	0.08 (1.89)**
Asymmetric test statistic	2.36 ***	1.27	1.14	0.55	2.44 ***	1.60 *	1.25	1.06	0.81	0.63	2.48 ***	2.23**	1.83*
$\overline{R}^2$	0.70	0.80	0.88	0.82	0.73	0.80	0.88	0.85	0.79	0.88	0.73	0.65	0.65
<i>AIC</i>	-3.69	-3.94	-4.44	-4.15	-3.70	-4.02	-4.48	-4.34	-4.03	-4.50	-3.70	-3.46	-3.44
<i>SIC</i>	-3.38	-3.49	-4.02	-3.84	-3.32	-3.64	-4.10	-3.99	-3.73	-4.19	-3.32	-3.12	-3.06
<i>DW</i>	2.03	2.06	2.26	2.22	2.08	2.04	2.26	2.10	2.15	2.36	2.12	1.96	1.83
$AR\chi^2(2)$	0.08	0.67	2.98	3.10 *	0.44	0.45	2.98	0.79	1.47	4.96 **	0.97	0.11	0.61
<i>RESET</i>	2.92	9.12 ***	7.65 ***	4.56 *	4.32 *	7.67 ***	7.77 ***	6.73 ***	2.48	3.03	4.19 **	4.32 *	2.23
<i>HET</i>	3.42	3.57 ***	3.04 ***	4.09	6.11	2.50 ***	3.01 **	3.64 *	1.45 ***	2.43 ***	6.05	13.23 *	16.68 **
<i>NORM</i>	8.53 ***	8.57 ***	1.31	0.77	4.33 *	6.81 ***	1.36	0.62	3.17	0.25	4.42 *	0.67	0.55

Notes: t-ratios in parentheses and \*\*\*, \*\* and \* respectively show the significance in 1%, 5% and 10% levels.

In all linear specifications, according to  $R^2$ , explanatory variables explain 63 to 83 percent of real non-oil GDP changes. The coefficients for the investment growth,  $\Delta \log inv$ , in all the specifications are significant and of the expected sign (positive). Show that, the investment enter positive and significant in the real non-oil GDP growth equations with the size of coefficient changing between 0.19 to 0.21. Using the investment to GDP ratio instead of the,  $\Delta \log inv$ , renders the similar results. The investment to output ratio ( $INV/GDP$ ) also raise the economic growth rate significantly by 0.45, but the effect will decrease fairly in the next period. Real oil revenue in symmetry specification increases the GDP by coefficient of 0.03 to 0.06. Thus the results show the positive relation between real oil revenue and investment with GDP. The government expenditure enters positive and significant in the real non-oil GDP growth equations with the size of coefficient 0.13, the exchange rate enter positive and significant in the real non-oil GDP growth equations with the size of coefficient changing between 0.05 to 0.06, the Liquidity enter positive and significant in the real non-oil GDP growth equations with the size of coefficient changing between 0.19 to 0.25, the inflation enter negative and significant in the real non-oil GDP growth equations with the size of coefficient changing between -0.12 to -0.17, the real money supply enter positive and significant in the real non-oil GDP growth equations with the size of coefficient changing between 0.15 to 0.17. Error correction coefficient  $ecm(-1)$  reflects the adjustment speed of

output with respect to the oil revenue disequilibrium. Considering the size of coefficient of error correction term (estimated between 0.03 to 0.08) it can be concluded that non-oil GDP responds significantly to its disequilibrium ( $ecm(-1)$ ). Among the linear specifications, the third one outperforms the others based on the R<sup>2</sup>, Akaike (AIC) and Schwartz (SIC) information criteria.

Diagnostic test results are presented at the bottom of the Table (3) for each specification.  $\chi^2$  AR (2) stand for the Lagrange multiplier test statistic for autocorrelation in error terms (with two lags), RESET is Ramsey's RESET test statistic for functional form misspecification based on the squares of fitted values, NORM is test statistic of normality of residuals based on the skewness and kurtosis and HET is Heteroscedasticity test statistic. As it can be seen, the obtained results are generally satisfactory.

The first to seventh specifications reflect the symmetric effects of positive and negative oil shocks on production. But if oil effects are asymmetric, the results of these models may be misleading. As it was explained in previous section, to examine and test the asymmetric effects of oil shocks on real production, oil revenue changes are divided into positive and negative ones and added as two explanatory variables to the growth model using Hodrick Prescott technique. Specifications 8 to 20 in Table (3) are estimated decomposition of oil shocks to positive (pos) and negative (neg) ones.

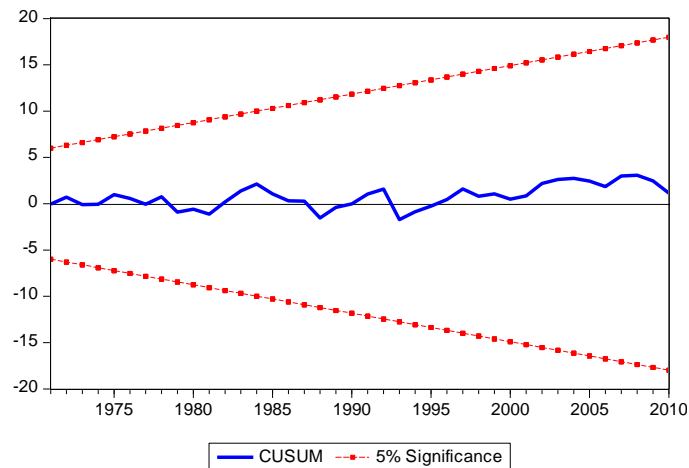
As it can be seen by adding positive and negative shocks to the growth equation, the coefficient of determination significantly increases (from 65 to 88 percent). In all cases, the negative oil shocks are much more effective than the positive oil shocks contemporaneously according to the size and statistical significance.

Although in most equations positive oil shocks have positive and significant effect on GDP, in the next period (based on the coefficient  $pos(-1)$ ) they have a negative effect on GDP with the same amount. In the other words the positive effect will be neutralized in the next time. Negative oil shocks have negative and significant effect on GDP in most equations (-0.04 to -0.07). The lag of negative oil shocks is not significant (based on the coefficient  $neg(-1)$ ) in any of the equation.

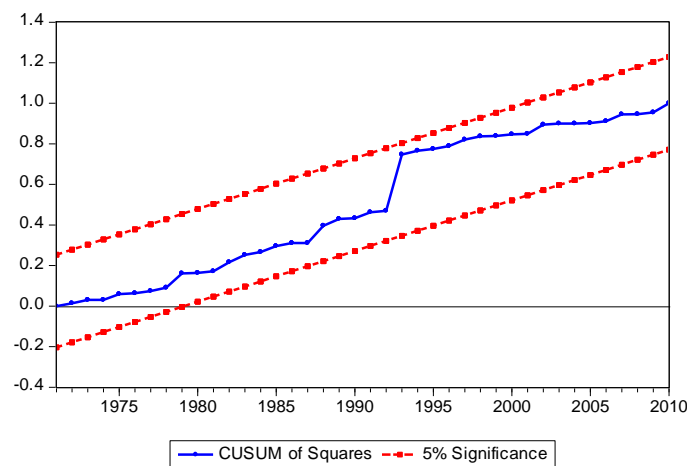
The estimation results from the above mentioned specifications indicate that long-run positive (ecm1) and negative (ecm2) imbalances also have asymmetric effects on economic growth. The size of coefficient of (ecm1), ranging from 0.02 to 0.03 is much less than the coefficient of (ecm2) which is estimated between 0.07 to 0.08. In addition, coefficient of (ecm1) is not significant in any equation, while the (ecm2) has important effects on (decreasing) economic growth.

Among asymmetric specifications, equation 17 enjoys the best base on  $\bar{R}^2$ , Akaike (AIC) and Schwartz (SIC) criteria. In most of the equations, the coefficients of the variables of the investment, are significant and of correct sign.

The estimated growth equation 17 passes through all diagnostic tests (Heteroscedasticity, Ramsey's RESET test, autocorrelation and normality). In addition, the preferred specification is able to explain 88 percent of changes in GDP growth. Thus 12 percent of production changes are yet attributable to factors that are not included in the model. Due to severe structural changes in the sample period (especially Iran-Iraq War and Islamic Revolution) stability of structural coefficients based on the plot of cumulative sum of recursive residuals (CUSUM) and plot of cumulative sum of squares of recursive residuals (CUSUMSQ) have been used. The plot of CUSUM and CUSUMSQ statistics together with the 5% critical lines clearly indicates stability in equation and residual variance during the sample period (Figure 2 and 3).



**Figure 2:** CUSUM test for parameters stability in the growth equation



**Figure 3:** CUSUMSQ test for parameters stability in the growth equation

#### 4. Conclusion

This paper examines the asymmetric effects of oil price shock on Iran economic growth as an oil exporting country for the period of 1980-2010 using Johansen cointegration test. The results from short run estimations indicate that oil shocks have a significant effect on economic growth. But the effects of negative shocks are much stronger than the positive shocks. In other words, the relationship between two variables is asymmetric. It means that production growth responds stronger to the negative shocks than to positive shocks. In addition, the effects of oil revenue on economic growth have opposite signs in long run and short run as being negative and positive respectively. Policy-makers must deploy institutional mechanisms to manage oil booms and busts through expenditure restraint, self-insurance, and diversification of the real sector. To achieve sustainable growth in the future, they must take policy measures that substantially enlarge and diversify their economic base. This should go in tandem with measures needed to enhance their capacity to withstand adverse external shocks and lessen their exposure to the volatility. Moreover, to insulate the economy from oil revenue volatility requires de-linking fiscal expenditures from current revenue. So, an oil revenue fund is one such institutional mechanism for managing the oil revenues. Another way that policy makers could decrease the degree of the asymmetry would be to lower borrowing constraints so that agents could better smooth consumption and so not cut spending as



drastically following a negative price shock. Perhaps developing deeper capital markets is one solution.

### 5. References

- [1] Anshasy, A (2006), Oil prices, fiscal policy and economic growth in oil-exporting countries, PhD dissertation, The Faculty of Columbian Collage of Arts and Sciences of The George Washington University.
- [2] Cover, J. p. (1992), Asymmetric Effect of Positive and Negative Money- Supply Shocks. Quarterly Journal of Economics, Nov. 1261-1282.
- [3] Behbudi, D, Mamipour, S, Karami, A (2010), Natural Resource Abundance, Human Capital And Economic Growth In The Petroleum Exporting Countries, Journal of Economic Development, Volume 35(3).
- [4] Delavari. M, Shirinbakhsh. SH, Dashtbozorgi Z (2008), "ANALYSING THE IMPACT OF OIL PRICES ON IRAN'S ECONOMIC GROWTH THROUGH USE OF ASYMMETRIC COINTEGRATION", QUARTERLY ENERGY ECONOMICS REVIEW FALL, 5(18):65-80.
- [5] Devlin, J. and Lewin, M., 2004. "Managing oil booms and busts in developing countries", draft chapter for: managing volatility and crises. A Practitioner's Guide.
- [6] Gordon, Robert J., 1984. "Supply Shocks and Monetary Policy Revisited." American Economic Review, May, 74:2. pp. 38-43.
- [7] Hilde C, Bjornland (2008), "Oil Price Shocks and Stock Market Booms in an Oil Exporting Country", Working Paper.
- [8] Hodrick R.J. and Prescott E.C. (1997) "Postwar U.S. Business Cycles: An Empirical Investigation" Journal of Money, Credit, and Banking 29 (1):1-16.
- [9] Hui Guo and Kevin L. Kliesen, 2005. "Oil Price Volatility and U.S. Macroeconomic Activity", Federal Reserve Bank of St. Louis Review, 87(6), pp. 669-83.
- [10] Juncal Cunado and Fernando Perez de Gracia (2004), "Oil Prices, Economic Activity and Inflation: Evidence for Some Asian Countries", Working Paper No.06/04.
- [11] Kandil, M. (2000), "The Asymmetric Effects of Exchange Rate Fluctuations: Theory and Evidence from Developing Countries," IMF Working Paper WP/00/184.
- [12] Karras, K. (1996a), why are the effects of money – supply shock Asymmetric? Convex Aggregate supply or "Pushing on a string"?, Journal of Macroeconomics, Vol.18, No.4 pg. 605 619.
- [13] Keqiang Hou, 2009. "The Impact of Oil Price Shocks on an Oil-Exporting Economy: A Structural Investigation", Job Market Paper.
- [14] Kornonen, L. and T. Juurikkala, 2007. "Equilibrium Exchange Rates In Oil-Dependent Countries.", BOFIT Discussion Papers 8.
- [15] Lee, K., Ni, S., and Ratti, R (1995), Oil shocks and the macro economy: the role of price variability, The Energy Journal, Vol.16 (4), pp.39-56.
- [16] M. Hakan Berument and Nildag Basak Ceylan and Nukhet Dogan, 2010. "The Impact of Oil Price Shocks on the Economic Growth of Selected MENA1 Countries", The Energy Journal, Vol. 31, No. 1.
- [17] Mishkin, F. S.,(1982) "Does Anticipated Aggregate Demand Policy Matter? Further Econometric Results", American Economic Review 72, 788-802.

- [18] Mohammad Reza Farzanegan, 2011. "Oil revenue shocks and government spending behavior in Iran", *Energy Economics* 33, 1055–1069.
- [19] Mohammad Reza Farzanegan and Gunther Markwardt, 2009. "The effects of oil price shocks on the Iranian economy", *Energy Economics* 31, 134–151
- [20] Mohsen Mehrara, 2008. "The asymmetric relationship between oil revenues and economic activities: The case of oil-exporting countries", *Energy Policy* 36, 1164–1168.
- [21] Mohsen Mehrara, 2009. "Reconsidering the resource curse in oil-exporting countries", *Energy Policy* 37, 1165–1169.
- [22] Mohsen Mehrara and Majid Maki and Hossein Tavakolian, 2010. "The relationship between oil revenues and economic growth, using threshold methods (the case of Iran)", *OPEC Energy Review*, Vol 34, No 1, pp 1-14.
- [23] Mohsen Mehrara and Mehdi Sarem, 2009. "Effects of oil price shocks on industrial production: evidence from some oil-exporting countries", *OPEC Energy Review*.
- [24] Mohsen Mehrara and Mohsen Alhosseini Seyedmohammadsadegh and Bahramirad, Duman, 2008. "Resource curse and institutional quality in oil countries", MPRA Paper No. 16456, posted 24.
- [25] Philip A. Olomola and Akintoye V. Adejumo, 2006. "Oil Price Shock and Macroeconomic Activities in Nigeria", *International Research Journal of Finance and Economics*, Issue 3.
- [26] Reihaneh Gaskari and Ali Reza Eghbali and Hamid Reza Hallafi, 2005. "Oil Export Instability and Economic Growth in Iran", *Iranian Journal of Economic Research*, Issue 24.
- [27] Ricardo Hausmann and Roberto Rigobon, 2002. "AN ALTERNATIVE INTERPRETATION OF THE 'RESOURCE CURSE': THEORY AND POLICY IMPLICATIONS", NBER Working Paper No. 9424.
- [28] Sandrine Lardic and Valerie Mignon, 2006. "The impact of oil prices on GDP in European countries: An empirical investigation based on asymmetric cointegration", *Energy Policy* 34, 3910–3915.
- [29] Talvi, E. and Vegh, C., 2000. "Tax Base Variability and Procyclical Fiscal Policy", NBER Working Paper No. 7499.

## A Multidimensional Analysis of Social Vulnerability\*

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**Abstract:** *Social vulnerability is often defined as a life-situation characterized by a multi-dimensional combination of disadvantage and advantage, of inclusion and exclusion factors. Its distinctive characteristic is that the weak and unstable integration in the main mechanisms of resources distribution in contemporary society places the people in a situation of uncertainty and high exposure to the risk of poverty and, eventually, of social exclusion. Because of its often temporary nature, vulnerability is difficult to capture.*

*The present paper presents various aspects of social vulnerability and the structuring of the main elements of which it is constituted.*

*The analysis focuses across the family structure, exposure to poverty (temporary or permanent), housing conditions, the family/work system (the presence of unemployed and temporary workers in the household), the ways in which work and childcare are reconciled, and the presence of dependent persons in households in economically compressed situations.*

**Key-words:** vulnerable groups, poverty rate, social exclusion

**JEL Classification:** I 32, I39, J65, P36

### 1. Introduction

Social vulnerability is often defined as a life-situation characterised by a multi-dimensional combination of factors. Its distinctive feature is that weak and unstable integration into the main mechanisms of human resources' distribution within the contemporary society places individuals into uncertainty situations and exposure to poverty and, finally, to social exclusion. Social vulnerability is difficult to be captured due to its temporary nature. As opposed to the poverty notion, social vulnerability includes aspects that are associated both with the incomes' level, but also with the housing conditions, the labour force employment, the child- and dependent persons'- care management, the difficulties that occur in the family in different stages of the life. Also, social vulnerability does not refer to those persons facing severe difficulties or social exclusion, but to individuals that are permanently exposed to instability and weak integration into society.

Characteristic to the second half of the last century was the creation of huge systems of welfare protection. Due to strong economic increase and to a relatively peaceful international situation, the countries of Western Europe have developed economic and institutional mechanisms that guaranteed a high living standard for the majority of the population. Thus, the main risks with which people are faced during their lifetime (unemployment, sickness, invalidity, retirement) were insured by generous social protection systems. These assured that by the beginning of the 21st century the majority of the West-European population benefitted of social warranties that, in principle, would protect it from major threats with which economies are faced.

In Romania, the Government adopted a series of measures in view of solving some issues of socio-cultural, housing, health, employment, education, birth increase order, and for

diminishing abandon and protecting all children's rights, for an as good as possible solving of issues facing individuals and families from the social and economic viewpoint.

## **2. Main characteristics of the social vulnerability in the European Union**

One of the definitions given to vulnerability is the one of "weakness", "lack of defence", "lack of means". The vulnerable groups are groups lacking support which often find themselves in chronic poverty situations, being incapacitated from profiting by the opportunities or from defending themselves against the issues with which they are faced.

The analyses realised by the European Statistical Office (EUROSTAT) have highlighted the fact that an impressive number of individuals live under the poverty threshold, and many persons are faced with difficulties regarding access to a job, education, housing, and financial services. At the European Union level is considered that *"all citizens should benefit from the advantages of prosperous periods and, also, from solidarity in difficult times"*.

The most recent data show that 16% from the Europeans are still at poverty risk. Even if the best protection measure against poverty is ensuring a quality job, the percentage of 8% of those in employment but still facing the poverty risk proves that not all jobs provide for such safety.

Against the significant increase of unemployment in some member-states, the contribution of social policies is crucial in combating poverty.

Children are faced with a higher poverty risk of 19% in EU-27, as compared with the rest of the population, a phenomena persisting from 2000. The actions developed within the Open Method of Coordination in 2007 have contributed to identifying the factors triggering poverty among children in each member state and has underpinned the need for some comprehensive strategies that would mix adequate forms of financial assistance with quality employment opportunities for parents and by supplying the necessary services.

With respect to the population of Roma ethnicity, the actions taken and enforced were centred mainly on desegregation, access to labour market, approaching education disadvantages and improving access to services like housing and health. Still, the majority of countries are short of an all-comprising political framework due, among others, to lack of basic data and information.

Persons without shelter represent the most severe form of social exclusion. At the level of many member states the efforts for ensuring more accessible dwellings were intensified, but the lack of data regarding the number of persons without shelter represents a hindrance in defining and monitoring effective policies.

At the level of the member states, inequalities with respect to access to health services between various socio-economic groups persist, and these tend to complete their universal approach with measures that are directed to those vulnerable. Basic policy approaches are: intensifying primary and preventive care, eliminating barriers in accessing health services and righting the situation in disadvantaged regions.

Solving some issues of vulnerable groups, of combating social exclusion can be also realised by means of education. Pre-school education is regarded in the member-states as a fundamental element, a key-element in straightening socio-economic disadvantages and as a means of facilitating reconciling professional and family life.

At European Union level, the year 2010 was appointed as the "European year of combating poverty and social exclusion" and had as purpose "increasing the awareness degree

about difficulties with which are faced *vulnerable groups* within society<sup>1</sup> (84 million Europeans were living under the poverty threshold in 2010). In the European Union 17% from population is affected by *poverty*. The four objectives that guided the Year were: recognition of rights, responsibility and joint participation, cohesion, commitment and concrete actions.

The actions taken in the 29 countries participating to this programme have completed the existing initiatives of the EU in the field and have increased the visibility of persons facing poverty and social exclusion. In the majority of countries were organised activities that answer to the needs of all vulnerable groups: elderly numerous families, and monoparental families, children and youths, persons with disabilities, immigrants, persons from among ethnic minorities. In this context, the vulnerable groups are delimited by comparison with the majority of the population, as having more difficult living conditions: precarious housing or lack of housing, unemployment, low education level, and lack of incomes.

One of the five major objectives of the Strategy “Europe 2020”<sup>2</sup> which follows to be fulfilled up to 2020 is “social inclusion”, as well. As result, at the level of the European Union is pursued that up to 2020 the number of persons running the risk of poverty and social exclusion shall be diminished by at least 20 millions.

Also, the achievement of this intention means undertaking a series of measures, among which:

- improving access to labour market, to social protection, to services of general interest (for instance, health care, finding a house) and to education;
- more efficient use of European funds for supporting social inclusion and for combating discrimination;
- testing and evaluating social policy reforms for increasing the efficiency in the field of social inclusion;
- realising new partnerships with the public and private sector and valuing the potential of the social economy;

By these measures is pursued that persons living now in poverty, and especially the most vulnerable (women, immigrants, Roma population and other ethnic minorities, persons with disabilities) shall benefit from an improvement in their living condition and, thus, all European citizens shall live in a more cohesive society with a smart, sustainable economic growth based on inclusion.

Achieving the objectives of the “Europe 2020” Strategy depends on all actions that shall be taken by each country, in particular in the field of labour force employment, of education and poverty. The determinant factors in combating poverty and social exclusion are: economic growth and conceiving successful policies regarding labour force employment and education. Even if in countries with high employment rates of labour force, the poverty and exclusion levels tend to be low still, more often than not a job is not a guarantee against poverty. In this context is of importance “the modernisation and strengthening of the countries’ policies regarding labour force employment, education and training, as well as the social protection systems by increasing participation to labour market and diminishing structural unemployment, as well as by increasing social responsibility of enterprises within the business community”<sup>3</sup>

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<sup>1</sup> Decision No 1098/2008/EC of the European Parliament and the Council, of 22 October 2008, on the European Year for Combating Poverty and Social Exclusion (2010), <http://eur-lex.europa.eu>

<sup>2</sup> “EUROPE 2020, A European Strategy for Smart, Sustainable and Inclusive Growth”, European Commission, Bruselles, 3.3.2010, COM(2010) 2020 final, <http://eur-lex.europa.eu>;

<sup>3</sup> “EUROPE 2020, A European Strategy for Smart, Sustainable and Inclusive Growth”, European Commission, Bruselles, 3.3.2010, COM(2010) 2020 final, <http://eur-lex.europa.eu>



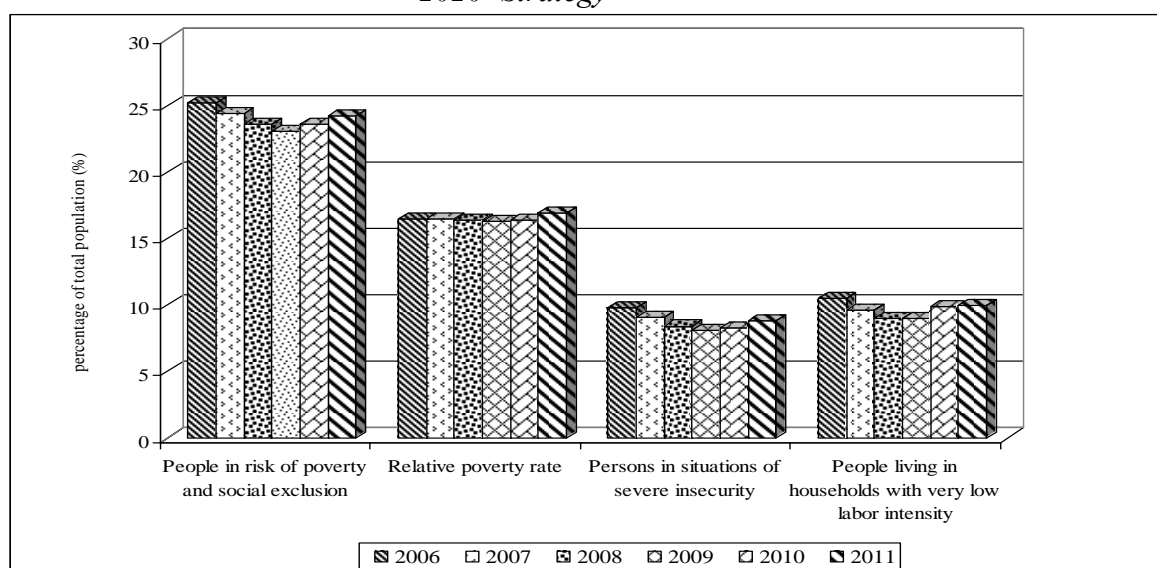
The objective of the “Europe 2020” strategy to guarantee the fact that the benefits of economic growth are widely distributed and that persons currently at the fringes of society can play an active role within its framework is reflected by means of three indicators that approach the varied characteristics of poverty and exclusion in Europe, as well as the different situations and priorities among the member-states:

- i) the number of persons exposed to poverty risk;
- ii) the severe material precariousness level;
- iii) number of persons living in households where the extremely low level of labour force employment represents a primordial element.

Also, the European Commission and the member-states have adopted a common list of indicators, from among which we enumerate: *the relative poverty rate, material precariousness, the number of persons exposed to poverty risk or to the social exclusion one, and the number of persons living in households with very low labour intensity.*

In the period 2008-2011, at European Union level, none of these indicators underwent significant changes (Figure 1). For the year 2011, the relative poverty rate was of 16.9%, by 0.5 pp higher than in 2010 and material precariousness – indicator describing the situation of persons that cannot afford goods regarded as essential for decent living in Europe and reflecting the differences with respect to living standards was, in average, in the year 2011, of about 8.8% (which means that over 40 million individuals were in a situation of severe material precariousness) (Figure 1).

**Figure 1** European Union Level Indicators Used for Monitoring the “Europe 2020” Strategy



Data sources: Eurostat statistics, online code: [\[tsdsc100\]](#), [\[tsdsc270\]](#), [\[tsdsc310\]](#), [\[tsdsc320\]](#), [\[ilc\\_lvh11\]](#)

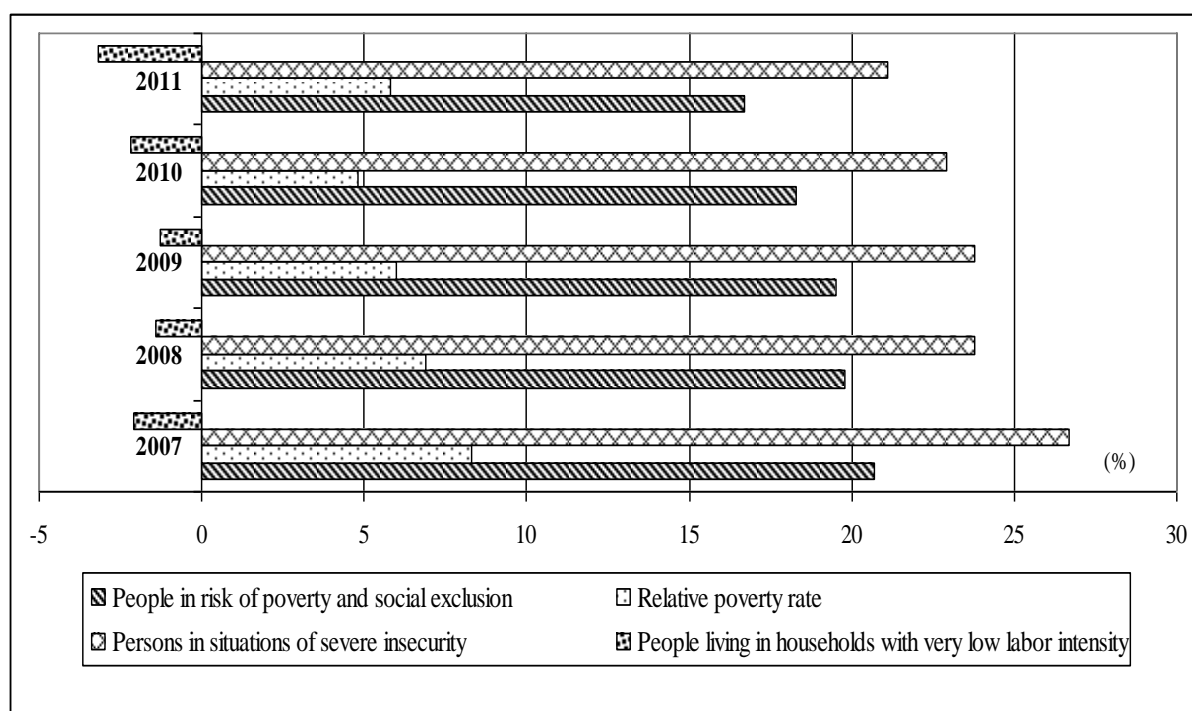
With respect to the weight of persons living in households with very low labour intensity in total population, for the year 2011 it was of 10%, which indicates that over 37 million persons live in households where non are employed (or where the members of the households work very little), yet who do not necessarily live with very low incomes. Also, in the year 2010, over 115 million persons, that is 24% from the European Union population



were in a risk situation quantified at least by one of the above-mentioned indicators regarding poverty, precariousness and pertaining to a household with very low labour intensity.

For Romania, the relative poverty rate had a decreasing evolution in the period 2007-2010, reaching in the year 2010 the value of 21.1 pp, at a difference of 4.7 pp from the value of the EU-27 relative poverty rate, but in 2011 in Romania this rate increased by 1.1 pp. If the weight of the persons in severe precariousness situations was in the year 2011 in Romania of 29.4% much over the EU-27 value (8.8%), the weight of persons living in households with very low labour intensity in total population was under the EU-27 average (6.7% against the 10% EU-27 average) (Figure 2).

**Figure 2.** *Evolution of the gap between the poverty and social exclusion indicators in Romania and EU-27*



Data source: Eurostat statistics, online code: [tsdsc100], [tsdsc270], [tsdsc310], [tsdsc320], [ilc\_lvh11]

### 3. General characteristics of social vulnerability in Romania

The state by means of economic-social policies developed, by measures for stimulating employment, and for guaranteeing the minimum wage on economy, of ensuring the necessary resources for paying rights resulting from social insurances, by granting the services pertaining to the social assistance system, as well as by ensuring quality social services has an important role in diminishing poverty.

Due to the multidimensional character of social vulnerability, for its diminishment the Government of Romania adopted a series of measures in view of solving some socio-cultural, housing, health, employment, education and birth increase issues, along with the ones for diminishing abandon, and promoting and protecting the rights of all children, for better meeting the issues faced by the individuals and families from the social and economic viewpoint.

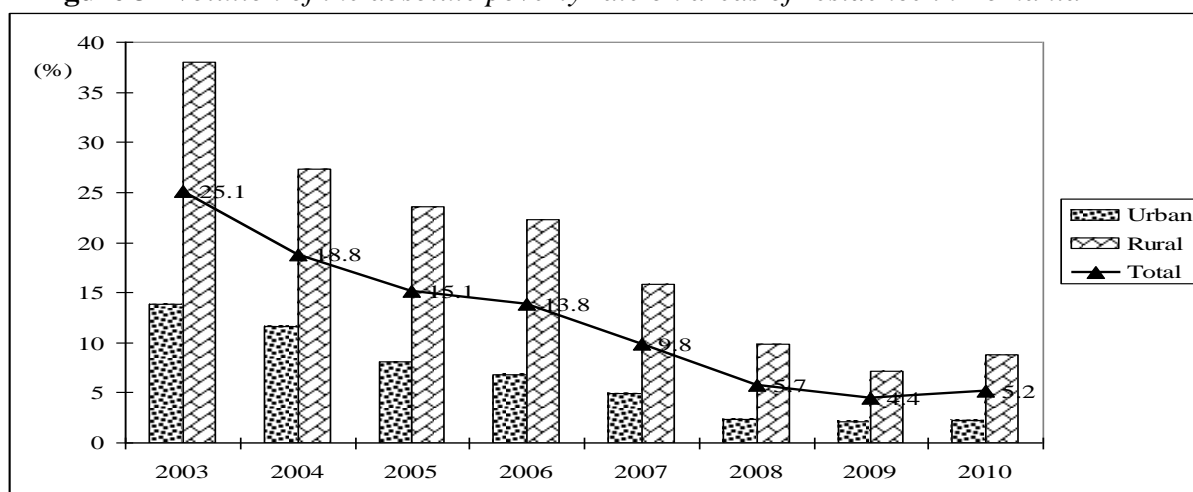
In analysing the vulnerability a series of indicators were used: primary – calculated in accordance with the methodologies set at European level, and secondary and tertiary ones – which reflect the social situation specific to Romania.

For Romania, the fields in which the *tertiary* indicators were grouped are: resources, labour market, housing conditions, education, health, and public order.

Some of these indicators refer to poverty and inequality, respectively: *relative poverty*, *absolute poverty*, *income* (taken into account for measuring relative poverty) and *consumption* (including self-consumption) for measuring absolute poverty. Also, for Romania, consumption expenditures estimate much better than incomes the actual economic situation of the households due to the tendency of under-reporting of incomes, to the difficulty of measuring informal incomes and to the existence of population's credits. To these is added also the fact that Romania is an economy with a strong agricultural component, the consumption expenditures reflecting thus much better the actual economic situation of the households due to a higher stability in time, as compared with the incomes affected by seasonality.

The analysis of absolute poverty on areas of residence in Romania for the period 2003-2010 highlights a decreasing trend at the level of each region up to the year 2009. As result of the economic crisis, in 2010 were recorded increases of this indicator, more marked for the rural areas (Figure 3).

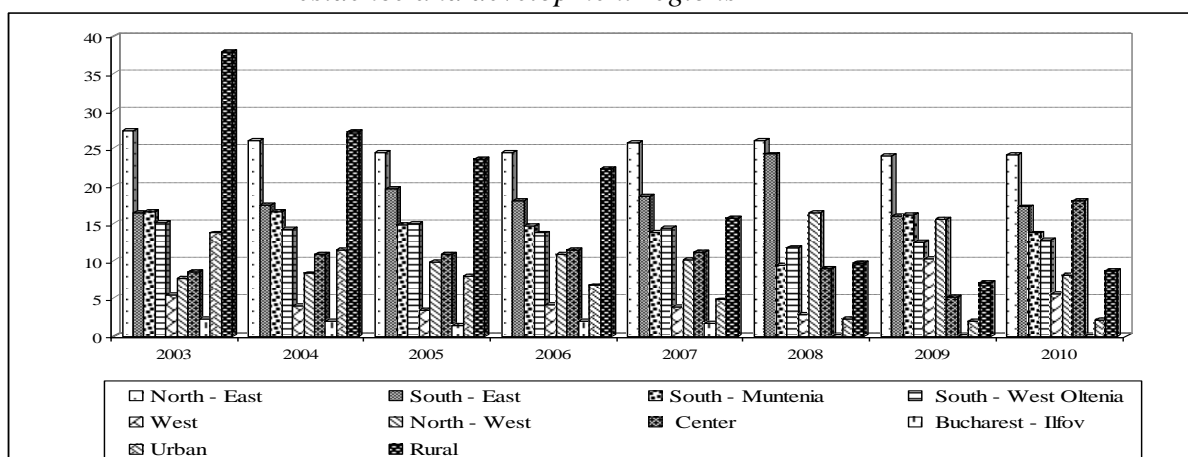
**Figure 3** Evolution of the absolute poverty rate on areas of residence in Romania



Data source: Annex 3 Report regarding social inclusion in Romania in the year 2010, Ministry of Labour, Family and Social Protection, Directorate Social Services and Social Inclusion, Department social indicators and social inclusion programmes

Regarding the distribution of poor population, in the year 2010, 82.9% of this population was in the rural area (on increase by 8.9 pp against 2009), year in which, in the urban area the poor population diminished by 8.9 pp. Almost one quarter of the poor population in accordance with the definition of severe poverty lived, in 2010, in the North-East region: 24.4%, and in the Centre region 18.1%, and in the South-East region 17.3% (Figure 4). Against the year 2009, the pauperisation process was most marked in the North-East region (change in 2010 against 2009:12.9%) and inexistent in the Bucharest region.

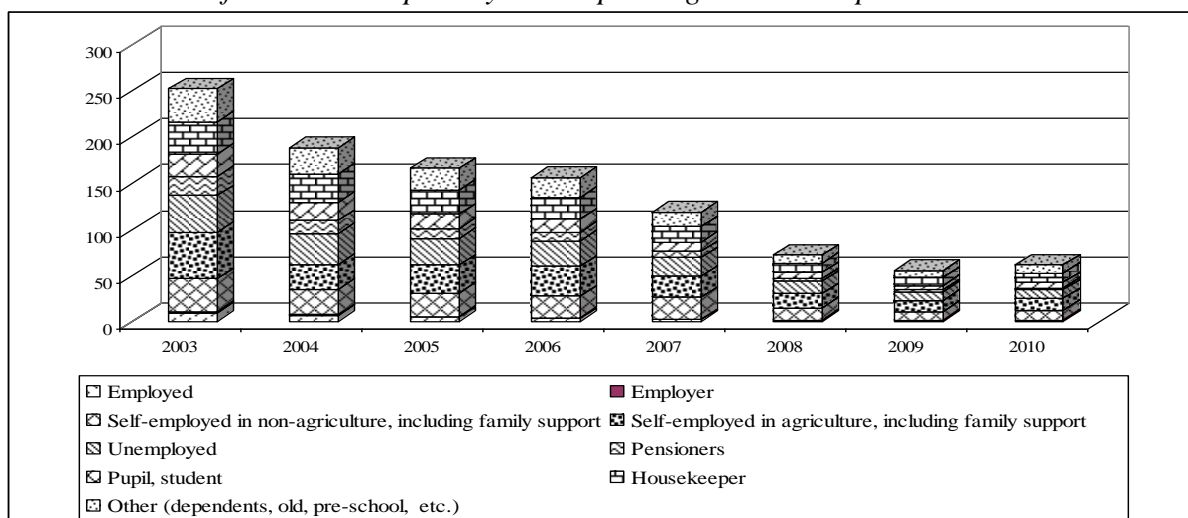
**Figure 4** *Distribution of poor population (severe poverty) in Romania on areas of residence and development regions*



Data source: Annex 3 *Report regarding social inclusion in Romania in the year 2010*, Ministry of Labour, Family and Social Protection, Directorate Social Services and Social Inclusion, Department social indicators and social inclusion programmes

The analysis of absolute poverty depending on the occupational statutes highlights a substantial diminishment of it for all occupational categories in the period 2003-2009 (Figure 5) and slight increases in the year 2010.

**Figure 5** *Evolution of the absolute poverty rate depending on the occupational statutes*



Data source: Annex 3 *Report regarding social inclusion in Romania in the year 2010*, Ministry of Labour, Family and Social Protection, Directorate Social Services and Social Inclusion, Department social indicators and social inclusion programmes

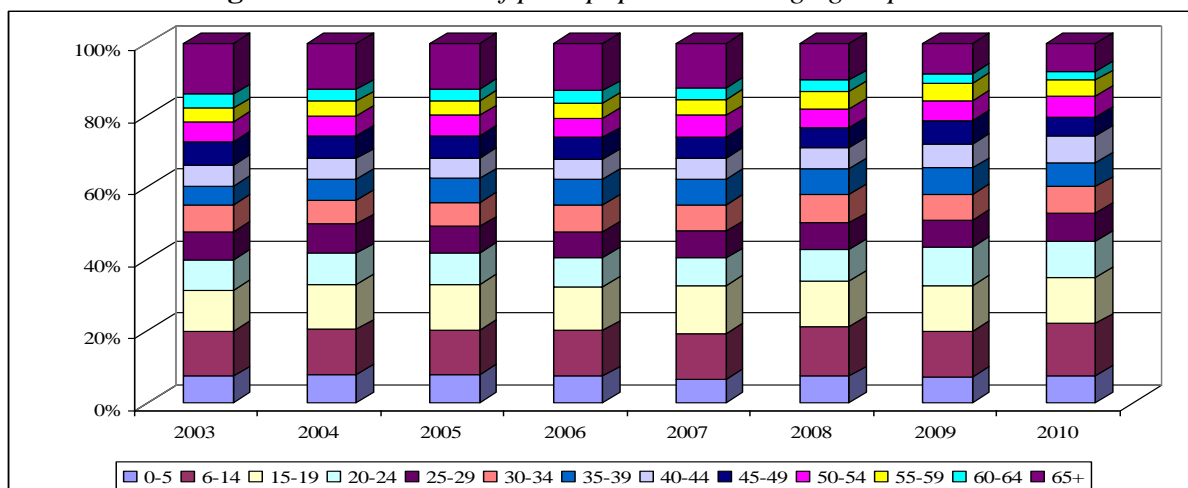
The differentiation of social vulnerabilities at the level of Romania's development regions is due also to regional disparities of the gross domestic product per capita. Thus, in the year 2010, in the North-East region the GDP/capita was of 21827.2 RON/capita, 3.87 times less than the one registered in the region Bucharest-Ilfov. Also, in the regions with a high degree of social vulnerability, the average number of employees is much smaller than in the others.

In all regions, the ILO long-term unemployment rate is situated under 6%, high values being registered in the regions Centre, South-East and South-Muntenia. Much higher values

were recorded for the long-term unemployment rate amongst youths in the majority of regions, which indicates that this population segment is the most vulnerable.

Population with ages between 6 and 24 years represents 37.5% from the poor population of Romania (Figure 6), the absolute poverty rate for this segment varying between 7.7 - 9.5%. For all the other age groups, the absolute poverty rate varies between 2.3 - 5.7%, the lowest level being recorded for the segment 60 to 64 years of age.

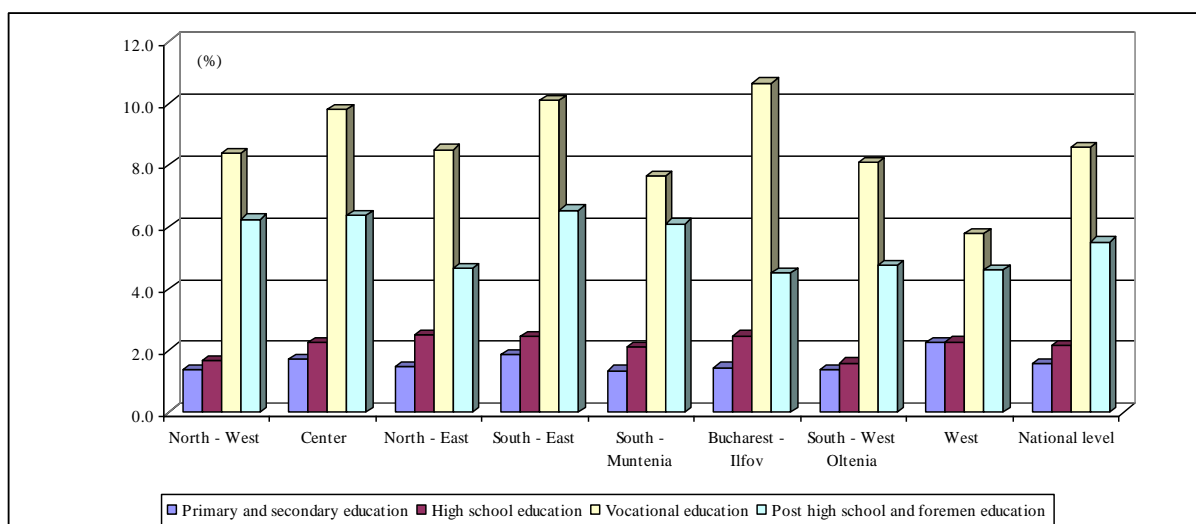
**Figure 6** *Distribution of poor population on age groups*



Data source: Annex 3 *Report regarding social inclusion in Romania in the year 2010*, Ministry of Labour, Family and Social Protection, Directorate Social Services and Social Inclusion, Department social indicators and social inclusion programmes

Another element leading to the increase of the vulnerability degree of some persons is also *school abandon*. In the development regions of Romania, this indicator for primary and secondary education in the school year 2009-2010 exceeds the average value of 2.2% only in the South-East region.

**Figure 7** *Abandon Rate in Pre-University Education, at Regional Level, in 2009/2010 Scholar Year*



Data source: *Romania's Statistical Yearbook, 2011*, National Institute of Statistics, Table 8.29

High values of the school abandon rate are registered for vocational education where the value at national level is of 8.6%, and in the regions Centre, South-East and Bucharest-Ilfov is exceeded (Figure 7). Because in Romania the obtained skills don't have the same

specialisation degree as those obtained in other European countries, as they are based more on general criteria and not on the specific abilities of each individual, this could be an explanation for the high abandon rate for this type of education in the Bucharest region, region which comprises the capital of the country and which can provide for other opportunities of vocational training, employment, etc.

In this context, in the year 2010, 33.6% from the poor population was represented by individuals with no education, 24.7% with primary education, and 24.4% with secondary education. The weight of poor population with secondary education (classes 9-10 or 9-12) and of those graduating vocational/trades/apprenticeship schools was of 9.2%, respectively 8.1%.

#### 4. Conclusions

The brief analysis of some indicators of the social vulnerability have lead to extracting some conclusions, among which:

- the absolute poverty risk was, in average, 4 times higher in the rural area than in the urban area;
- the North-East region and the regions from the southern part of Romania register higher poverty rates than the ones at national level;
- self-employed have registered the highest poverty rates (especially those developing their activity in agriculture, and pensioners have a poverty rate under the national average);
- the most vulnerable age segments are, irrespective of the region, children and youths;
- according to the education level, the highest poverty rates were the ones of individuals with no education, and for those who graduated only primary education (grades 1-4), and of those with secondary education;
- school abandon, which is high in particular in the Centre region and in the regions from the southern part of Romania, determines the much higher unemployment rate amongst youths against the general one and this, together with the specific socio-economic factors to each region might become an important factor in increasing the vulnerability of several persons;
- in Romania the Roma ethnicity continues to register a poverty rate much above the national level (about 6 times higher than the value registered at national level) and it also represents a population segment which is very vulnerable from the social viewpoint;
- persons living in large households of five members or more are exposed to a 5 times higher poverty risk as compared with the one corresponding to persons in single households;
- households managed by women, irrespective of the region in which they are, are much more affected by poverty than the ones managed by men, due to the fact that to a large extent women designated as family heads are less active on the labour market.

#### 5. Selective Literature

1. Popescu R., (2011), Dimensiunii Incluzive ale Grupurilor Vulnerabile, REES, Anul I 2/2011;
2. \*\*\* Anuarul Statistic al României, 2011, Institutul Național de Statistică;

3. \*\*\* “*EUROPA 2020, O strategie europeană pentru o creștere inteligentă, ecologică și favorabilă incluziunii*”, Comisia Europeană, Bruxelles, 3.3.2010, COM(2010) 2020 final, <http://eur-lex.europa.eu>;
4. \*\*\* Decision No 1098/2008/EC of the European Parliament and the Council, of 22 October 2008, *on the European Year for Combating Poverty and Social Exclusion (2010)*, <http://eur-lex.europa.eu>;
5. \*\*\* *Raport privind incluziunea socială în România în anul 2010*, Ministerul Muncii, Familiei și Protecției Sociale, Direcția Servicii Sociale și Incluziune Socială, Compartiment indicatori sociali și programe incluziune socială;
6. \*\*\* *Raport statistic privind M.M.P.F.S. în domeniul incluziunii sociale, în semestrul I 2012*, Ministerul Muncii, Familiei și Protecției Sociale, Direcția Servicii Sociale și Incluziune Socială, Compartiment indicatori sociali și programe incluziune socială;



## Marketing Strategy Formulation for the Introduction of Eukula Strato German Wood Finishes in Local Market of Emerging Indian Economy

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**Abstract:** Wood finishing relates to the process of embellishing or protecting the surface of the wood. The paper aimed at formulating a marketing strategy for introducing water borne German based Wood Finishes named Eukula Strato into local market of northern Kerala, India. Multiple cross sectional descriptive research with judgmental sampling technique elicited responses from Finishers, Furniture manufacturers and Interior designers. Findings revealed that Eukula Strato had a distinct advantage when compared to any other Wood Finish that was available in the local market. Findings and suggestions were reported as per 4P's of marketing mix. Percentage analysis, Chi square analysis etc were used to interpret the results.

**Keywords:** Eukula Strato, Finishing, Marketing strategy, Wood

**JEL Classification:** M30, M31, M39

### 1. Introduction

Wood finishing relates to the process of embellishing or protecting the surface of the wood. The process starts with surface preparation. This can take up the form of sanding by hand or by power. Once the wood surface is prepared and stained, a number of layers of coats are normally applied. It starts by applying a wood sealer over the wooden surface. The process finally ends by giving a final coat known as topcoat, which is also known as the Wood finish. Wood finish is essential for protecting wooden surfaces and also enhances the beauty of the wood by highlighting the grain. (Classic Wood Finishing Ltd.).

Eukula GmbH is a reputed German manufacturer of specialty wood coatings. The Company has been developing and selling world-class industrial coatings since 1963. The Eukula Strato water based coating system uses fully developed high molecular weight polyurethane (PU) polymers in its dispersed form in water. Once water evaporates, these coating leaves a uniform layer of merged molecular chains of PU which possess superior resistance of PU to abrasion, scuffing, and chemicals (Western India Plywoods Ltd.).

The Western India Plywoods Ltd (WIP), Baliapatam, Kannur District, Kerala, India was established in 1945. The Company started their initial operation by manufacturing sawn timbers and plywoods on a modest scale. Over the years, the Company made steady progress

and the business expanded to its present stature and today WIP is one of the biggest wood based industrial integrated complexes in India (Western India Plywoods).

Eukula GmbH, has joined hands with the Western India Plywoods Ltd., to bring the best in wood protection. WIP is now the only company in the state of Kerala, India to introduce and distribute Eukula Strato. This research article aimed at formulating a marketing strategy for Western India Plywoods Ltd (WIP), so as to introduce the water borne finish, Eukula Strato in northern Kerala, India.

## **2. Literature review**

According to Williams (1999), wood finishes imparts wood an elegant appearance, protect the wooden surfaces and also provide a cleanable surface. He also opined that most people consider appearance as the most important element when choosing finishes for wood. He further suggested that performance of wood largely depends on choosing an apt finish for wood, considering the usage conditions, and applying the finishes properly in sufficient quantity. Further he explained that for long life of wood, one must choose a harmonic mix of wood products and finishes appropriate for environments where they are mainly used. He noticed that a climate having severe seasonal changes placed greater importance on finishes than a mild climate. As per Hoadley (2000), wood finishes enhanced the appearance of the wood. He further explained that appearance was more controversial as it largely depended on individual taste and preference. He added that wood finishes protect wood against abrasion or serration and prevent changes in color due to light or atmospheric pollutants. However he added that the most important function of wood finishes is to hamper the exchange of moisture with the atmosphere, avoiding the consequences of dimensional change. He also argued that it is impossible to generalize as far as surface appearance was considered. This was because of the variation in circumstance and personal preference as to what looked the best. Some wood finishers or end users prefer to preserve wood in its natural state as much as possible, while others wished to change the wood in both color and appearance. Some desire to retain any visible surface irregularity due to cell structure, while others crave for surface that is perfectly smooth. Some wish a matte finish, others a high gloss. Some try to hang on to variation in figure and color, others attempt to achieve uniformity. As per Hawks (1995), the choice of finishing material depended on the type of wood, the use of the furniture; the time available to do the finishing job and personal taste. Jewit (2004) opined that finishing products can be grouped into several categories such as waxes, oils, varnishes, shellacs, lacquers and water-based finishes. He also added that no single wood finish can excel well in all of these categories. He opined that a finish that excels in one may fail in another.

## **3. Research methodology**

The objective of this paper was to formulate a marketing strategy for the Western India Plywoods for the introduction of Eukula Strato in the local market. The task was to provide a comprehensive marketing strategy to launch the new water-based PU wood finish, Eukula Strato in northern Kerala, India. This strategy covered:

- Analyzing target audience
- Analyzing market potential for Eukula Strato
- Consumer understanding
- Strategies for 4Ps of marketing mix.

### *Scope of the study*

WIP had not yet thought about any marketing strategy for the introduction of Eukula

Strato. So far no attempt had been made to check the brand awareness of Eukula Strato. So they wished to know the awareness and acceptance of waterborne finishes and also for Eukula Strato. So a survey had been carried out in northern Kerala. Finishers, Furniture manufacturers and Interior designers were the chosen respondents. An analysis had been carried out as per 4Ps of marketing mix for the finishes used by the respondents. This report may enable the Company to formulate a marketing strategy for Eukula Strato.

#### *Limitations of the study*

- Population size of the target audience was very small.
- Unwillingness of the respondents to reveal financial data.

#### *Research design*

The major objective of this design was the description of market characteristics and functions. The research design adopted in this study was multiple cross-sectional descriptive research. It was because; there were three samples of the respondents viz. Finishers, Furniture manufacturers and Interior designers. The data obtained through this design were subjected to quantitative analysis. The findings from this research helped to formulate the marketing strategy for Eukula Strato.

#### *Data collection*

The primary data was obtained by survey method through a specifically designed questionnaire. Secondary data was collected from published and unpublished sources. These mainly included websites, annual reports, articles and so on.

#### *Data collection method and instrument*

The survey method of data collection was used in the research and a specifically designed questionnaire was used as the data collection instrument. This method of obtaining information was based on questioning the respondents. A formal structured questionnaire was prepared and the questions were asked in a prearranged order which projected the 4Ps of marketing mix. Respondents were asked a variety of questions regarding their behaviour, intentions, attitudes, awareness, motivations and so on.

#### *Questionnaire design, development and pre-testing*

At first an initial questionnaire was prepared. This questionnaire had been redesigned after pilot study. The scaling techniques used in the questionnaire were dichotomous and Likert scale. Pre-testing of the questionnaire was done on a small sample of respondents in the Kannur district, Kerala, India, to identify and eliminate potential problems. Pre-testing or pilot survey is a small-scale replica of the main survey and it was highly useful on the following grounds.

- The drawbacks of the questionnaire like difficulty in understanding certain questions by the respondents, existence of some meaningless questions etc could be found out.
- An idea was formed about the extent of non-responses.
- The probable cost and duration of the main survey was evaluated.

#### *Data sampling*

Sampling is one of the key components of a research design. Judgmental sampling technique was used for the survey. Judgment was exercised to choose the exact target audience to be included in the sample. The sampling units (occupational groups) were Finishers, Furniture manufacturers and Interior designers. The sampling area considered for the study was three districts in Kerala state, India. They were Kannur, Kozhikode and

Malapuram. A total of 60 respondents were interviewed during the course of the study from the above-mentioned three regions. SPSS 12 for Windows was used as the software tool for analysis. Results were interpreted at 95% confidence interval

#### *Tools for Analysis*

- a) Percentage analysis
- b) Chi-square test.

#### *Hypotheses of the study*

H1: There were no significant differences between the type of wooden surfaces finished and the occupational group.

H2: There were no significant differences in Melamine usage under different occupational groups.

H3: There were no significant differences for the tendency to stick on to a brand under different occupational groups.

H4: Awareness of water borne fishes does not appeal equally to all occupational groups.

### **4. Results and discussion**

Chi square analysis were carried out to test the above mentioned four hypotheses and yielded the following results as shown in Table 1

**Table No. 1**

Sr.No	Hypotheses	Valid cases	Value	Significance	Result
1.	H1	60	2.821	.244	Accept
2.	H2	60	.918	.632	Accept
3.	H3	60	1.438	.487	Accept
4.	H4	60	.116	.944	Accept

**\*\* $p < .05$ , level (2-tailed)**

Source: Survey data

The findings of the study laid down as per 4P's of marketing mix are as shown below.

#### **Product**

- There was no usage of water borne finishes from the sample drawn in the surveyed districts, viz. Kannur, Kozhikode, and Malapuram of Kerala state, India
- Only 47 % of the sample population was aware of water borne finishes.
- Finishers developed keen interest in using water borne finishes because the solvent based wood finishes that they are now using were harmful to their health.
- Melamine was the chemical which was having a major market share of the finishes used. Respondents mainly preferred Melamine matt. The respondents described Melamine as hazardous to health. Melamine was also reported to have unpleasant smell.
- Respondents were not that much satisfied with their finish's resistance to heat, humidity, chemical reactions, corrosive climate and so on.
- Respondents were aware of superior performance by polyurethane (PU) finishes. But PU finishes were less used because of its premium price level.
- Traditional chemicals like French polish, Lacquer were also used by the respondents.
- It was observed that lesser percentage of the sample population was doing wooden floorings.
- 57 % of the sample drawn was carrying a systematic procedure of wood finishing, i.e.

filling the wood, sealing the wood and finally giving a topcoat.

- The modal class of area finished in a month was 1000-2000 square feet. The modal class of area (square feet) covered by per litre of the respondents existing finishes were 36-40 square feet.
- Coverage of Eukula Strato was calculated as nearly 4 times to that of existing finishes used by the respondents.
- 55% of the respondents used both spray and brush to finish the wooden surfaces. Roller was exclusively used for wooden floorings.
- Asian Paints Melamine (solvent based) wood finish was the market share leader in wood finishes with 27 % market share. Brands like Esdee and Sheenlac were the nearest competitors.
- Brand Esdee was observed to be little pronounced in Malapuram district.
- Respondents were in need of an eco friendly and quick drying finish.
- 39 % of the respondents associated 'good finishing' as the key attribute of their finish and this was the parameter that they liked the most about their finish.
- Health hazards, which contributed to 37 %, were the major disadvantage of their finish and this was the parameter that they like least about their finish.
- Sheenlac brand was reported to be turning yellowish during dry climate. Sheenlac was reported for better use during rainy season when compared to Asian wood finishes due to its quick drying period. But Sheenlac wood finish was reported to be evaporating while the finish bottle was opened for so long when compared to Asian wood finish.
- Respondents were highly conscious about the quality of the product.
- Respondents were more aware of water borne finishes like ICA, Sirca.
- Respondents were also aware of the advantages of water borne finishes such as environment friendly, ease of application, more coverage and so on.
- Respondents raised doubts regarding Eukula Strato's application procedure, method of application, price expected and life span. Doubts were also raised whether Eukula Strato would bubble up during finishing since it was water borne.
- Respondents were eager to know about the complete information about Eukula's products that supplemented the topcoat Eukula Strato.
- Respondents also raised doubts whether Eukula Strato could be applied to rubber wood. Leading furniture manufacturers like RUBCO and Andaman Timbers who were using Rub wood raised this question.
- Respondents were expecting samples from the Company.

### Price

- 70% of the respondents rated 'pricing' as important as the 'quality of the product'. However they were not ready to give high price for a product even if the quality was good.
- 53% of the respondents wished to get a high quality medium price product.
- 37% preferred medium price medium quality product.
- Respondents were least interested in getting a low price low quality product.
- Price was subjected to discount when the respondents went for bulk orders.
- An ideal price of a wood finish in the minds of the respondents was between in the range 110-220 (Indian Rupees)
- PU finishes were available only at higher price in the market. Since Eukula Strato was also PU based finish, and moreover Eukula Strato was water based, respondents believed that Eukula Strato would be heavily priced.

### Promotion

- It had been observed that the respondents were the sole decision makers for the

purchase of the finish. Customers (end users of wooden surfaces) had only lesser percent share in making decisions to purchase a finish. Customers were mostly conscious about the colour of the finish.

- Respondents came to know more about the finishes through trade exhibitions and personal use and experience.
- 65% of the sample population drawn was not getting any incentives. 86% of the sample population, who got incentives, would be still interested in buying the finish even if the incentives were withdrawn.
- 72% of the respondents said that they would switch on to another brand, if it satisfied the quality and pricing in their mind
- The major source of purchase of the finish was through wholesalers and retailers.
- 78% of the respondents said that their finishes were regularly available.

### **Place**

- Main suggestions given for improving the distribution channels were opening more outlets in city/towns, bazaars and built up towns in villages, speedy delivery, and delivery at doorsteps and so on.
- It was observed that Eukula Strato had a distinct advantage when compared to any other wood finish that is now available in the market.

## **5. Suggestions for marketing strategy formulation for Eukula Strato**

### **Product**

- The Company should clearly position the firm and the product to highlight their differential advantage of their product Eukula Strato. This can be done through aggressive product promotion. The Company should specifically highlight the unique features of Eukula Strato, i.e. 4 times the coverage than any other wood finish, highly eco- friendly, strong abrasion resistant, highly odor less, limited drying period, ease of application even by an unskilled worker, resistance to almost all tortuous conditions for any wood such as the humidity, heat, chemicals, corrosive coastal climate and salt laden sea breeze and so on through proper advertising channels to reach the target segment.
- The Company should specifically educate its potential respondents and demonstrate the unique feature of Eukula Strato, i.e. coverage, through demonstrations / exhibitions.
- The Company should conduct research among the respondents and non-respondents to determine the perception of the firm and of its various competitors before introducing the product in the market.
- The Company should have a clear cut strategic vision for the marketing efforts and the values that hold sacred in carrying out this vision.
- The Company should have a vision to anticipate the reaction of their competitors to the Company's marketing strategic decisions.
- The Company should also have clear flexibility in responding to competitive actions and changes in the market.
- The Company can position the product as quality leader (best reliable product and services), service leader (the most responsive when customers have problems), value leader (the best price performance) and so on.
- The Company should have a clear vision on the position that is cluttered with many competitors.



**Price**

- Serious thoughts should be done in fixing the price of the product in comparison with the price of its nearest competitors because the market is not ready to accept a high price product even though the product may be of superb performance and quality.
- The Company can invoke penetration strategy at the market development stage of the product life cycle.

**Promotion**

- The Company should target the right segment to sell their product. The target segment is finishers, furniture manufacturers and interior designers and it is not the end users of wooden surfaces. The end users are customers.
- The Company can involve in personal selling at the beginning and educate the respondents about the benefits of the product, give samples of the product, answer to their questions and reduce their perceived risk.
- Advertising can be enhanced at the point of purchase of the finishes, which are mainly at wholesalers and retail shops. Media advertising should also be enhanced before the introduction of the product.

**Place**

- Company can start up the distribution of the product by setting up its own distribution outlets at different locations.
- Immediate thoughts must also be raised for the market entry decisions because water borne finishes are already available in India and soon or at a later date, it can invade the local market and there can be a tight competition among all water borne finishes.

Thus the marketing managers have to think intelligently and strategically to formulate the 4Ps of marketing mix to introduce Eukula Strato.

**6. Conclusion**

Effective marketing strategy should provide various degrees of focus and flexibility. Depending upon the level of change in the market place, there should be clear focus on what segment to serve, what will be the primary source of the differential advantage and why to do things in a particular way. There should also be clear flexibility on decisions about how to respond to competitors, when to enter the market and with what technologies to meet the customer segments and so on. WIP may focus on perennial renaissance as an essence of effective marketing strategy.

Perennial resistance has high focus and high flexibility. Perennial suggests consistent, enduring and constant change; renaissance implies creativity and rebirth of the ideals of an earlier age. Thus, by carrying out more thoughtful analysis of market, differentiation, positioning, market entry, competitive response and fusing of strategic vision and values, the Western India Plywoods Ltd can introduce 'Eukula Strato' and inimitably make its mark in wood protection.

**7. References**

- [1] Classic Wood Finishing Ltd. (n.d.). Wood finishing:Classic Wood Finishing Ltd. Retrieved October 24, 2012, from Classic Wood Finishing Ltd Website: <http://classicwoodfinishing.com/finishing.htm>
- [2] Hawks, L. K. (1995). Finishing. Cooperative Extension Service, Utah State

University.

[3] Hoadley, R. B. (2000). Finishing and protecting the wood. In Understanding Wood (pp. 200-212). The Taunton Press.

[4] Jewitt, J. (2004). Selecting a Finish. Retrieved January 18, 2013, from [www.finewoodworking.com:http://www.finewoodworking.com/toolguide/articles/selecting-a-finish.aspx](http://www.finewoodworking.com/toolguide/articles/selecting-a-finish.aspx)

[5] Western India Plywoods. (n.d.). Eukula:The Western India Plywoods. Retrieved October 13, 2012, from Western India Plywoods: <http://www.wipltd.in/eukula.html>

[6] Williams, R. S. (1999). Finishing of Wood. Retrieved December 3, 2012, from [http://www.fpl.fs.fed.us/documnts/fplgtr/fplgtr190/chapter\\_16.pdf](http://www.fpl.fs.fed.us/documnts/fplgtr/fplgtr190/chapter_16.pdf)

## Sustainability of National Cohesion

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**Abstract:** *In the European Union, cohesion policy is the third country after the domestic and social policy, as this policy is a tool for economic growth and also a balancing factor. Through its solidarity funds contribute to the other sectorial policies: the Common Agricultural Policy, social policy, environmental policy. This article aims to demonstrate the importance of cohesion policy in the national economy and how to improve its implementation by ensuring sustainable development and sustainable economic growth.*

**Keywords:** cohesion policy, economic sustainability, sustainable growth

**JEL Classification:** G18; Q56; R11.

### 1. Introduction

The starting point in defining this concept is the explanation of economic and social cohesion in the „Glossary of Terms” found on the official website of the European Union, which states that „economic and social cohesion is an expression of solidarity between Member States and regions European Union. The aim is balanced development of the EU by reducing disparities between regions and promoting equal opportunities for all. "This definition establishes practically the landmark of economic and social cohesion, namely the European regions and thus regional policy.

DG REGIO (Directorate General for Regional Policy of the European Commission) defines regional policy as „a policy that promotes solidarity „with an emphasis on supporting regions to overcome their structural problems and develop their economies so that the results obtained are converged. At the same time, however, regional policy is a policy that is defined mainly by its instruments known as „structural instruments”, representing the funds used to achieve the objectives of reducing disparities between regions.

Considering the assumptions above, presenting economic and social cohesion is closely related to the development of regional policy and its financial instruments.

Until the reform of the Structural Funds in 1988, when they were set targets regional development, it is difficult to speak of European regional policy as something more than an

"umbrella" under which they were granted some funds, without a well-defined purpose. Basically, regional policy developed while promoting economic and social cohesion, it is difficult to distinguish between them, causing the development of European integration extrapolation to the regional development objectives of convergence, and thereby to economic and social cohesion, and recently, the economic, social and territorial cohesion.

In this context, it can be said that economic and social cohesion is the sum of public initiatives and actions undertaken in reducing economic and social disparities between regions and approaching the living standards of their people through actions aimed at increasing the competitiveness of these regions and creating better jobs for the residents of these regions paid to embedding sustainable development objectives as defined in the Lisbon European Council (March 2000) and Gothenburg (June 2001).

Can be concluded the following: economic and social cohesion is an objective of harmonious development of the whole European Union, and in this situation, all European policies, community or national, will be formulated and implemented to contribute to this goal; economic and social cohesion is a European development policy, which aims to develop the European Union by reducing disparities between the levels of development of the regions, and it has to achieve its financial instruments (Structural Funds and the Cohesion Fund, EIB loans).

## **2. Tangibility of Cohesion Policy in Romania and the European Union**

Cohesion Policy is one of the tangible examples of how it should be a European policy: modern, flexible, proactive, and adaptable to rapid economic and social environment changing and having a substantial contribution to key policy objectives of the Union. These features can be seen is how the new policy for the programming period 2007-2013, which all Member States have already begun to implement. The overall objective is to support economic growth, social and territorial cohesion by reducing disparities in development between Member States and regions<sup>4</sup>.

EU enlargement to 27 Member States has increased, however, geographical disparities within the Union, a number of increasingly more Europeans living in disadvantaged regions. Reducing the gap will be a long process, which is why the least developed regions is the first priority of cohesion policy<sup>5</sup>. Applying this principle in the period 1994-2006, the poorest countries to date (Spain, Greece, Portugal and Ireland) significant increases in each of the four countries reaching over 75% of GDP (Ireland - 145%, ranking has now shifted to the second place among the richest countries in the bloc's 27, Spain - 102%, Greece - 88%, Portugal 75%).

According to the fourth report on economic and social cohesion, Romania and Bulgaria will reach a GDP per capita representing 75% of the EU-27 only after more than 15 years from the date of accession.

Last year, Romania had a GDP per capita quota of 38 units, being the second of the poorest countries in the Union list of countries with the lowest GDP per number of inhabitants being led by Bulgaria with 35 units<sup>6</sup>. In third place, according to this criterion, ranked Poland, with 54 units.

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<sup>4</sup> Burghilea, C., *Modelul dezvoltării durabile, Theoretical and Applied Economics*, Bucharest, 2012, pp. 96-107

<sup>5</sup> Hübner, D., *Declarația de la Berlin*, martie, 2007, cuvânt înainte la Cel de-al Patrulea Raport Privind Coeziunea Economică și Socială;

<sup>6</sup> [www.smartfinancial.ro](http://www.smartfinancial.ro)

For cohesion policy objectives (Convergence, Regional Competitiveness and Employment and European Territorial Cooperation) in 2007-2013 Romania will benefit from funding from the European Union budget of about €31 billion of which 12 billion are allocated to agricultural policy and rural development and 19,668 billion euros are distributed through the Structural and Cohesion Funds as follows:

12.661 billion under the 'Convergence';

6.552 billion are allocated to the Cohesion Fund;

0.455 billion under the 'European Territorial Cooperation' (see table no. 1).

**Table no. 1.**

**Structural and Cohesion Funds allocation for Romania in 2007-2013**  
-million euro-

<b>Year</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>Total</b>
<b>Convergence</b>	830	1215	1654	1997	2154	2319	2489	<b>12661</b>
<b>Cohesion Fund</b>	445	638	858	1030	1109	1192	1278	<b>6552</b>
<b>Territorial Cooperation</b>	60	61	62	64	66	68	70	<b>445</b>
<b>Total</b>	<b>1335</b>	<b>1915</b>	<b>2576</b>	<b>3092</b>	<b>3330</b>	<b>3580</b>	<b>3837</b>	<b>19668</b>

Source: www.creditefinanciare.ro

Romania's contribution is at least 5.5 billion euros, so that the total investment in structural and cohesion policy is about 25.2 billion euros for the next seven years.

Allocation of funds designed to achieve the objectives set in the National Strategic Reference Framework 2007-2013: reducing social and economic development disparities between Romania and the EU Member States and the EU to reduce disparities by generating an additional 10% of GDP by year 2015<sup>7</sup>.

Priorities of the NSRF are implemented under a seven Operational Programs (OPs) for the Convergence objective:

- Three PO financed by the ERDF: Regional, Sectorial Operational Program for Increasing Economic Competitiveness Operational Program Technical Assistance;
- Two PO receiving ESF resources: Sectorial Operational Program - Human Resources Development, Sectorial Operational Program - Development of administrative capacity;
- Other two are funded PO CF and ERDF: Sectorial Operational Program Environment, Sectorial Operational Program - Transport;

Five CBC programs for the European territorial cooperation objective are being financed by the ERDF as well as other three programs in the directions of transnational and interregional cooperation. Within this objective, Romania will take part in cross-border cooperation programs with Hungary, Bulgaria, Moldova, Serbia and Ukraine, transnational cooperation program for the Black Sea and two other neighborhood programs and extension: PO Area Southeast European PO inter-regional cooperation.

In terms of economic development, Romania will have to face enormous challenges<sup>8</sup>. The National Strategic Reference Framework (NSRF), are ways in which Romanian

<sup>7</sup> Cadrul Strategic Național de Referință, 2007-2013, Al doilea proiect, octombrie 2006, p.5;

<sup>8</sup> Burghilea, C., Ene, C., M., Uzlău, C., *Impact of economic models on European Union economies development*, Theoretical and Applied Economics, Volume XX (2013), No. 4(581), pp. 91-102

authorities intend using this resource in accordance with the Lisbon Agenda. Thus, we pursue the following objectives<sup>9</sup>:

- Development of infrastructure to European standards: upgrading of road, rail, air and water, creating a clean transport system, increasing the quality of the drinking water supply system, sewerage system and waste management;
- Increasing the long term competitiveness of the Romanian economy: the increasing costs of research and development, local and regional economies more competitive, service development and business support infrastructure;
- efficient use of human capital requires increasing investment in education, harmonization of educational offers with labor market demand, growth of jobs in order to meet the demand, increased adaptability and entrepreneurship and promoting equality and inclusion;
- Improving public administration: the implementation of structural funds to achieve the objectives of the NSRF includes: creating an environment in which innovations are promoted effectively use the "know-how" and the new technologies, the development of institutional frameworks and effective administrative and personal use of a highly qualified professional.

### 3. Cohesion Policy 2007-2013

Cohesion policy is the EU's main measure pursuing a balanced and sustainable development in Europe. EU funds available amount to about 344 billion in the current period 2000-2013 (see Fig. no. 1), Representing over a third of the EU budget - a tangible sign of the EU's commitment to regional development and social cohesion and growth (see table no. 2).

The main elements of the European Regional Development Fund (ERDF) and European Social Fund (ESF) are divided between:

- Convergence objective (212 billion euros in 2007-2013) covering the less prosperous 100 NUTS 2 regions with a total population of 170 million. These are regions with a GDP per capita of less than 75% of the EU average;
- Regional Competitiveness and Employment (RCE) (55 billion euro) aimed at supporting other EU regions in terms of competitiveness and maintaining employment in a global economy;
- European Territorial Cooperation objective (7.8 billion euro) to strengthen cooperation and exchange of experiences between countries in the EU.

In addition, the Cohesion Fund (70 billion euro) supports investment in transport and environmental infrastructure in the 15 Member States with the lowest levels of national income (less than 90% of the EU average).

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<sup>9</sup> Cadrul Strategic Național de Referință, 2007-2013, Al doilea proiect, octombrie 2006, p. 66;



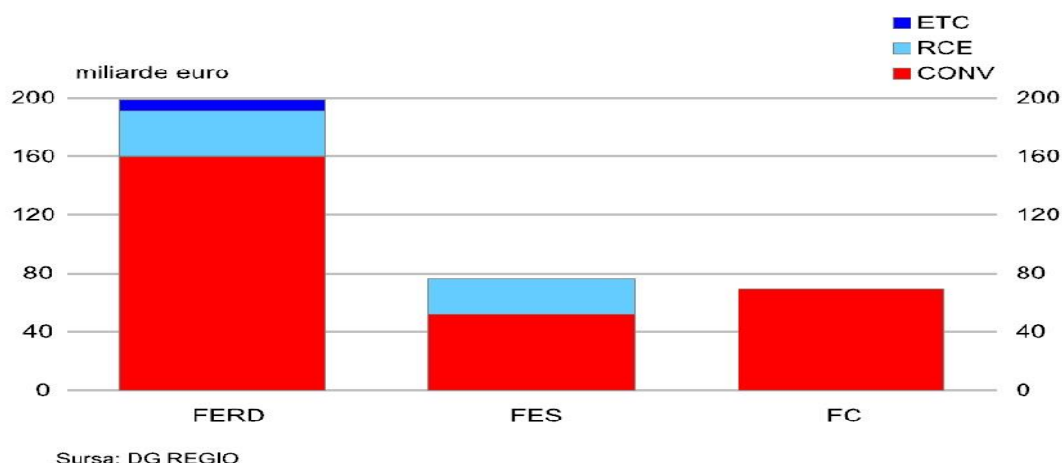


Fig. no. 1 – Distribution of funds by objective, 2007 - 2013

Table no. 2.

Distribution of funds by objective, 2007 – 2013

Billion euro				
Objective	TOTAL FUNDS	FERD	FES	Cohesion Fund
All Objectives	344,3	198,8	76	69,6
Convergence – CONV <sup>10</sup>	281,5	159,9	52	69,6 <sup>11</sup>
Regional Competitiveness and Employment – RCE <sup>12</sup>	55	31	23,9	
European Territorial Cooperation – ETC <sup>13</sup>	7,8	7,8		

Source: [www.eurostat.ro](http://www.eurostat.ro)

Expenditure under cohesion policy covers a broad mix of measures, although four broad policy areas more than 80% of the total:

- Support given enterprise and innovation, which are engines of economic development and tax revenue source to support social spending, environmental protection. This includes direct financial support for investment and research and development, non-financial assistance in the form of networks and innovation systems, consulting and business incubators. Planned investments in this area amounts to about 79 billion euros in 2007-2013 and is the largest single item of expenditure in almost all regions.
- Transport infrastructure by creating links between the internal and external regions of the world. Support is provided for investments in roads and railways and urban

<sup>10</sup> Include regions with progressive suspension of aid

<sup>11</sup> Correspondence between convergence regions and countries that benefit of cohesion fund, not identical

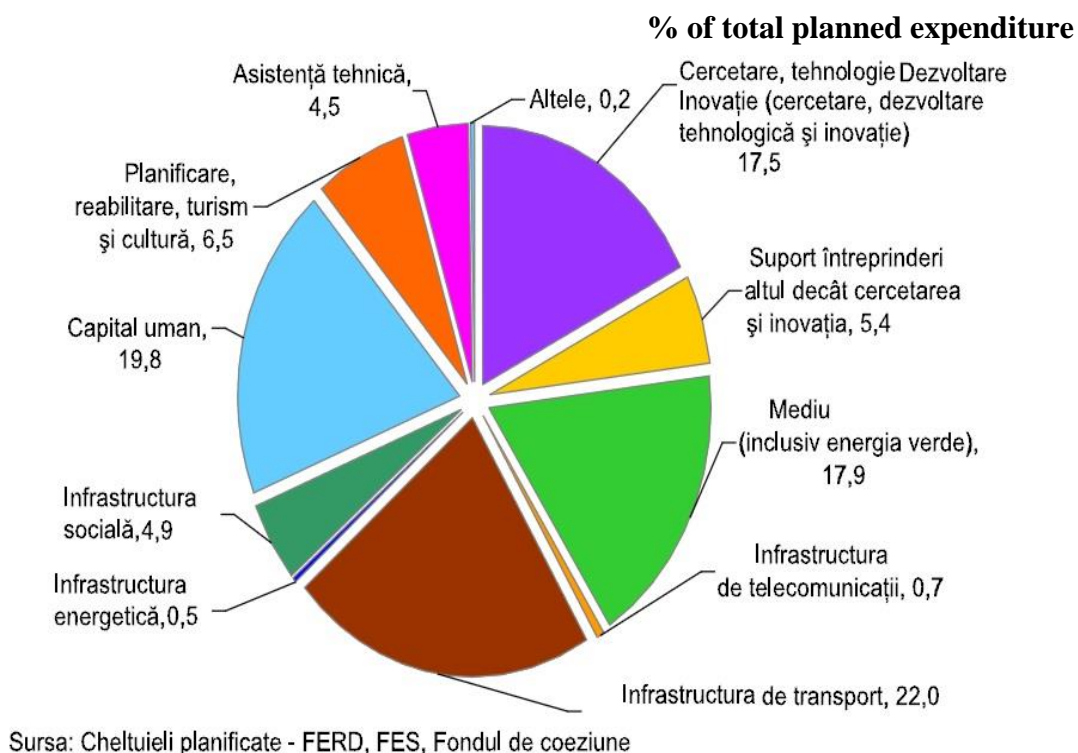
<sup>12</sup> Include regions with progressive establishment of aid

<sup>13</sup> Not included 0,9 billion euro for cooperation with third countries

transport, ports and airports and the connections between different modes of transport. The planned investments amount to approximately 6 billion in the period 2007-2013, most of the EU -12, where road and rail networks need upgrading , but also in many southern regions where investment programs have covered many programming period is nearing completion.

- Development of human capital is a means of strengthening social cohesion and equal opportunities and to improve the adaptability of workers and entrepreneurs to economic change. Investing for 2007-2013 are estimated at 68 billion euro funding being given to support different forms of education and vocational training , structural reform of the labor market and education and training systems and groups of people who have difficulties special labor market , such as long-term unemployed , people with disabilities and migrants.
- Environment to ensure the sustainability of economic development and to make regions more attractive places to live and work. The planned investment amounts to around 62 billion euros in 2007-2013, largely for waste, water and wastewater, especially in less developed regions.

Relative scale of expenditure in these main areas of policy tends to remain similar over time (see Fig. no. 2). But, there was a change of focus, according to the Lisbon Agenda, particularly support for companies to support innovation, mostly targeting SMEs.



**Fig. no. 2 – Expenditure under cohesion policy on key themes 2007 – 2013**

#### 4. Conclusions

Following this analysis, it appears that our country has recorded low results in areas such as productivity, basic infrastructure and spending on education and research, but is

expected to improve these indicators for the period 2007-2013 as a result of accessing Structural Funds and Cohesion.

Strategic documents highlight the importance of cohesion policy for the Romanian economy, proposing development priorities and measures to improve the implementation system. Thus the main priority areas relevant for Cohesion Policy are: development of basic infrastructure in all sectors, increasing competitiveness of the Romanian economy, in particular through the implementation of the results of research and development and business development, including by encouraging small and medium human capital development through upgrading infrastructure and education system, educational programs adapt to market requirements, supporting actions to promote social inclusion of vulnerable groups, ensuring sustainable development: promoting production methods, services and consumer durables, reducing the maximum negative impact on the environment and human health, effective exploitation of natural resources, mitigation of climate change, developing competitive advantages of regions, implementation of Cohesion Policy in conjunction with other national and European policies, simplify the implementation of the policy.

Among the specific measures proposed by Romania are:

- to improve territorial cooperation programs analysis is needed on whether a new delimitation of territorial transnational cooperation areas;
- is necessary to strengthen existing partnerships territorial cooperation, including the establishment of the role of each actor involved, but also creating new ones to better use existing mechanisms;
- be done a better inform and engage local communities in the development and implementation of policies;
- to adopt policies and measures for areas with unique geographical features.

## 5. References

1. Albu, L., *Trends in structural changes and convergence in EU*, Romanian Journal of Economic Forecasting, București, 2008;
2. Allen, D., *Coeziune și fonduri structurale. Eleaborarea Politicilor în Uniunea Europeană*, Editura IER, 2005, București;
3. Bachtler, J., Taylor, S., *The added value of the Structural Funds: a regional perspective*, Centrul European de Cercetare Politică, 2003;
4. Balm, A., *Economie Mondială*, Editura ASE, București, 2006;
5. Bal, A. (coord), Luțas, M., Jora, O., Topan, V., *Scenarii privind evoluțiile comunitare în domeniul competitivității, politici de coeziune și politici de dezvoltare regională*, Institutul European din România, București, 2007;
6. Barr, J., Pasarelli, F., *Who has the power in the EU?*, Mathematical Social Sciences, 2009, p. 339-366, accesabil online pe [www.elsevier.com/locate/econbase](http://www.elsevier.com/locate/econbase);
7. Băleanu, A., *Impactul fondurilor structurale – aspect calitativ*, Colecția de Studii I.E.R., nr. 20, București, 2007;
8. Bănașcu, C., Ibrahim (Kagitci), M., *Absorbția Fondurilor Europene*, Tribuna Economică, București, 2007, v. 18, nr. 22, p. 78-80;
9. Burghilea, C., *Modelul dezvoltării durabile, Theoretical and Applied Economics*, Bucharest, 2012, pp. 96-107
10. Burghilea, C., Ene, C., M., Uzlău, C., *Impact of economic models on European Union economies development*, Theoretical and Applied Economics, Volume XX (2013), No. 4(581), pp. 91-102
11. Constantin, D., L., *Elemente fundamentale de economie regională*, Editura ASE, București, 2004;

12. Dobrescu, E., *Macromodels of the Romanian Transition Economy*, Editura Expert, București, 1996, ediția I;
13. Hübner, D., *Declarația de la Berlin*, cuvânt înainte la Cel de-al Patrulea Raport Privind Coeziunea Economică și Socială, martie, 2007;
14. Marinaș, M.,C., *The Role of Cohension Policy in the Decision to Adhere to the Euro Area*, Economie Teoretică și Aplicată, vol. 4(509), p.61-64;
15. Moșteanu, N.,R., *Problematica dezvoltării regionale în România* , Editura Sylvi, București, 2001;
16. Preplicean, G., T., *Restructurarea și dezvoltarea regională*, Editura Economică, București, 2001;
17. Pușcașu, V., *Dezvoltarea regională*, Editura Economică, București, 2000;
18. [www.europa.eu](http://www.europa.eu) (Regulamentele fondurilor structurale și de Coeziune 2007-2013);
19. [www.fonduri-ue.ro](http://www.fonduri-ue.ro) (Fonduri Structurale și de Coeziune în România);
20. Al șaselea Raport de progres pentru coeziune economică și socială, Comisia Europeană, 25 iunie 2009;
21. Al cincilea Raport de progres pentru coeziune economică și socială, Comisia Europeană, iunie 2008;

## **An inquiry into the characteristics, applicability and prerequisites of Radio-Frequency Identification (RFID) solutions in transport networks and logistics**

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**Abstract:** *The use of intelligent solution represents the key factor for developing both the logistics sector and the economic environment. This paper analyses the Radio-Frequency Identification (RFID) technology and its role in the Supply Chain Management (SCM) especially in logistics and transport networks. The main objective is to demonstrate that RFID represents a solution for improving the transport networks and logistics sector by implementing various complex and intelligent solutions that can improve the actual economic environment.*

**Key words:** RFID, technological development, transport networks, logistics, barcodes

**JEL Classification:** L91, L96, M14, M16, R40

### **1. Introduction**

RFID (*Radio-Frequency Identification*) is an automatic identification method that relies on storing and retrieving data without touch, remotely, using radio waves and devices called RFID tags and RFID transponders. The technology requires the cooperation of a RFID reader with an RFID label.

RFID technology involves storing information not through bar codes, but by means of electronic chips embedded in RFID labels or tags. The information can be read from a distance of a few meters through radio waves. The use of RFID tags greatly reduce the time and cost of gathering information.

Since the time when radio-frequency identification (RFID) technology was invented around this subject appeared numerous controversies. Submitted more than 30 years as a technology that will revolutionize the efficiency of production lines and distribution chains, RFID has indeed, in different proportions contributed to the success of great companies and retail groups in the world.

Currently, labeling with RFID tags is still a desideratum, due to the costs involved. Instead, used on a wider-scale, RFID labeling of pallets for example that are used for transporting divers merchandises brings numerous benefits for companies and they justify their investment in equipment, training and implementation in this technology by reducing the transport, logistic and storage costs considerably.

RFID technology is becoming more and more an integral part of the distribution and retail chains, large retail companies have implemented and are currently using RFID solutions for a long time.

As obstacles related to implementing a RFID solutions-costs, process modeling, testing the solution, standardization and the allocation of radio frequencies are, one by one, outdated, the real benefits for retailers and vendors begin to come out to light.

Also barcode technology and RFID technology represent a powerful tool for better traceability of products, to eliminate human error and logistical costs. Practical experience of using RFID tags and Electronic Product Code (EPC-Electronic Product Code) reported significant gains for transport companies, but also for logistic suppliers, in relation to:

- improving the management of stocks;
- avoid situations like "zero inventory";
- reducing the cost of inventory;
- reducing losses;
- improving the quality of logistics information.

In a shorter term, a better control management of all goods that need to be transported increases profitability.

## 2. Literature review

RFID is an automatic identification method regarded by some researchers as one of the most popular technologies in history (Cooke J., 2001).

RFID relies on storing and remotely retrieving data using devices called tags or RFID transponders (Fishkin K., Sumit R., 2003).

The Auto-ID system, based on RFID technology, is an asset inventory system important for two reasons. Firstly, the visibility offered by this technology allows for exact knowledge of the inventory level by eliminating the discrepancy between recorded inventory and physical inventory. Secondly, RFID technology can prevent or reduce sources of error.

The benefits of using RFID include cutting labor costs, streamlining business processes and reducing inventory incorrectness (Garfinkel S., 2002).

RFID is a technology with great value in business and with a huge potential that promises to replace the old bar code and contribute to the visibility of goods in real time, regardless of the logistics chain in which the point lies. We can find RFID applications in the most diverse fields, but their main use is in tracking objects (Want R., 2004).

In the simplest form, RFID is a concept similar to the bar code technology, without the need for direct visibility of the monitored entities. As the bar code systems requires a corresponding optical reader and special labels stuck on objects, RFID reader and equipment requires special labels attached to articles or even to be integrated into them (Moore B., 1999).

At the european level, the European Committee for Standardization (ECS) promotes the development of international standards for identifying technologies and automatic data collection. European Institute of Standards in Telecommunications (EIST) has drawn up standards for RFID operating at a very high frequency, as well as generic standards for short range devices (SRD), applicable to the equipment that is operating in areas of low and high frequency and microwave (Gobioff H. & all 1996). The Commission appeals to the european standardization organisms, in collaboration with the industry forums and contortions, to ensure that european and international standards meet the requirements of the European Community, in particular with regard to the issues of privacy, security, property rights (intellectual and authorization), to identify gaps in standardization and to provide an appropriate framework for the development of future RFID standards.

The RFID systems present in the European Union are currently starting to use the same frequency but the implementation or conversion of them is a complicated task because of the multitude of frequencies used.

At present time, RFID systems used in the logistic or transport sector are very diverse, establishing classifications is becoming very difficult because of the multitude of technologies used to implement RFID solutions. However, there are some universally accepted



classification criteria, among which: power supply method, transmission method, frequency type that is used, the amount of data stored on the tags and others.

### 3. The structure of an RFID system

An RFID system includes two essential components: the transponder and reader that are distant from each other, so that the connection is made only through radio waves via antennas. Obviously, the information is encoded into the digital transponder and the radio link is actually a data transmission.

Data exchange between the RFID reader and tag can use a variety of schemes for encoding and modulation. The signal transmitted by the RFID label reader contains an unmodulated carrier. The RFID tag and RFID reader will respond when the carrier will receive the unmodulated emission during which the RFID label impedance will modulate the signal response (see fig. 1).

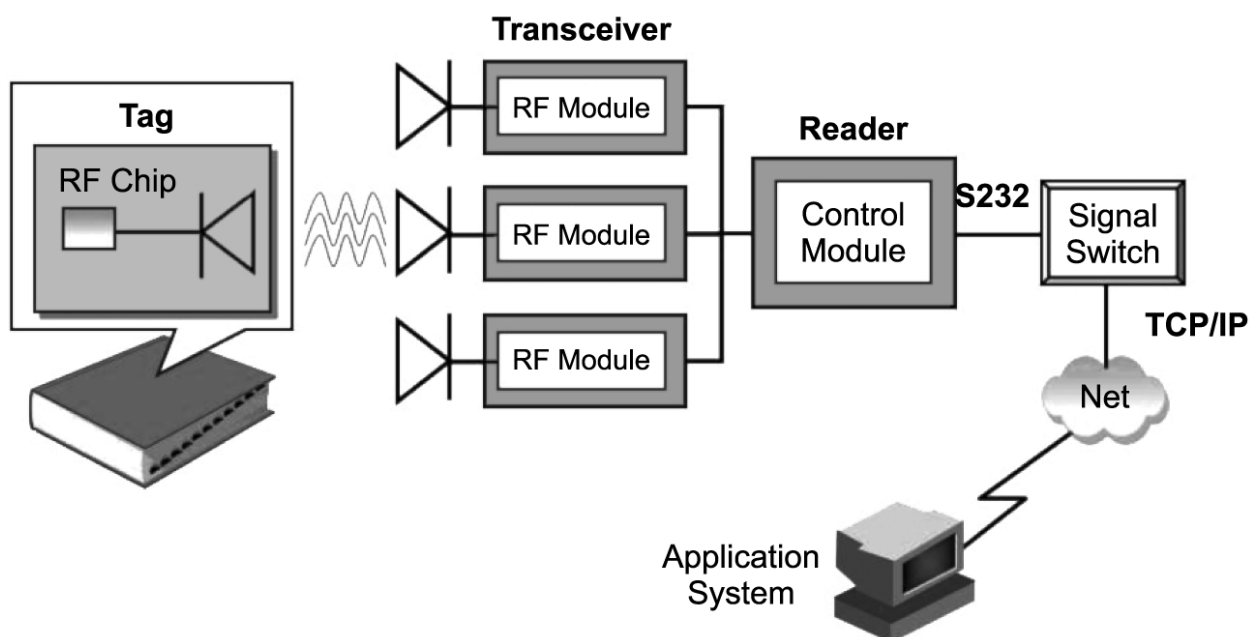
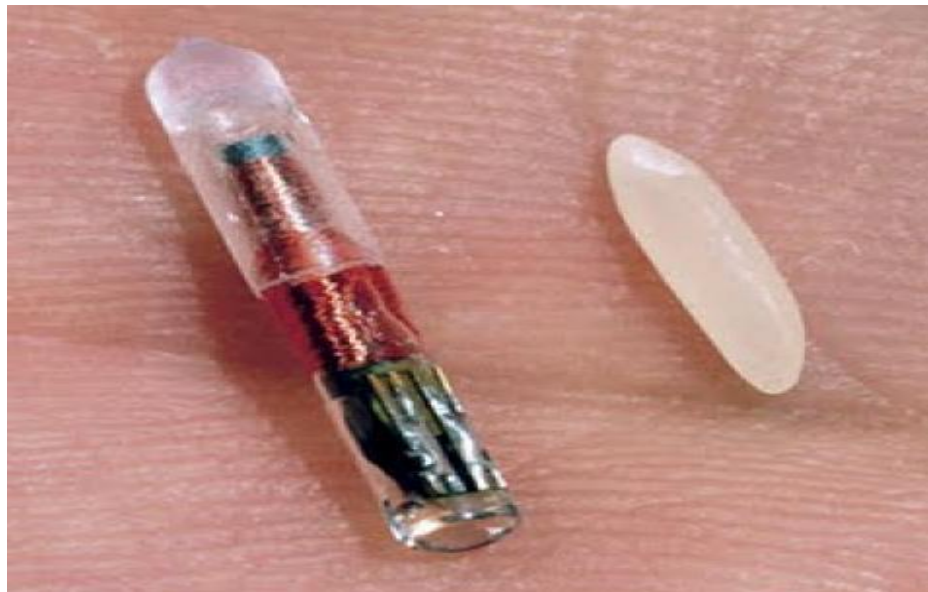


Figure 1: The main structure of an RFID system  
Source: <http://www.emeraldinsight.com>

The integrated systems that are used for identifying RFID labels consist essentially from the following components:

- the labels themselves are movable components of the system and information carriers; they have a storage capacity of up to 3 KB and are used for writing and reading information ensuring the identification and traceability of the product and they are also available in various geometrical constructions covering a range of temperatures from -40 to + 210 °C;
- the reading devices allows the enrollment of information and reading from/into RFID tags; connected over a network with specific equipment; they allow writing/reading RFID tags that are in motion;
- the communication interface ensures that the information is transmitted to/from the RFID tags;
  - programming device labels - allows to enter data and program RFID tags;
  - the antenna is considered to be part of a distinct RFID system and makes possible the transfer of information between the RFID tag and reading/writing device;

- the reading distance can vary between a few centimeters and a few tens of meters.



Picture 1: Increased picture of the latest generation of RFID device next to a grain of rice. This device is usually used for animal implant.

Source: [http://en.wikipedia.org/wiki/Radio-frequency\\_identification](http://en.wikipedia.org/wiki/Radio-frequency_identification)

For data storage proposal, the RFID tag contains one of the following types of memory:

- a ROM memory that is used for registers and instructions from the operating system.
- a RAM memory that is used for communication and to store data temporally.

Due to the different radio spectrum in which RFID equipment and applications operate, they can be divided into several categories. The choice of optimal frequency band for RFID application is dictated primarily by the environmental conditions in which the system must function and application requirements.

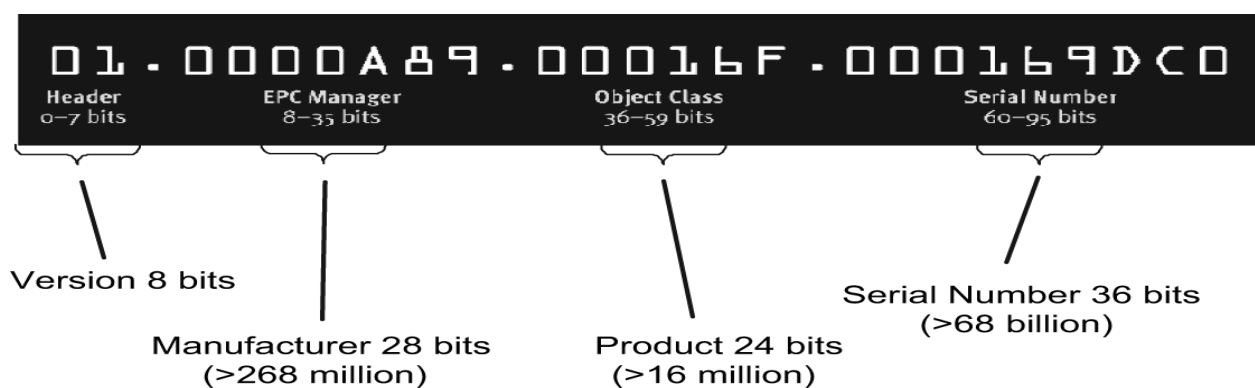


Figure 2: The format of an electronic code included in an RFID tag

Source: [www.emeraldinsight.com](http://www.emeraldinsight.com)

For Europe (see fig. 3) the operating bands are:

1. Low-frequency (LF):

$F = 125/134$  KHz - inductive coupled devices, for which most countries do not constitute approval for the use of this frequency from the E.U. (European Union).

The common applications for this frequency are:

- animal identification; • access control; • management of the containers.

The reading distance is 0.1m up to 1 m and is operating excellent near or in liquid metals.

2. High-frequency (HF):

$F=13,56$  MHz – this frequency is generally used for electronic surveillance elements.

The common applications for this frequency are:

- inventory; • documents control; • archiving; • storage; • transportation;

The reading distance is from 1m up to 3 m and has the most possible applications.

3. Ultra High Frequency (UHF/MW):

$F = 850$  MHz - 2,46 GHz – these frequencies are divided into two areas:

- the frequencies between 430 MHz up to 460 MHz which are used in industrial applications, scientific and medical applications;
- the hyperfrequency between 2,35GHz and 2,45 GHz.

The common applications for these frequencies are:

- transportation; • parking; • the management of containers.

The reading range is from 1m up to 12 m and it can be used also to identifying vehicles that are moving with speeds of over 100 km/h.

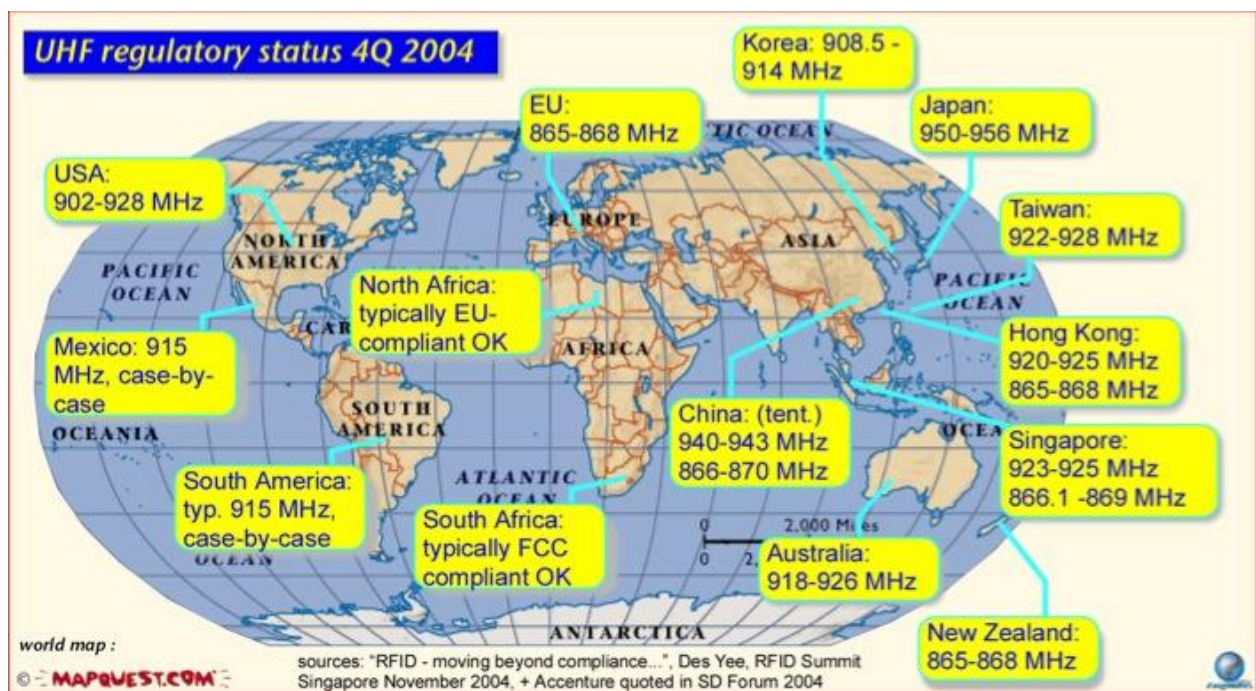


Figure 3: RFID frequencies around the world

Source: <http://www.mapquest.com/>

#### 4. The implications of RFID technology in logistics and transport networks used as an intelligent transport system (ITS)

The implementation of new RFID technologies is slowly but surely substituting the barcode system which has become omnipresent in the logistics and transport companies. Starting with the middle 1980's the implementation of intelligent transport systems in the field of logistics and transport companies has become a necessity because of the growing worldwide economy. Thus, the implementation of RFID technology, which represents an intelligent tool in the transport sector and the Supply Chain Management (SCM) sector also, has overcome the barcode system which was not coping with the progress of the supply



sector. Compared to the barcode technology, RFID technology has the following classes of benefits:

- storage capacity: conventional labels based on the bar code can "memorize" a volume of information of only 20 characters. RFID technology offers the advantage of storage, of a larger volume of information;
- speed: compared to barcode technology, RFID technology can gather more rapidly information;
- the possibility of automation: reading the information stored in the RFID tag it does not imply the presence of the visual field and does not require a specific orientation of the product;
- flexibility: there are RFID tags that can be erased and rewritten again;
- selectivity: RFID technology allows the labels to respond to selectively requests.



Picture 2: RFID antenna for container access that are transported by truck  
Source: [http://en.wikipedia.org/wiki/Radio-frequency\\_identification](http://en.wikipedia.org/wiki/Radio-frequency_identification)

The logistics and transportation sector are two of the most important fields that RFID technology is applied. The use of RFID tags is used especially on container freight transport that is done on rail, highways, waterways or by air. The use of the RFID tags helps find out more easily the owner, characteristics, history, dimensions, load and the destination of a container.

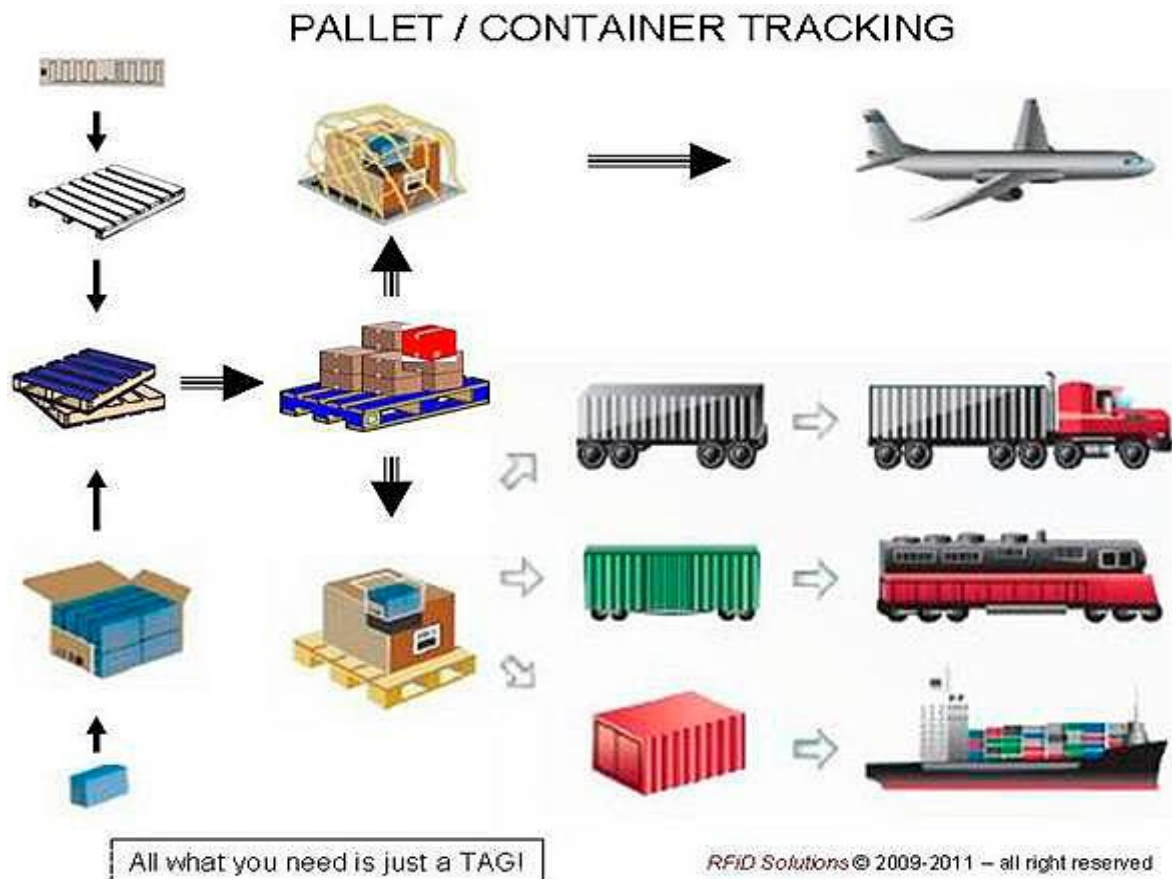


Figure 4: The use of RFID tags on locating a container or a pallet  
 Source: <http://www.rfids.ro/wp-content/uploads/2009/11/image149.jpg>

The implementation of RFID technology on a global scale can bring many benefits to transport and logistics companies such as:

- increasing efficiency and productivity by fully computerization the identification process of a container possible through metering, tracking, sorting and routing;
- streamline data collection and identification;
- reducing errors and losses;
- building a better inventory;
- streamlining the monitorization of mobility of objects;
- increasing profitability through cost reduction related to human resources and reducing the duration of processing of goods;
- efficiency on control quality;
- reduced maintenance costs in comparison with other systems of identification;
- increased customer satisfaction by providing the most accurate information;
- reducing subjectivity and support accountability;
- increasing the quality of products and services by offering competitive prices and most important rapid adaptation to market dynamics.

RFID identification technology streamlines data collection and removes human intervention. RFID technology is the most cost-effective solution for identifying if it is evaluated over the long term.

### 5. Conclusions / Recommendations:

The use of RFID technology in transport and logistics networks represents the future of the global economy. The importance of implementing this technology in all the major transport and logistics companies is represented by the fact that we need to streamline the costs that are involved, the time that is needed for identifying a pallet or a container and most important the time that is needed for the container / pallet to get from point A to point B. To better satisfy all the needs of the logistics and transport companies I recommend that we should use that same type of RFID systems all over the world that work and respond at the same frequency. Also the better cooperation between major companies can streamline the transport and logistics sector worldwide.

### 6. References:

1. Albright B., 2002, "Eye spy", *Frontline Solutions Journal*, Vol. 3 No. 11, pp. 16-22;
2. Balint A. O., 2012, *Contributii la dezvoltarea rolului logisticii in transporturi. "Smart Logistics" – Drumul spre solutii eficiente si inteligente*, Volumul conferintei nationale "Tendinte in mediul economic actual" – UHB, Facultatea de Stiinte Economice, Bucuresti, 14.12.2012, Editura Transversal, ISBN 978-606-605-061-6;
3. Balint A. O., Cristea A. M., Niculescu M. D., 2013, The Applicability of the Behavioral Market Segmentation Theory in Transport Networks, *Ovidius University of Constanza Annals – Economic Sciences Series*, vol. XIII, Issue: 1, pp. 702 – 706;
4. Brusey J., Harrison M., Floerkemeier C., Fletcher M., 2003, "Reasoning about uncertainty in location identification with RFID", *IJCAI-2003 Workshop on Reasoning with Uncertainty in Robotics*;
5. Cooke J., 2001, "The battle over RFID standards", *Logistics Management and Distribution Report*, Vol. 40 No. 10, pp. 59-66;
6. Finkelzeller K., 2003, *The RFID Handbook*, 2<sup>nd</sup> edition, Publishing house: John Wiley & Sons;
7. Fishkin K., Sumit R., 2003, "Enhancing RFID privacy through antenna energy analysis", MIT RFID Privacy Workshop;
8. Garfinkel S., 2002, "An RFID Bill of Rights," *Technology Review Palm Coast*, vol. 105, no. 8, p. 35;
9. Garfinkel S., Juels A., Pappu R., 2005, RFID privacy: an overview of problems and proposed solutions, *Security & Privacy IEEE*, vol. 3, no. 3, pp. 34-43;
10. Gobioff H., Smith S., Tygar J. D., Yee B., 1996, "Smart cards in hostile environments", 2<sup>nd</sup> USENIX Workshop on Electronic Commerce;
11. Gould L. S., 2000, "What you need to know about RFID", *Automotive Manufacturing & Production*, Vol. 112, No. 2, pp. 46-59;
12. Juels A., Rivest R. L., Szydlo M., 2003, "The Blocker Tag: Selective Blocking of RFID Tags for Consumer Privacy," *Proc. 8<sup>th</sup> ACM Conf. Computer and Commerce Security*, ACM Press, pp. 103–111;
13. Moore B., 1999, "Barcode or RFID: which will win the high speed sortation race?", *Automatic ID News*, Vol. 15 No. 7, pp. 29-36;
14. Ollivier M., 1995, "RFID enhances materials handling", *Sensor Review*, Vol. 15 No. 1, pp. 36-49;
15. Tsukiyama T., 2003, "Navigation system for mobile robots using rfid tags", *Proceedings of the International Conference on Advanced Robotics (ICAR)*,



16. Want R., 2004, "Enabling Ubiquitous Sensing with RFID", *Computer Journal*, vol. 37, no. 4, pp. 84–86;
17. Weiser M., 1991, "The Computer for the 21<sup>st</sup> Century", *Scientific Am. Journal*, vol. 265, no. 3, pp. 94–104.

## Reality of a Sustainable Economy

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**Abstract:** *Sustainable development addresses the complex concept of quality of life, economically, socially and environmentally, by promoting the idea of balance between economic development, social equity, efficiency and environmental conservation. This article aims to analyze a number of indicators of sustainable development by establishing specific passage to a reasonable and realistic development model generating high added value, interest in knowledge and innovation in order to continuously improve the quality of people's lives and their realities as well as the harmony with the natural environment.*

**Keywords:** sustainable development, sustainability, economic growth.

**JEL classification:** Q01; Q56; F43.

### 1. Introduction

Until recently, the concept of environmental protection was thought to be a concept for which only environmentalists fought. In reality, the environment concerns us all: our environment is reflected in everything what we do: the way we live, how we work, our health and quality of life.

Europe was one of the first areas on Earth who understood the importance of environmental conservation and the role of the environment in an area of economic and social development. The European Community has realized that the environment has been threatened in recent decades by human activities embodied in large-scale pollution of air, water, the use of natural resources such as uncontrolled deforestation, fishing and extermination of species of animals and birds and their habitats. Europe faces this challenge using human knowledge and technology, bringing a higher degree of happiness and standard of living of the people.

An impressive institutional network has been developed in order to deal with environmental problems that have emerged during recent decades. This network was expanded by creating special ministries in most countries, as well as establishing the United Nations Environment Programme and emergence of numerous non-governmental

organizations and the development of regional and world conferences since the Stockholm 1972 and ending with one in Rio de Janeiro in 1992, which analyzes all environmental issues and human development and population and its health status.

Although many of these concerns have emerged after many decades, one can not say that an agreement was settled regarding the scope of the indicators and means of achieving sustainable economic development.

Among the first indicators for measuring sustainable development there are the traditional indicators comparing development to GDP and GNP. But there is a general consensus as these indicators are not sufficient in assessing sustainability and thus a comprehensive set of indicators has been defined that should reflect and track sustainability.

The new set of sustainability indicators should provide a variety of information sources, ranked on several levels: local and regional indicators, sector indicators, resource indicators, output indicators, summary indicators.

At the basis there are the sector indicators that are used to integrate and analyze the economic, environmental and social sector level. They describe the impact of sectoral policy development on the environment, social conditions and economic efficiency and sectoral trends positive or negative effects on environment. Also, in the framework of these indicators there is a generally recognized need to investigate more closely the relationship between economic activity and human energy, in monetary terms as well as from a physical point of view.

Another set of indicators are indicators that describe the resource consumption of capital accumulation in all its three forms (human, social and natural). They provide information about the extent of present consumption affecting future generations. Analysis of this kind are facing evaluation difficulties as many resources have multiple uses, as to both inputs and key ecosystem stability often use value can not be measured in terms of price. The main aim of these indicators for human capital and human resources is diminishing physical consumption per unit of GDP, while in the case of human capital objective is to capitalize..

Current sustainable development is questioned from the point of view of employment, because so far it has led to unemployment, reduced employment opportunities and wasted labor.

The result indicators are divided into three main areas: economic indicators, social indicators and environmental indicators. Selection of the most representative indicators to be taken into account represents a rather difficult task because they have to satisfy both the need not to exclude any of the key issues involved in three major areas, but also not overload with too many elements which would lead to difficulties to draw overall conclusions.

The most relevant result indicators are:<sup>14</sup> economic indicators - represent economic development, acquisition and replacement of capital, which is calculated using the rate of saving, productivity and financial, social indicators - represent employment (unemployment rate, employment rate), education (enrollment rate, the rate of graduation), health (life expectancy) and income (poverty incidence, income available per person); environmental indicators - these are represented by climate change (greenhouse gas emissions and intensity), air (sulfur or nitrogen oxide emissions and their intensity), biodiversity (the share of threatened species), water resources (water resources consumption intensity), forests (current consumption of wood) and the fishing fund (fish production and consumption).

In this set of indicators employment and labor market indicators are not missing. "It is a well known and recognized, frequently cited, truth according to which human resources, human capital is a prerequisite factor and purpose of sustainable development. Properly

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<sup>14</sup> The interim report on the OEDC Three Year Project on Sustainable Development, 1999

managed, human capital, given its productive capacities, participatory and innovative is the main factor for adherence and support the transition to a market economy .... Currently in Romania, improving labor market information system is dictated by requirements relating to the preparation of EU accession "<sup>15</sup>

Synthetic indicators provide a summary overview of current achievements in the field of sustainable development, by processing or interpreting information on several levels.

Many of the scientific-methodological concerns have resulted in numerous proposals for indicators, some of which, such as the Human Development Index (HDI) had already entered into domestication.

One can speak here about other summary indicators such as Indicators of Sustainable Economic Welfare. To calculate this indicator household consumption is needed, consumption which is then adjusted according to certain positive and negative influences, coming from the economic, environmental and social factors.. Another important summary indicator is the natural rate of savings (genuine savings) which is the actual proportion of savings from one country to ensure a better future. In this way, the aggregate savings is adjusted for impairments caused by physical capital, natural resources consumption, investments in human capital and the level of damage caused by emissions of greenhouse gases.<sup>16</sup>

The aspects of sustainable development, however, can not be captured by a single indicator, even if it widens the scope of the factors taken into account. Therefore, there will be more and more proposals and theoretical preoccupations will never stop. An important example in this respect is the Human Economic Development Indicator (HEDI), which is calculated based on a number of indicators such as GNP per capita share of the GNP per capita in the country with the highest level; the ratio between admitted degree of pollution considered optimal and actual degree achieved; ratio of the total expenditure per capita with effective environmental protection and the highest expenditure level in this regard.<sup>17</sup>

## 2. Measuring sustainable development

Of the more than 100 existing indicators, 11 were identified as key indicators. They will determine how the big picture will look like, if the European Union has made some progress in terms of sustainable development objectives and targets defined in the strategy. For an overview, we need to look at the progress of these indicators in various fields of application<sup>18</sup>.

✓ In the field of socio-economic development, the considered indicator was *real GDP growth per capital*.

GDP includes goods and services that markets and products belonging to governments and non-profit institutions. To measure the real rate of GDP growth rates prices are expressed in the corresponding values for the previous year, so the value changes from one year to another to have a certain reference level.

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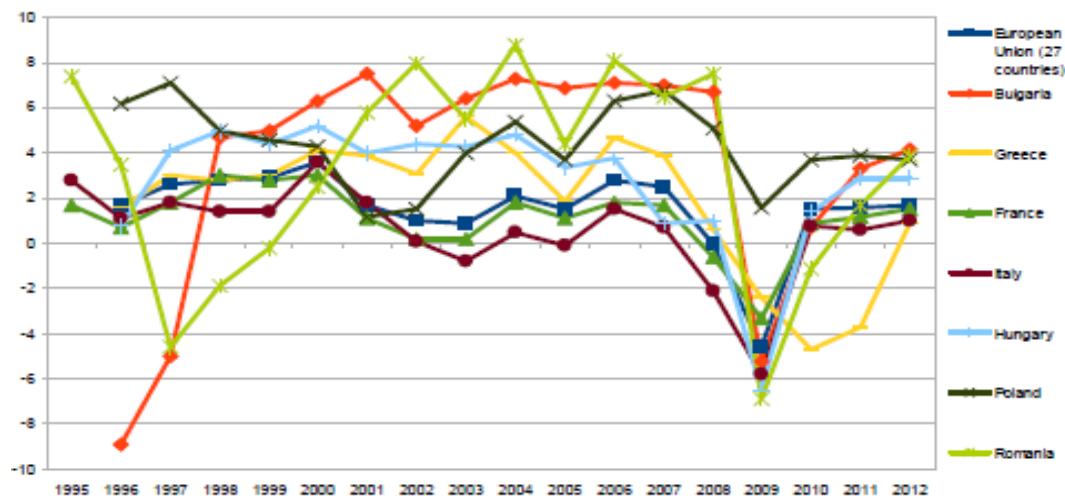
<sup>15</sup> Perț, S., *Un sistem informațional operațional al pieței muncii*, Raporturi de muncă, nr. 7/1998

<sup>16</sup> Expanding the Measure of Wealth. Indicators of Environmentally Sustainable Development, The World Bank, Washington DC

<sup>17</sup> Burghilea, C., *Modelul dezvoltării durabile*, Theoretical and Applied Economics, Bucharest, 2012, pp. 96-107

<sup>18</sup> [www.epp.eurostat.ec.europa.eu](http://www.epp.eurostat.ec.europa.eu)

Figure no. 1. Real GDP growth per capital



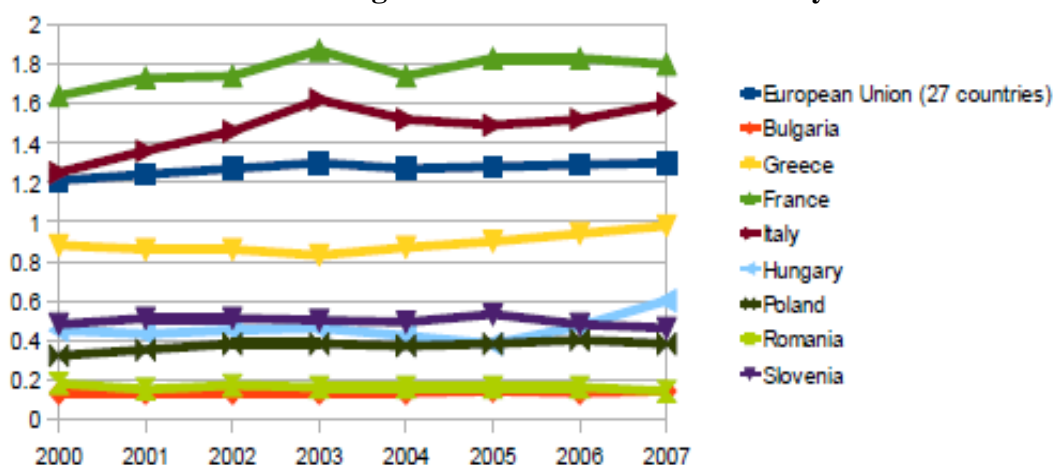
Source: ec.europa.eu/eurostat

As can be seen from Figure 1 Romania has seen a sharp GDP increase from 1996 to 2002, the 2009 economic crisis affecting the stability that this indicator had. Today, Romania is at the same level as Slovenia or the average for the European Union, but was overtaken by countries like Hungary and Poland.

✓ In the area of sustainable consumption and production, the indicator that was taken into account is *resource productivity*.

Resource productivity is GDP divided by domestic material consumption (DMC). DMC measures all material goods directly used by an economy. It is defined as the total amount of raw materials extracted from the domestic territory of the economy plus total imports minus total exports. It is important to note that the term "consumption" used in DMC refers to apparent consumption and not to the end consumption. DMC does not include streams related to imports and exports of raw materials and products that originate outside the focal economy.

Figure no. 2. Resource Productivity



Source: ec.europa.eu/eurostat

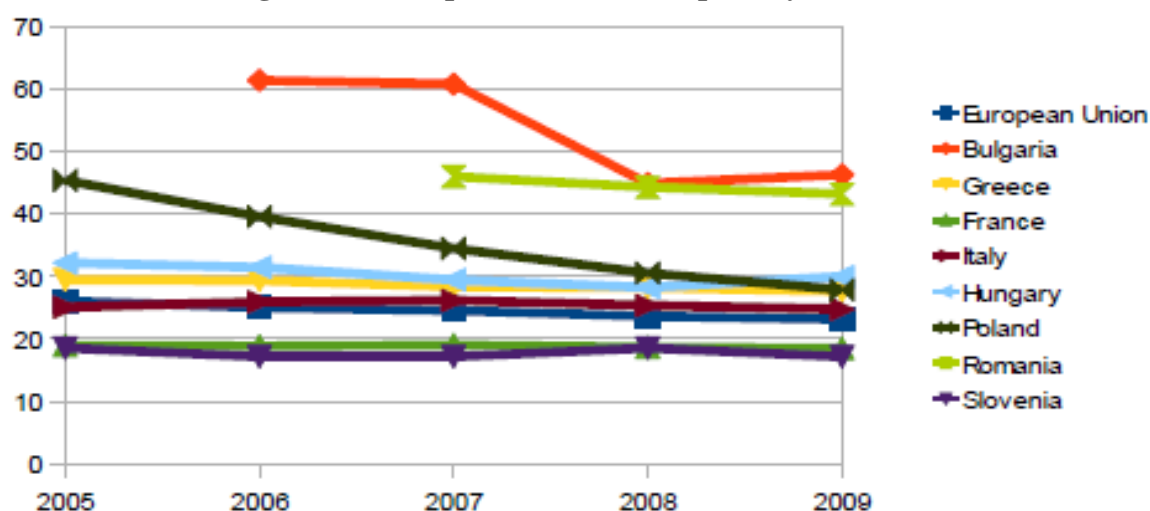
As can be seen from Fig. 2 Romania together with Bulgaria places last in this chapter, first in top hovering countries like France or Italy.

- ✓ In field of social inclusion an indicator was considered in order to determine *the population at risk of poverty and exclusion*.

Europe 2020 strategy promotes social inclusion, in particular through the reduction of poverty by trying to remove at least 20 million people at risk of poverty and social exclusion for this reason. This indicator summarizes the number of people who are either at risk of poverty or material deprivation or living in households with very few employed members. The interaction between these indicators is excluded. People at risk of poverty are those who have an income beneath the poverty threshold, which is calculated as 60% of the national average disposable income. The "material deprivation" refers to economic effort, durable goods, housing and the environment in which it lives. Persons in severe material need live in conditions constrained by lack of resources and not affording at least 4 of the following: payment of rent and utilities, house heating, to face unexpected expenses, eat meat, fish or protein every two days, a week of vacation per year, a car, a washing machine, color TV, telephone.

People who live in homes where low labor intensity are people aged 0-59 years who live in homes where adults work less than 20% of their total potential in the last year.

**Figure no. 3. Population at risk of poverty and exclusion**



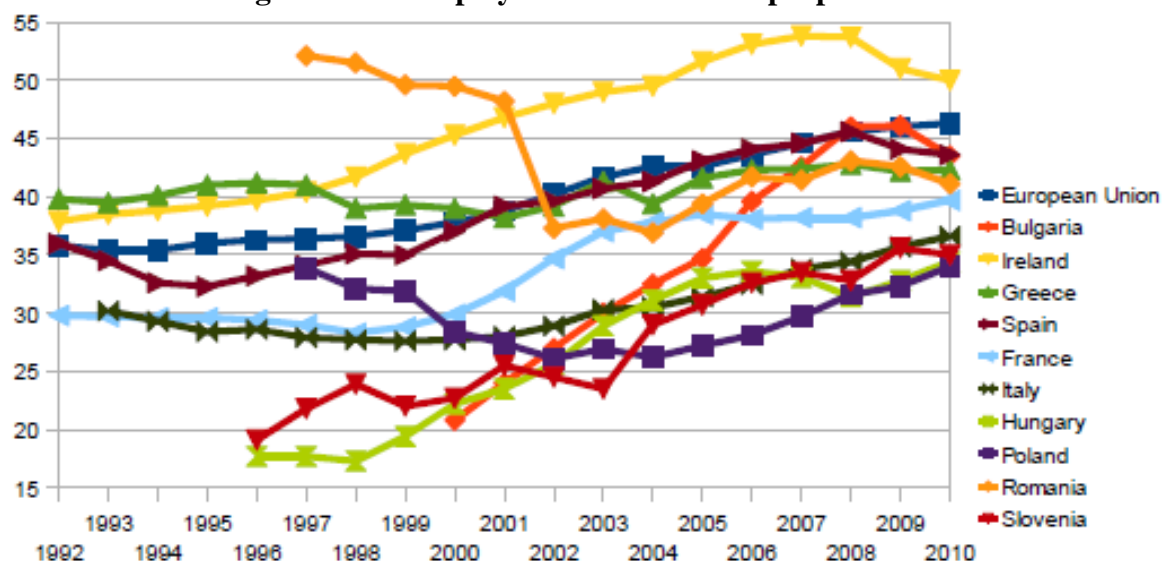
Source: ec.europa.eu/eurostat

From fig. 3 we observe that Romania, along with Bulgaria has the highest risk of poverty of the population, and this percentage is relatively constant from 2007 to 2009. Among the countries with the lowest risk of poverty there are Iceland, Norway and Sweden.

- ✓ In the field of demographic change, the indicator *employment rate of older people* was considered.

Employment rate of older persons is calculated by dividing the number of persons aged 55 to 64 by the total population in the same age group. The indicator is based on EU study on manpower. The survey covers the entire population living in private dwellings and exclude people living in hostels or hospitals.



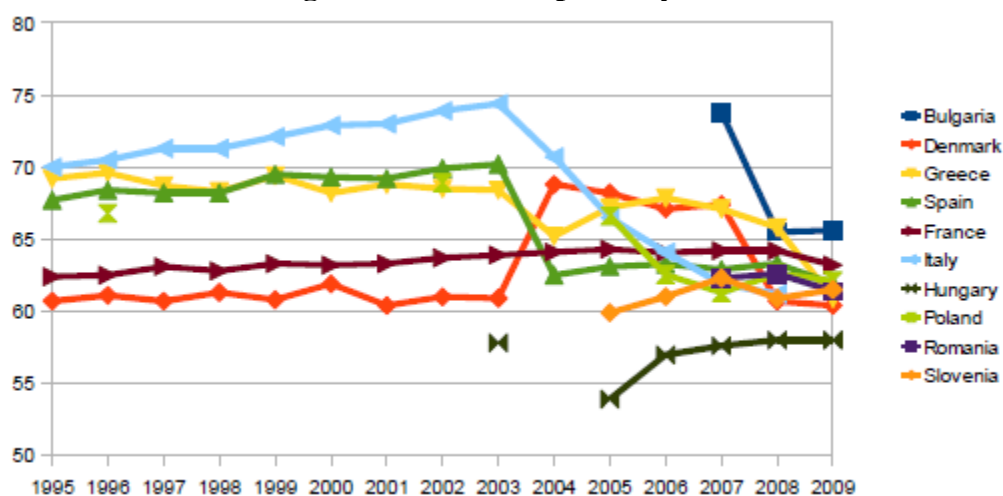
**Figure no. 4. Employment rate of older people was considered.**

Source: ec.europa.eu/eurostat

Romania reached in 2002 a level of employment rate of people aged between 55 and 64 similar to those in the EU and Spain between 1996 and 2001 after it was higher, comparable to that in Denmark (see fig. 4 ). Currently, the employment rate of older people is 50% lower than that of Denmark (leader in 2010 with 80%) but 10% higher than that of Turkey which was in 2010 to 29.5 % (the last country in this ranking).

✓ In the field of public health, *life expectancy* was the chosen indicator.

According to Figure 5, life expectancy in Romania is higher than in countries such as Hungary and Denmark in 2009, with an average of 62.1 years, while leaders in the ranking are Malta (69.7 years) and Sweden (63.5 years ) and at the bottom of the table hovering Slovakia (54.2 years) and Portugal (59.4 years).

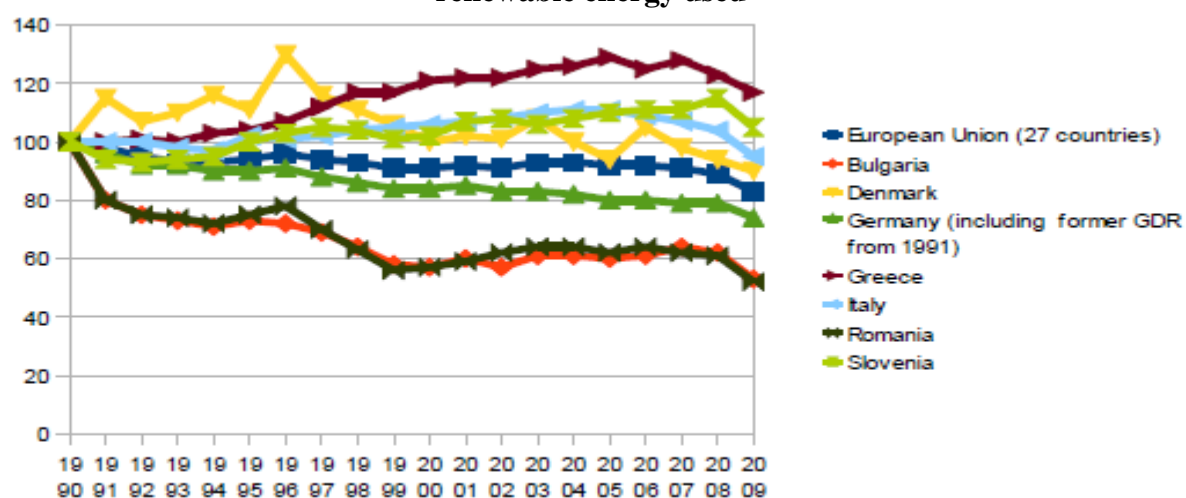
**Figure no. 5. Life Expectancy - women**

Source: ec.europa.eu/eurostat

- ✓ In the field of climate change and energy, indicators that were chosen are: emission of greenhouse gases and the percentage of renewable energy used.

The first indicator shows the total emissions of greenhouse gases, showing total annual greenhouse gas emissions compared to base year 1990. Some greenhouse gases are: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrate oxide (N<sub>2</sub>O) and the so-called F gases (hydrofluorocarbons, perfluorocarbon and sulfate hexafluoride (SF<sub>6</sub>)). These gases are aggregated into a single unit called the Global Warming Potential gases (global warming potential - GWP). Emissions of greenhouse gases are expressed in units of CO<sub>2</sub> equivalent. This indicator does not include emissions related to farming, emissions from international aviation and maritime transport. Excepting Malta and Cyprus, all EU Member States have individual limits set by the Kyoto Protocol. EU decided by Council Decision 2002/358/EC to decrease rates of emissions of greenhouse gases by 8% by 2014.

**Figure no. 6. Indicators of greenhouse gases emission and the percentage of renewable energy used**



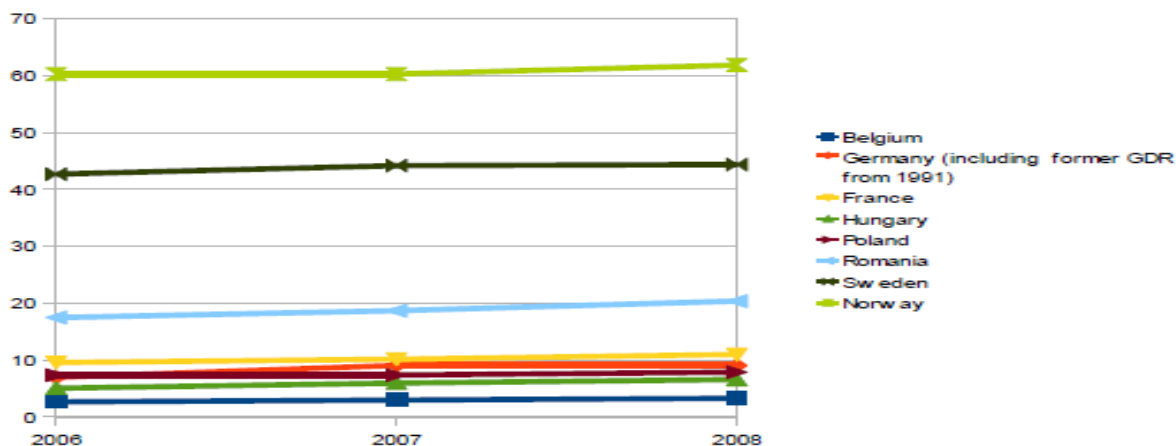
Source: ec.europa.eu/eurostat

Romania is among the least polluting countries, together with Lithuania and Latvia. Turkey and Portugal are on the front positions, exceeding by more than 100% the emission of greenhouse gases in our country (see fig. 6).

The second indicator is calculated based on energy statistics covered by the Energy Statistics Regulation. This indicator can be considered as an estimate of the indicator described in Directive 2009/28/EC as the statistical system is not fully developed for specific renewable energy technologies. For now, the contribution of these technologies is marginal.

According to Figure 7, Romania is in the top half countries using renewable energy, while Norway, Sweden and Finland are on top and last rank Malta, UK and the Netherlands.

Figure no. 7. Use of renewable energy



Source: ec.europa.eu/eurostat

In the field of sustainable transport, *energy allocated to transport relative to GDP* was the chosen indicator.

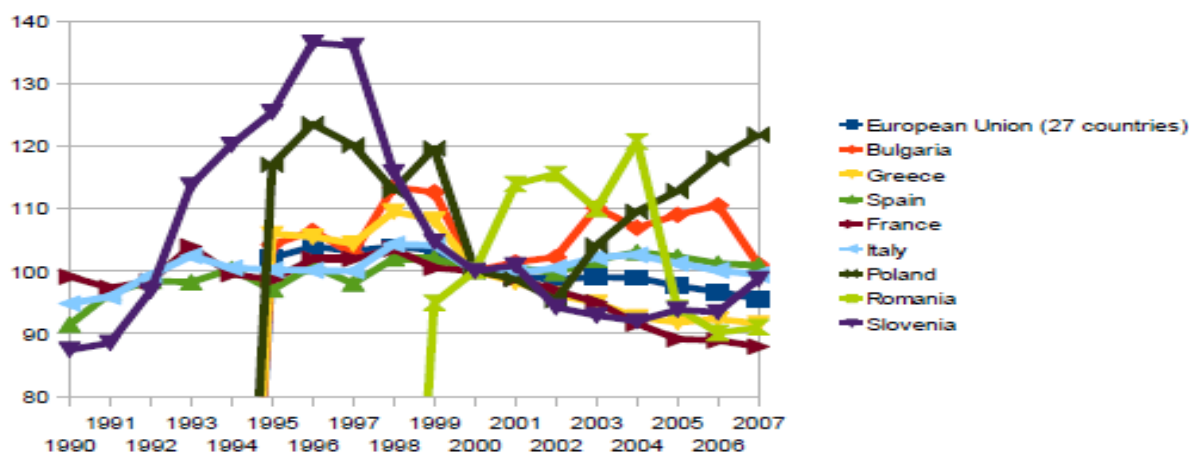
Acest indicator este definit ca raportul dintre consumul de energie alocat transporturilor și PIB. Energia consumată de către toate tipurile de transporturi (pe șosele, căi ferate, căi navigabile și aviație) este luată în calcul, inclusiv transportul comercial, public sau individual, cu excepția transportului maritim.

În România acest indicator a avut o scădere semnificativă în anul 2005, în anul 2006 menținându-și trendul descrescător iar în 2007 înregistrând o ușoară creștere. În 2007 se situa undeva la coada clasamentului, alături de UK, Suedia sau Elveția. Pe primele locuri se situează Polonia, Austria sau Ungaria (vezi figura nr. 8).

This indicator is defined as the ratio of energy consumption to GDP allocated to transport. Energy consumed by all modes of transport (road, rail, waterways and aviation) is taken into account, including commercial transport, public or private, except shipping.

In Romania this indicator had a significant decrease in 2005, in 2006 it maintained its downtrend and in 2007 recorded a slight growth. In 2007, this indicator ranked Romania somewhere in the bottom, along with the UK, Sweden or Switzerland. The first places are occupied by Poland, Austria and Hungary (see figure 8).

Figure no. 8. Energy allocated to transport relative to GDP

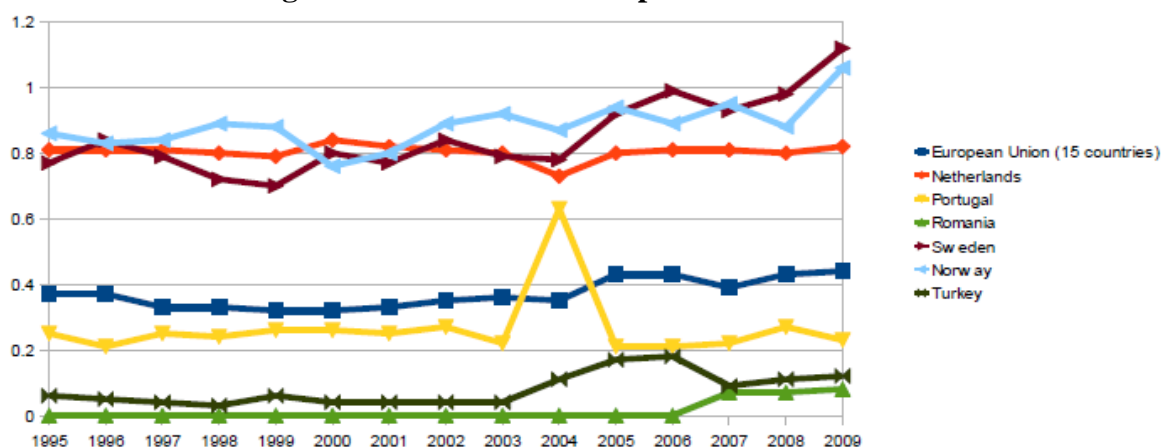


Source: ec.europa.eu/eurostat

- ✓ Indicators of natural resources are the *number of ornithological resources* and the *extent of fishing outside biological limits*.  
However, data for this indicator to Romania were not included in the statistics.
- ✓ The chosen indicator for assessing global partnerships is *Official Development Assistance- ODA*.

ODA represents the number of loans that are taken by the official sector to promote economic development and welfare in countries receiving loans. Payments and release of funds are allocated for the purchase of goods and services. Payments record the actual international transfer of funds, goods or services valued at the cost of the donor (see fig. 9).

**Figure no. 9. Official Development Assistance**



Source: ec.europa.eu/eurostat

In this respect, Sweden, Luxembourg and Norway are the top spots. Romania ranks last, with Bulgaria, Latvia and Poland. But Romania is less than 150% behind the leading countries.

### 3. Conclusions

Sustainable development in our country is seen as an adaptation of society and the economy to major problems humanity currently faces: climate change, water crisis, drought, desertification, waste, population growth, poverty, migration, etc. To eliminate their repercussions for human development there is a need to ensure initiation and support concrete actions, summarized in specific and measurable objectives, subject to national strategies for sustainable development.<sup>19</sup>

A prerequisite for achieving sustainable development is the implementation of an appropriate mix of macroeconomic policies, which ensure sustainability of material and energy used for growth.

For Romania, where many may ask themselves whether there is sustainable development, the answer would be very simple: there are viable solutions to reach the level of developed countries. Romania must enter quickly the track of economic growth, a sustainable growth based on performance management in all sectors of economic and social activity.

<sup>19</sup> Europa 2020, O strategie europeana pentru o crestere inteligenta, ecologica si favorabila a incluziunii, Bruxelles, 3.3.2020

Thus we are left to reach as quickly as possible the national strategy objectives in areas such as education, health, investment in research and development, rural development and administrative capacity.

#### 4. Bibliography

1. Burghilea, C., *Modelul dezvoltării durabile*, Theoretical and Applied Economics, Bucharest, 2012, pp. 96-107
2. Burghilea, C., Ene, C., M., Uzlău, C., *Impact of economic models on European Union economies development*, Theoretical and Applied Economics, Volume XX (2013), No. 4(581), pp. 91-102
3. Cărcota, D., Cărcota, C., *Dimensiuni contemporane ale Dezvoltării Durabile și competitive, Idei și experiențe istorice*; Editura ASE, București, 2004;
4. Dinu, M., Socol, C., Marinas, M., *Modelul european de integrare*, Editura Economica, București, 2007;
5. Dinu, M., Socol, C., Marinas, M., *Economie Europeană. O prezentare sinoptică*, Editura ASE, 2008;
6. Dinu, M., Socol, C., Marinas, M., *Economia României/ O viziune asupra tranziției postcomuniste*, Editura Economica, 2006;
7. Dobrescu, E., Albu, L., *Dezvoltarea Durabilă în România, modele și scenarii pe termen mediu și lung*, Editura Expert, București, 2005;
8. Europa 2020, *O strategie europeană pentru o creștere inteligentă, ecologică și favorabilă a incluziunii*, Bruxelles, 3.3.2020
9. Expanding the Measure of Wealth. Indicators of Environmentally Sustainable Development, The World Bank, Washington DC
10. Iftimoaie, C., Porojan, D., *Dezvoltare durabilă în contextul globalizării*, Editura Irecson, București, 2008;
11. Perț, S., *Un sistem informațional operațional al pieței muncii*, Raporturi de muncă, nr. 7/1998
12. Pohoța, I., *Strategii și politici europene de dezvoltare durabilă*, Editura Economică, București, 2007;
13. Radulescu, V., C., *Dezvoltarea durabilă și implicațiile economico-financiare ale organizării exploatareilor agricole*, Editura Economică, București, 2007
14. Sârbu, R., Marchis, D., *Dezvoltare durabilă și conexiunile sale*, Editura Universitas, Petroșani, 2010;
15. The interim report on the OECD Three Year Project on Sustainable Development, 1999
16. Zaman, G., Gherasin, Z., *Criterii și principii ale dezvoltării durabile din punct de vedere al resurselor acestora*, Buletin AGIR nr.1/2007;
17. [www.eurostat.ro](http://www.eurostat.ro)

**Synthesis of the work****Analysis and Forecast of the Youth Inclusion on the Labor Market  
Determining Factors in Romania and their Impact on the Social and  
Economic Development of the Society**

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In the EU, young people represent, according to Eurostat statistics, one-fifth of the total population. Even though modern Europe currently offers unprecedented opportunities to young people, however, they are faced with some challenges (aggravated also by the economic crisis) related to education and training and access to the labour market.

Unemployment among young people is very high, standing at 21.8% in 2010 and at 21.9% in 2011. In this context, reaching the objective of an employment of 75% for the population aged 20-64 years old specified in the “Europe 2020” strategy requires an improvement of the measures/transition pathways of young people to the labor market.

The issue of social inclusion of young people was always present on the political agendas, but only in the last two decades it has got a particular importance. In the European context, since 1988 so far specific programs have worked such as “Youth for Europe”, but the first strategic document dedicated to young people, “The White Paper on Youth” was released in 2001. It proposes collaboration between the Member States of the European Union towards a move to some sectors, namely: participation, information, voluntary work, understanding and knowledge of youth.

For the period 2010-2018, the directions of European action in the field of youth were collected in the strategic document called “Youth-Empowerment and Investment” (“EU Strategy for Youth-Investing and Empowering. A renewed open method of coordination to address youth challenges and opportunities”), which concerns policies relating to young people in Europe in terms of education, employment, social inclusion, civic participation, entrepreneurship, etc.

The main goals pursued by the European Youth Strategy are: (i) to provide access for youth to education and the labor market, ii) civic engagement, social inclusion and solidarity.

Among the main objectives laid down in the “Europe 2020” Strategy are: (i) at least 40% of the population aged 30-40 years to have completed tertiary education or equivalent by the year 2020, ii) to reduce early school leaving to 10%, iii) raising the level of literacy at reading for the population 15 years of age, but also a digital literacy that young people of 15 years need to hold to meet the challenges of the knowledge society.

Low participation of young people and vulnerable groups in the labor market was seen as one of the main challenges in the short and medium term by the National Strategy on Social Protection and Social Inclusion, 2008-2010, as well.

At the level of our country, “the National Development Plan 2007-2013” (NDP)



proposed by the Government determines the issue of integration of young people in the labor market as one of the action priorities, as a result of the unemployment rising among them. Government document put the young people integration on the labor market in close correlation with the education system's ability to provide relevant skills and qualifications adapted to the market.

In the context of a growing level of unemployment, young people are dealing harder to find a job, and many of them might decide to extend or to resume his studies. This could represent an investment for the future, with the condition to obtain the appropriate skills. However, the reality is that many young people are not participating neither in the world of work, nor in that of the studies.

Among *the advantages of using young labor force in building the new society of knowledge*, the following may be listed:

- employment of young people on sustainable jobs ensures consistency for the economic development and the growth of the capabilities of the local and national markets;
- promoting young people on attractive jobs (new jobs created on the IT technology and the theory of knowledge) leads to productivity growth and prospects of at least maintaining the level of competitiveness of economic agents (market-specific);
- the young people labor market, through its performance, supports the growth of the sustainable economy;
- employment structure, based on the young labor force component, at least stable if not growing, and on a higher level of training than the average in the labor market, leads to sustainable economic growth;
- structural unemployment among young people, whether it is based on a shortage of classic, historical jobs, is the most serious problem of the current labor market; if the structural deficit of young labor force on crafts and professions is based on the equivalent unemployment to new professional specializations generated by the educational process, in order to create sustainability in economic development, the absorption of foreign direct investment is needed, based on the introduction of higher generations of technology, comparable with those already existing in the business environment;
- unemployment among young people is given by a growing component of salary motivation. Inadequate remuneration of prospective jobs is slowing down the economic development, thereby undermining the foundations of sustainable growth;
- the true unemployment of the young labor force in Romania is higher than those registered, because young people are more flexible and adapt to the "requirements" working environment on at least two directions:

(a) in the conditions in which they claim the principle to employ to the corresponding profession acquired through school, they would seek corresponding jobs through migration/mobility to other markets (EU, extra EU);

(b) when the internal mobility factor is excluded for various reasons, the significance of correlation between professional profile upon graduation and that of the place of employment is lost, the workplace being determined by the earnings.

In both cases, national sustainable growth potential goes in a negative sense because it loses the added value corresponding to vocational training.

- sustainable development not only attracts and leverages the potential of young labor force, but also the need to update their experience, because in today's society, but especially in the future, the average length of knowledge degradation decreases in a greater proportion than the ability to adopt the initial education.

In a knowledge-based economy, the ability to innovate at all times is the key to success in business. International statistics indicate that in the global top of the most-innovative companies there are Apple, Facebook and Google, companies with excellent

financial results. But all of these companies have a huge number of young employees, the average age of employees being 33 years at Apple, 26 years at Facebook and Google's employees at an average of 31 years.

Also, young people are equipped with knowledge regarding new media tools and virtual environments, indispensable tools for the labor market in the future. Technology of online video, blogs, podcasts and software that enables interactivity are tools that support productivity, when used effectively.

The European Commission considers that young people are the most threatened category of the European market, and the risk of being marginalized is increasingly higher. This has immediate consequences, but also implications on the medium and long term. The deepening crisis on the labor market can affect much a big part of a whole generation of young people, affecting employment, productivity and social cohesion, both in the present and in the future.

In 2020, the pupils and the students of today will be at the beginning of their career, having to face at least 30 years of professional life, some of them with occupations that today don't exist, and some with professions that may be endangered.

Therefore, improving the capacity of education and professional training (EPT) has become a necessity in order to meet the changing needs of the labor market. But, in order to integrate the needs of the changing labor market in providing long-term EPT, a better understanding of the sectors and the emerging powers and changes that will affect existing occupations is also required.

If it is taken into account the economic and political developments of the decade 2010-2020, in particular in the perspective of the strategy "Europe 2020", then at the national and the EU level, the Copenhagen Declaration of 2002 should be given a fresh impetus, as the Copenhagen process is an integrated part of the strategic framework "education and training 2020".

The work **"Analysis and forecast of the youth inclusion on the labor market determining factors in Romania and their impact on the social and economic development of the society"** presents in the first chapter a brief characterization of the labor market at EU level and an analysis of the youth labor market in Romania, compared to the EU-27 or other EU countries.

At the moment, over 5 million young people are unemployed across the EU. Between 2008 and 2010, this number has increased by one million.

This means that one of five young people on the labor market may not find a job. The unemployment rate among young people (over 20%) is two times higher than for the total working population and nearly three times higher than the rate for the adult population. In some countries, this rate reaches up to 40%. Within the same country, the situation can significantly vary from one region to another. In addition, certain categories of young people (including women, disabled young people, and young people coming from migrant backgrounds) are particularly exposed to the risk of unemployment, long-term unemployment, early school leaving or inactivity.

Permanent job loss during the crisis has disproportionately affected young people, who are overrepresented in the category of temporary contracts. Although temporary contracts can constitute a first step towards more stable employment forms, this can create segmented labor markets, young people being stranded in the lower segments of them, with less training on the workplace, lower levels of payment and poor prospects in terms of employment and long-term career. The difficulties on the labor market also have a negative impact on young people between 25 and 29 years with higher education, for who is harder to find a job suited to their qualifications.

The issues that young people encounter on the labor market have significant

consequences on the level of their livelihood, their families and on the national and international communities whose members they are. The most significant effects of young people's inactivity are: the risk of poverty, inability to play an active role in the development of the society.

The high level of unemployment among young people leads to the lowering of the chances of employment of individuals in general, but also to the decrease of the opportunities for economic development, both nationally and globally.

Unemployment among young people has increased also in 2012 in the developed States. At the end of the semester I 2012 in Greece, most young people (55.5%) did not have a job, and the percentages were almost as high in Spain (53,1%). The unemployment rate among young people in Portugal reached 38.6% and in Romania has reached 23% (Eurostat Statistics).

The consequences of unemployment among youth directly affect the level of fluctuation of temporary personnel in the labor market. The accumulation of experience is reflected at both the individual level and in the development of the labor market at the national level.

A high level of unemployment also contributes to increase poverty and lower living standards, such as medical, nutritional, cognitive and psychological. As to young people get older and settle their own families, their failure to accumulate both economic capital, and social capital can be passed to their children.

In accordance with Business Europe (Executive Committee, 2/16/2012, "*Creating opportunities for youth*") in the first quarter of 2011 there were 24 million young jobless in the European Union, and employers have reported 2.2 million jobs available, of which over 1 million in Germany and 450,000 in the United Kingdom.

"The high level of unemployment among young people has dramatic consequences for our economies, for our societies and, in particular, for young people. Therefore, we must invest in young Europeans now", said László Andor, EU Commissioner for employment, Social Affairs and inclusion<sup>20</sup>.

For companies, young people are an asset, since they satisfy the quality by consumers, as well as the innovators, a category that influences the public opinion and have knowledge in technology. As employees, young people offer to the business environment information directly related to their generations tastes and preferences, promoting at the same time employers' products and services.

In Europe in general and in Romania in particular, extending the schooling is a long-term phenomenon. Increasing life expectancy, the number of years that a young person spends in the formal education system is today at an average of 17 years, far higher than in the last decades of the 20<sup>th</sup> century. In this context, the second chapter of this work deals with the main issues of the educational offer at the European Union level and in Romania: general education vs. specialized education, training education (accumulation of knowledge) vs. the education for the job market of the future, skills and attitudes to promote professional insertion performance of young people on the labor market. Also, there are analyzed the mechanisms for increasing the offer's adaptability to market demand.

About 50% of European young people complete their education and enter the labor market on a path of education and training, heading towards a wide range of jobs, both in industry and in services.

Analysis of data concerning the educational drop-out rate of 18 to 24 years young

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<sup>20</sup> European Commission, press release, Brussels, December 5<sup>th</sup>, 2012, *the Employment of young people*: the Commission proposes a package of measures

people highlights the high levels, especially among those from disadvantaged backgrounds, but decreasing in 2011 compared to 2000, and a low correlation between skills acquired and labor market needs and the system of quality assurance in education and training of young people in accordance with the European model.

Compared to 2000, in Romania there was a significant decrease in the number of people who leave the education system with a low level of education. The value of this indicator in Romania for 2008 is 15.9% when it registered the lowest value in our country and the closest value compared to the European average EU-27 - 14.9%. In 2009 and 2010, this indicator grew in Romania up to 18.4% and then decreased in the year 2011 at 17.5%. Reducing the rate of early leaving education and training system is formulated as a goal also in the Romanian Tax-budgetary Strategy over the medium term. Material incapacity remains, in the case of many children, the primary reason that causes leaving the education system.

Spending on education can help a rapid economic growth<sup>21</sup>, increasing productivity, contributing to the people's personal and social development, as well as to the decrease of social inequities. The percentage of total financial resources allocated to education is one of the key choices made by Governments in each EU country.

In order to meet the challenges that young people face in the labor market, a series of policies of employment and work have been drafted at national and European level. In *the chapter three* of this work there is presented a series of youth employment policies in some EU Member States. Also, there are analyzed also strategies on improving youth employment policies at European level and in the development regions of Romania.

The current economic recession has imposed and is imposing EU governments to strongly intervene on the labor market, especially in the field of youth employment. In the paper there are also presented a series of best practices within the European Union countries to minimize unemployment for young people and their employment opportunities on the labor market, as well as some of the advantages of using the young labor force in achieving the objectives set out in the "Strategy 2020" and the European Strategy for Youth.

The implementation of national strategies for lifelong learning remains a challenge for many Member States, including as regards the development of flexible learning journeys to allow citizens to move from one level of education to another, and to draw also other categories of citizens who are not part of the classical pattern of pupil/student.

The percentage of young workers is decreasing in almost all Member States. This situation reflects a decline in the birth rate, but it may also indicate that educational activities are becoming increasingly more widespread and longer-lasting. In addition, young workers are more vulnerable to economic recession — employers react to economic pressures by reducing the employment of new young workers.

However, a successful integration of young people into professional life is essential for society and businesses, as well as crucial for the juveniles themselves, for their own control over their lives, health and well-being.

Distribution by activity sectors shows that, in the EU-25, the highest proportion of young workers can be found in the hotels and restaurants sector (22.7%) and in commerce (16.3%). The hotels sector is on the first place in terms of employment of young workers in 20 of the 25 Member States and in third place in all Member States.

This distribution has important implications on the safety and health of young workers, given the specific set of potentially dangerous conditions that characterize these sectors

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<sup>21</sup> The balance sheet for the future: 20 years of sustainable development in Europe, Eurostat, European Commission over, the Best days of their lives? [http://epp.eurostat.ec.europa.eu/cache/ITY\\_PUBLIC/2](http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/2)

(including low wage, seasonal or temporary activities, precarious working conditions and physical demanding work). Within the EU-25, young workers were mostly employed as workers in the field of services (5.2 million), followed by other craftsmen and workers assimilated (3.6 million). Officials (2.7 million), technicians and associate professionals were tied for third place (2.7 million), followed closely by unskilled occupations (2.5 million). This professional distribution shows slight difference between Member States.

Youth employment is found, at the level of public policy, at the crossroads between employment policies, social inclusion policies, educational policies and policies for youth. Given the nature of multi-dimensional approach to youth employment, social inclusion approach of this age sector represent a great challenge for the public institutions, young people, being, in fact, the engine for sustainable economic development.

Based on the analysis of national and regional policies with regard to the issue of social inclusion of young people, the need for coordination of structural and regional/local levels in the development of employment policies is felt. Correlation between educational level and the demand on the labor market can only be made through a careful analysis of the needs and the socio-economic challenges at the local level so that the skills and knowledge acquired by young people to be reflected in an increased level of employment. There are currently two types of measures: those related to information and counseling on labor market and training-conducted by LABOUR OFFICES and subsidies to employers who hire certain vulnerable groups (under law 76/2002).

Specific measures relating to the linking of the education system with the requirements of the labor market were not included in the law on unemployment insurance system and employment stimulation, and the law on education (version 2010) specifies that upper secondary education may be organized according to the requirements of the labor market at regional, district or local level.

All programmatic documents concerning employment were drawn up prior to the year 2007, in the context of economic growth and the integration of Romania into the European Union.

At the local level in Romania, LABOUR OFFICES (LO) draw up annual plans for employment and training in accordance with the public policy strategy. These plans should, naturally, follow the plan of budgetary appropriations from which LOs benefit, but instead, the planning calendar, in practice, is not coupled directly with budget allocations, the latter being made later than LOs' service schemes. The consequences are that the proposed indicators are either supplemented (without being related to budgetary supplements) or lowered (jettisoned developed centrally, without taking into account the capacity and the real needs of the territory).

The economic and social situation was discussed with Member States in preparation for the European economic governance semester 2012. Thus,

- different Member States could use more EU funds available, including rescheduling and expediting implementation, to create programs to support young people more widely, focusing on combating early school leaving and to improve employment opportunities. This is particularly important for those Member States where unemployment and precariousness among the young are very high.
- the use of EUR 1.3 million in ESF technical assistance to support the establishment of programs such as the apprentice through the ESF, and an amount of EUR 3 million in ESF technical assistance which will focus, inter alia, on the establishment of new programs to support young entrepreneurs and social entrepreneurs.
- the definition by the Member States of measures aimed at young people in preparing their programs for the next period of ESF.



In terms of supporting the transition from school to work for young people, the adoption of measures and policies is needed, including:

- Member States, in cooperation with the social partners, should pursue a substantial increase of apprenticeship opportunities existing in the EU and to ensure that they offer young people opportunities in terms of experience and specific training, acquired in the workplace, thus facilitating the passage of more stable employment forms. An increase of at least 10% in the EU by the end of 2013 would provide a total of 370000 internships apprenticeships more<sup>22</sup>.
- the social partners should consider, depending on each case, together with the authorities of the Member States, the most appropriate ways of implementing the specific objective of “promoting more numerous internships apprenticeship and better quality”, in the context of their autonomous agreement regarding “the inclusion favorable labor market” (2010).
- substantially strengthening the support for mobility of students in higher education and those who perform training courses. Directing more funds to investments in businesses could achieve a 30% increase in the number of placements, aiming to achieve a minimum of 130,000 of placements in 2012 within the framework of the Erasmus and Leonardo da Vinci programs.
- in the first half of 2012, the Commission launched a campaign with a budget of EUR 1.5 million, which will propose to raise the awareness of enterprises in connection with Erasmus and Leonardo da Vinci placements and encourage the potential host-businesses to receive European interns.
- in 2012 the Commission presented a framework to support the delivery and achievement of high quality internships, including a comprehensive view on the stages at EU level, in order to increase transparency regarding the conditions to perform internships throughout the EU.
- intensify efforts to implement youth guarantee, ensuring that, four months after the end of the school, young people either work or continue the education or attend (re)training classes, paying particular attention to young people who leave school early and to other vulnerable young people. It was released in the year 2012 a preparatory action for “Measures designed to enable young people to implement the initiative *Youth on the move*”, focusing on guarantees for young people, with a budget of EUR 4 million.
- investing a significant part of the budget of EUR 6 million for social innovation in innovative projects, aimed at young people in disadvantaged areas and situations.
- strengthening the budgetary allocation for the European Voluntary Service to provide at least 10,000 volunteer opportunities in 2012.

It also outlines the necessity of forming a stock of highly qualified/ educated human capital and to adapt those with average skill at performing manufacturing methods, to a culture of continuous learning and the flexibility of supply and learning certification. There is insufficient material and technical basis for quality assurance in education, in particular for modern technological fields required on the labor market.

Development of knowledge-based economy also lead to changes in labor market requirements: there are required new skills and abilities. Therefore, in order to maintain the

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<sup>22</sup> In early 2012, the Commission shall submit a comprehensive study on the offer of apprenticeship training in the EU. Currently, approximately 40% of students in upper secondary education cycle in the EU carries out professional training apprenticeship type experiences. However, less than half of them are dual training, combining theory and practice in the workplace.



competitive position of Europe, reforms of the education systems and vocational training are essential. Future jobs require people with high-level qualifications. Elements of the economic impact of the knowledge-based society on the labor market are presented in *Chapter 4* of this

Despite unprecedented opportunities offered by modern Europe, young people are faced with some challenges - worsened by the economic crisis – related to the educational and training systems and the access to the labor market. Unemployment among youth is unacceptably high, standing at 21%. In order to achieve the objective of the employment work of 75% for the population aged 20-64 years of age, the transition of young people to the labor market must be radically improved.

By the year 2020, it is estimated that 35% of jobs will require high level qualifications, combined with the adaptability and innovation, compared to 29% at present. This means with 15 million more jobs requiring high-level skills. An increasing number of jobs require digital skills, but the EU's economy suffers from a shortage of highly qualified personnel in the field of ICT (information and communication technology). In the EU, less than one person out of three has higher education (31.1 per cent), compared to over 40% in the USA and more than 50% in Japan. The EU has a smaller proportion of researchers in the labor force than its competitors. The main objective of “Europe 2020” Strategy is that by the year 2020, at least 40% of the population aged 30-40 years to have completed tertiary or equivalent education. Too many young people leave school early, which leads to increased risk of becoming inactive or unemployed and live in poverty, as well as to increase the economic and social costs. Currently, 14.4% of the EU population aged between 18 and 24 years old have completed lower secondary education and does not follow other education or training programs. The EU's aim is to reduce early school leaving to 10%. Furthermore, Europe must strive for the literacy - 24.1% of the population aged 15 years has obtained poor results in terms of literacy to lecture/reading, this proportion increasing in recent years.

In 2011, in Romania, 68% of young people between the ages of 25-29 years have been part of the active population, representing the lowest percentage in the studied period 2002-2011 for this category as well. There was a decrease of 3.5% this percentage compared with 2002, when there was a rate of 71.8% out of this category.

Even if young people today are fewer in number and better educated than their predecessors in the previous generation, there are still difficulties in entering the labor market. Many of those who were hired often have unstable jobs. There are several reasons for this, such as the disparity between the skills acquired in education and labor market requirements, as well as the general conditions of the labor market. In difficult times, companies will downsize recruitment programs, available places being mostly for qualified experts.

There are also made estimations on the impact of new economy on the process of schooling and education in Romania.

The method of approach allowed the authors, together with the formulation of conclusions to be drawn with purely scientific feature, to provide some useful information from the practical point of view. In this way the work manages to overcome the rigidity of the usual bureaucratic arbitrariness in specific literature devoted to the same topic.