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TECHNICAL EFFICIENCY OF SMALLHOLDER SUGARCANE FARMERS IN MALAWI : THE CASE OF KASINTHULA CANE GROWING SCHEME

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Abstract. This study examines the productivity of peasant sugarcane farmers in rural Malawi. The article is based on data collected through a survey. A Stochastic Frontier Model is used to estimate technical efficiency levels of the Kasinthula Smallholder Cane Growers Scheme. A Cobb-Douglas production function for farmers of the scheme is estimated using the maximum log likelihood method. The results suggest that on average, farmers of the scheme are technically efficient, with an estimated technical efficiency mean score of about 89 percent. The recorded minimum score was 52 percent, with a maximum of 97 percent. This suggests that for the lowest level of efficiency, there is about 48 percent chance of increasing production using the available inputs. Land size is found to be an essential factor to increasing production. The level of experience of the farmer, level of education, gender of a field leader as well as mode of weeding are important determinants of technical efficiency of sugarcane out growers in Malawi.

JEL Classification: R21, R22

Keywords: technical efficiency, productivity, sugarcane farmers, Malawi

1. Introduction

Productivity of smallholder farmers has been studied extensively over the years in both developed and developing countries using different methodologies. The Data Envelope Analysis (DEA) and the Stochastic Frontier Analysis (SFA) have been the most common measures of technical efficiency. Binam et al. (2003)

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studied the technical efficiency of 81 peasant farmers in the low-income region of Côte d'Ivoire. DEA techniques were used to compute farm-level TE measures. The study concluded that substantial gains in output and/or decreases in cost can be attained given existing technology.

Tchale et al. (2005) used a non-parametric frontier analysis to analyze the technical efficiency of farmers in the maize-based mixed farming systems of Malawi. They also assessed the socio-economic and policy related factors that may explain the estimated levels of technical efficiency. Their results indicated low to medium levels of technical efficiency depending on crop variety and soil fertility management option used. Higher levels of relative technical efficiency were obtained when farmers used integrated soil fertility options compared to the use of inorganic fertilizer only. Of the policy variables included in the analysis, agricultural input and output market, credit and extension access strongly influenced smallholder technical efficiency.

Technical efficiency is defined as the ability to produce a given level of output with a minimum quality of inputs under a given technology (Farrel, 1957). Studies on efficiency can be an important indicator for potential productivity growth. In an economy where resources are scarce, positive efficiency results can show that it is possible to increase productivity by improving efficiency without increasing the resource base or developing new technology. This can therefore inform decisions on whether to improve efficiency or developing new technologies to raise productivity.

Other studies on efficiency have used SFA to investigate efficiency effects. Chirwa et al. (2006) examined technical efficiency differentials using maximum likelihood estimation techniques. The study modelled the stochastic frontier production functions of 302 rice farmers in Nigeria. In their study, hired labour, use of fertilizer and pesticides and land size were found to be major determinants of technical efficiency for rice farmers. They, however, did not consider the impact of experience and training on technical efficiency of farmers. The stochastic frontier production and cost function model was used to predict the farm level technical and economic efficiencies.

Bravo-Ureta and Pinheiro (1997) analysed a sample of Dominican Republic peasant farmers and concluded that allocative efficiency appears to be more significant than technical efficiency as a source of gains in economic efficiency. Their findings suggest that contract production, farm size, and agrarian reform status are important determinants of efficiency. They argue that the statistically significant positive relationship between allocative efficiency and being an agrarian reform beneficiary is probably a result of better access to managerial assistance and information. Their analysis supports the argument for public sector involvement in the provision of information to peasant farmers as a means to improve efficiency levels, and thus household incomes.

There are also studies that have specifically estimated and analyzed the efficiency levels of sugarcane farmers elsewhere. Mahadevan (2007) examined the impact of various socio-economic factors on the viability of the sugar industry in Fiji. It was found that in general, farmers were inefficient and produced 25 percent less than their potential output. Among the farm inputs, land and labour were the most and least efficiently used inputs respectively. Msuya and Ashimogo (2005) examined the technical efficiency of sugarcane production and the factors affecting this efficiency for Tanzanian sugarcane outgrowers. Specifically, the study

determined and compared the level of technical efficiency of outgrower and non-outgrower farmers, and investigated the relationship between levels of efficiency and various specific factors. Using a cross sectional single-visit survey that included randomly selected representative samples of 140 outgrower and non-outgrower farmers, they showed that there were significant positive relationships between age, education, and experience with technical efficiency.

A number of policy interventions can be undertaken to improve productivity using results from an analysis of farmers' efficiency. Shapiro (1983) suggested that new investment or technologies, and educational efforts should be directed to efficient farmers. These efforts can therefore improve the allocation and use of available resources so that more farmers would come closer to the efficiency level achieved by their counterparts.

2. Background to the area of study

Malawi is a relatively small landlocked country in Southern Africa (118,000 square kilometres, of which one fifth is water) with an agro-based economy. Agriculture accounts for over 36 percent (2007 estimate) of the country's Gross Domestic Product (GDP) and nearly 80 percent (2006 estimate) of exports. It employs an estimated 84.5 percent of the labour force and accounts for about 82.5 percent of foreign exchange earnings (GoM, 2004). The sector has a dual structure consisting of a large smallholder sub-sector engaged in mixed subsistence farming, which is 4.5 times larger than large scale commercial estates combined. Tobacco is the country's major foreign exchange earner, followed by sugar and tea, in that order (GoM, 2006).

Smallholder Sugar Authority (SSA) was introduced in 1978 as an appropriate agency to carry out development of sugarcane production. Its mandate included the provision of extension services and input loans to farmers. The success of SSA in Dwangwa and the need to increase sugar production to meet Malawi's quota to its major export market, the EU, influenced the government of Malawi to initiate and establish a similar scheme at Kasinthula in the lower Shire district of Chikwawa. Apart from increasing the production of sugarcane as a raw material for the Nchalo Sugar Mill in Chikwawa, government also aimed at reducing poverty of smallholder farmers around the area through cultivation and growing of sugarcane. KCG was jointly set up in 1996 by the state-run Sugar Corporation and a sugar mill later taken over by Illovo Sugar (Malawi) Ltd, part of Illovo Sugar, a South African-owned leading global sugar producer which dominates production in Malawi. The project involved converting an area of largely uneconomic land to sugar cane production in order to increase the supply of raw cane to the mill and at the same time provide an income for the subsistence farmers who were barely able to grow enough food to eat. The project extends to around 1,200 hectares of land leased from the government, with individual plots of 2.5 to 3 hectares. The sugar cane is cut by hand and delivered to the Illovo mill approximately 25km away. On top of the negotiated contract price for the sugar cane (Illovo, 2007).

Although the sugar industry has been growing, it has also been facing problems. Some of these include declining production and productivity, increasing cost of production due to rising input prices (fertilizer, pesticides and other farm inputs), fall in export prices and increased competition to the EU markets. Using Stakeholder Consultative Workshops, a study commissioned by the government

and KCGL outlined a number of challenges smallholder cane growers are facing in Malawi. Among them productivity was identified as an area in need of attention in order to improve the out grower farm yields. However, there is no study that we are aware of that has measured the efficiency levels of the out grower farmers in Malawi. This study attempts to fill this gap. The estimation of efficiency levels and its determinants in KCGA will enhance an understanding of productivity and the relationship between efficiency and specific socio-economic factors in the sugar industry in Malawi.

3. Research methodology

Survey process
The empirical analysis is based on survey data collected using a structured questionnaire. Two questionnaires were administered, one to management of KCGL and another to farmers. The area of study is the lower shire district of Chikwawa, about 45 kilometres south of Blantyre, the commercial city of Malawi.
A random sample was carried out on small farmers that comprise a field. A total of 44 farmer representatives for each field were interviewed. Data on output was obtained from management of KCGL as most of the farmers were not able to provide output figures either for their plot or for the field they were representing.
At KCGL, farmers are shareholders who carry out only a limited number of specified activities in the growing season. Notably growers are required to weed their farms. At the end of each month, a fixed amount of money is paid to each farmer in the form of a dividend. When a profit has been declared at the end of the season, a general meeting agrees on how best to use the money. It is, however, the responsibility of KCGL to obtain and repay all loans on behalf of the farmers.

Empirical model
A Cobb-Douglas (CD) functional form is used to model sugarcane farmer production technology for a number of reasons. Firstly, the functional form has been used in many empirical studies particularly those relating to developing countries' agriculture (Ogundari et al., 2006). Secondly, it meets the requirement of being self-dual. That is, it allows for an examination of economic efficiency. Thirdly, given the constraints of a relatively small dataset, a CD cost function is deemed the most appropriate rather than a more flexible (but data-intensive) translog form (Holder et al., 2006; Chirwa, 2000).
To identify production inefficiencies, SFA is applied to the following functional production framework presented in logarithms, in line with Msuya and Ashimogo (2005), Ogundari et al. (2006) and Ogundele and Okoruwa (2006):

$$lny_t = \beta_1 + \beta_2 lnflab_t + \beta_3 lnhlab_t + \beta_4 lninputs_t + \beta_5 lnland_t + \varepsilon_t \quad (1)$$

where, *ln* represents the natural logarithm, which is employed in order to linearise the CD function; y_t is output of a farmer from sugarcane field *i* in metric tonnes; *flab* is family labour utilised measured in man-days; *hlab* is hired labour also measured in man-days; *inputs* represent the aggregate value of inputs; and *land* is land area cultivated measured in hectares. β_1 to β_5 are parameters to be estimated.

According to Tchale et al. (2005) the major sources of (in) efficiency discussed in the recent literature are management qualities of farmers. These include formal education, access to extension services, experience, and amount of knowledge acquired about the crop. In this section we follow Binam et al. (2003) and Bravo-Pinheiro (1997) and estimate a two-limit Tobit model of technical efficiency for cane growers. Given that technical efficiency scores are bounded between 0 and 1, the two-limit Tobit model is presented as follows:

$$TE_i^* = \beta' X_i + \mu_i \qquad (2)$$

where TE_i^* is the latent value of efficiency score. If we denote the observed technical efficiency value for sugarcane field *i* by just TE_i, then the restricted equations can be specified as:

$$
\begin{aligned}
TE_i &= L_{1i} \; if \; TE_i \leq L_{1i} \\
&= TE_i^* \; if \; L_{1i} < TE_i^* < L_{1i} \\
&= L_{2i} \; if \; TE_i^* \geq L_{2i}
\end{aligned} \qquad (3)
$$

where L_{1i} and L_{2i} are the lower and the upper limits respectively. In our case that means 0 and 1 in that order. The X_i is a vector of the determinants of efficiency. The maximum likelihood of equation (7) yields consistent estimators and according to Greene (2003), it is presented as:

$$
\begin{aligned}
&L(\beta, (\sigma/y_i), x_i, L_{1i} L_{2i}) \\
&= \prod_{y_i = L_{1i}} \Phi\big((L_{1i} - \beta' x_i)/\sigma\big) \prod_{y_i = y_i} \phi/\sigma\big((y_i - \beta' x_i)/\sigma\big) \\
&\qquad \prod_{y_i = L_{1i}} \big[1 - \Phi\big((L_{2i} - \beta' x_i)/\sigma\big)\big] \qquad (4)
\end{aligned}
$$

where Φ and ϕ are the normal standard and cumulative density functions respectively. Following this specification, we will be empirically estimate the following equation:

$$
\begin{aligned}
TE_i &= \gamma_1 + \gamma_2 educ_t + \gamma_3 agesq_t + \gamma_4 exper_t + \gamma_5 training_t \\
&\quad + \gamma_6 weeding_t + \gamma_7 inputs_t + \\
&\quad \gamma_8 fldays_t + \gamma_9 gender_t + \gamma_{10} distance_t + \gamma_{11} land_t + \gamma_{12} age_t + \\
&\quad \gamma_{13} hlab_t + \omega_i
\end{aligned} \qquad (5)
$$

In similar studies education is found to be a major factor in determining efficiency. It is generally argued that the more education a farmer acquire the higher the ability to produce higher output using the available inputs. In which case then the parameter γ_2 is expected to have a positive sign. However, it can also be argued that if people get more education, they will concentrate more on activities unrelated to farming, bringing forth a negative relationship. The sign for γ_2, therefore, is indeterminate, *a priori*.

1. Age - is also an important factor of efficiency for farmers because maturity is associated with good decisions. In this study we also use *agesq*, squaring age as a measure of diminishing efficiency as the farmer becomes older. As the farmer grows on the farm it is expected that efficiency will be increasing but at a decreasing rate. The parameter of *agesq* is therefore expected to be positive. These two variables are expected to be highly collinear since *agesq* is derived from *age*. Therefore two models one with age and another one without *agesq* will be estimated.

2. Training - Farmers that have been exposed to formal training or workshops on cultivation of sugarcane as well as leadership skills are expected to perform better than those who have never had the opportunity to do so. Therefore the parameter of training is expected to have a positive sign. We measure training using a dummy variable *training*, which takes the value 1 if at least one member of a field underwent cane growing training and zero otherwise.

3. Weeding is done in two ways. The first is by hand and the second is by chemicals. It is expected that those who hand-weed their crops are less efficient than those who use chemicals. Therefore, the dummy variable *weeding* takes the value 1 if weeding of a particular field was by chemicals only for at least more than once and 0 otherwise. The parameter of weeding is accordingly expected to be positive.

Experience (*exper*) is measured by the number of years a farmer has operated as a sugarcane outgrower. Since experience leads to greater knowledge about ways of minimizing production costs given the level of technology, the coefficient of *exper* is expected to have a positive sign. Gender is measured by a dummy variable which takes the value 1 if a field representative is male and 0 otherwise. A positive relationship is expected between *gender* and efficiency, particularly because women have not been empowered enough to exercise confidence and make independent decisions in the fields where they are leaders. Distance of a farm from a canal that supplies water for irrigation is also expected to impact on productivity. We expect a negative relationship between *distance* and farmer efficiency. Hired labour (*hlab*) is measured in man-days. The hired labour in question includes man-hours for cane cutting during harvesting, loading into trucks and weeding using hoes. It is expected that the parameter for family labour (γ_8) will be positive reflecting the relationship of family labour and output. The more the hours spent in the field by at least one family member the higher is the expected yield given the level of technology. Finally it is expected that the parameter of the land variable (*land*) will be positive. Land represents field size under sugarcane production in hectares. Farmers with a larger field are assumed to have more room for operational purposes and hence increasing efficiency.

Efficiency and Frontier Production Functions

We begin by estimating efficiency scores, followed by a regression analysis of the determinants of efficiency. In what is considered a seminal paper, Farrell (1957) proposed that the efficiency of a decision making unit (DMU) consists of three components, namely: technical, allocative and economic efficiencies. Technical efficiency is defined as the ability to produce a given level of output with a minimum quantity of inputs given the level of technology. Allocative

efficiency refers to the ability to choose optimum input levels for given factor prices; and economic or total efficiency is the product of technical and allocative efficiencies.

Most studies, however, have focused on technical efficiency using a deterministic production function with parameters computed using mathematical programming techniques such as the DEA (Chirwa, 2000). DEA methods have traditionally been non-stochastic in nature to the extent that all deviations from the efficient production frontier are assumed to be represented by the error term. With this inadequate characteristic of the assumed error term, this approach has an inherent limitation on the statistical inference of parameters and the resulting efficiency estimates. The model assumes that all deviations from the frontier are due to inefficiency factors.

In order to decompose the error term into a stochastic component and an inefficiency measure in a way of overcoming the weakness of the DEA method, a Stochastic Frontier Model (SFM) is used in this study. SFMs models are based on production and cost functions. The stochastic frontier production function model for estimating technical efficiency is specified as:

$$Y_i = f(X_i; \beta) + \varepsilon_i \ \forall i = 1, 2, \ldots, n \quad (6)$$

where Y_i is output, X_i is a vector of the actual inputs, β is a vector of parameters to be estimated and ε_i is the error term that is composed of two elements:

$$\varepsilon_i = v_i - \mu_i \quad (7)$$

where v_i stands for symmetric disturbances assumed to be $N(0, \sigma_v^2)$ given the stochastic structure of the frontier. The second component μ_i is a one-sided error term that is independent of v_i and is normally distributed as $N(0, \sigma_\mu^2)$. Technical efficiency estimation is given by the mean of the conditional distribution of inefficiency term μ_i given ε_i; and thus defined by:

$$E(\mu_i / \varepsilon_i) = \left(\sigma_\mu \sigma_v / \sigma \right) \left(f(\varepsilon_j \lambda / \sigma) / (1 - F(\varepsilon_i \lambda / \sigma)) \right) - \varepsilon_i \lambda / \sigma \quad (8)$$

where $\lambda = \sigma_\mu / \sigma_v$, $\sigma^2 = \sigma_\mu^2 + \sigma_v^2$ while f and F are the standard normal density and cumulative distribution function respectively evaluated at $\varepsilon_i \lambda / \sigma$. We define the firm-specific technical efficiency as the ratio of observed output (Y_i) to the corresponding frontier output (Y^*) using the available technology derived from the result of equation (3) as:

$$TE = Y_i / Y_i^* = E(Y_i / \mu_i, X_i) / E(Y_i / \mu_i = 0, X_i) = E[exp(-\mu_i) / \varepsilon_i] \quad (9)$$

It should be clear that TE takes values within the interval [0,1], where 1 indicates a fully efficient enterprise and 0 a firm which is not efficient at all. This implies that technical inefficiency of farmer i is given by $1 - TE_i$.

4. Results of the study

Profile of farmers

Descriptive statistics presented in Table 1 show that the highest man-hours of hired labour (*hlab*) were 864 and the minimum were 240. On average farmers utilised 495 man-hours of hired labour especially during harvesting and weeding.

Table 1: Descriptive statistics

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum
Output	44	1535.63	561.7828	194.16	2887.68
Hlab	44	496.3636	202.4443	240	864
Exper	44	10.61364	0.4925448	10	11
Educ	44	4.636364	4.012138	0	12
Distance	44	78.93182	150.4357	1	600
Inputs	44	15371.07	13783.75	0	74000
Age	44	50.56818	15.04783	27	83
age^2	44	2778.432	1560.265	729	6889
Fldays	44	279	40.19603	132	308
Gender	44	0.5909091	0.497303	0	1

In the season under study, the average production level was about 1,536 metric tonnes of raw cane. A standard deviation of 561.78 was recorded for a minimum and maximum of 194.16 and 2,887.68 metric tonnes respectively. The average age of leaders of the farmers was 50.5 years, with experience of 10.6 years of cane growing. On average family members go to their sugarcane farms in 279 days of the 308 days sugarcane is expected to be in the field. The least visited field was worked on by a farmer in 132 days.

On average the value of variable inputs is US$119 with a standard deviation of 13,783.75. This means that there is a large variation in terms of cost of variable inputs. Another variable of particular interest is the level of knowledge acquired in the formal education system. The data shows that the average number of years of school attendance is about 5. The most educated farmer has up to 12 years of schooling, and the least educated having never been to school at all. Finally, there is evidence suggesting that many women played a leadership role. The results show that about 40 percent of the leaders of certain fields were women. Table 2 looks at the gender distribution of the sampled farmers.

Table 2: Number of smallholder households by phase and gender

Phase	Area	Households		
	Hectares of Sugar	Male headed	Female headed	Total
Phase 1	313	79	24	103
Phase 2	442	129	40	169
Phase 3	550			250
Total	1,303			522

Stochastic production frontier results

Table 3 presents results of the maximum likelihood estimates of the CD production function as specified in equation (1). The specification of the CD production function requires an assumption about the distribution of the composite error term. In this paper we specify and estimate both the half normal and the exponential distribution and we pick the one that seem to explain the variation better in a way of indicating the presence of technical inefficiency variations among the farmers.

Table 3: Stochastic Frontier Model for the Cobb-Douglas Production Function

lnoutput	Coef.	Std. Error	Z	P>|Z|	[95% Conf. Inter
Lnflab	0.04266	0.1376	0.31	0.757	-.2271, 0.3124
Lninputs	-0.0450	0.0167	-2.69	0.007	-0.0779, -0.0122
Lnland	0.74877	0.0482	15.52	0.000	0.6542, 0.8433
Lnhlab	0.05908	0.0576	1.03	0.305	-0.0539, 0.1721
constant	5.2460	0.8377	6.26	0.000	3.6040, 6.8880
lnsig2v	-5.1586	0.5478	-9.42	0.000	-6.2324, -4.0849
lnsig2u	-4.2100	0.5310	-7.93	0.000	-5.2509, -3.1692
sigma_v	0.07582	0.0207			0.04432, 0.1297
sigma_u	0.12184	0.0323			0.0724, 0.2050
sigma2	0.02059	0.0066			0.0076, 1.6997
Lambda	1.60689	0.0473			

Likelihood-ratio test of sigma_u=0: chibar2(01) = 3.63   Prob>=chibar2 = 0.028

The maximum likelihood estimates of the CD function with errors are assumed to be distributed as half normal. The estimated maximum likelihood coefficient for land and inputs are significant at the 5 percent and 10 percent levels of significance respectively. However we give attention to the Likelihood-ratio test which is set to test the null hypothesis that $sigma\_\mu = \mu^2 = 0$. Under this null hypothesis, the test statistic is asymptotically distributed as the weighted chi-square variable $0.5\chi^2(1) + 0.5\chi^2(2)$, rather than as a simple $\chi^2(2)$, because the value of $\sigma\_\{\mu\}^2$ under the null hypothesis is on the boundary of the permissible parameter space, and so a two-sided test is inappropriate (Coelli, 1996). This statistic is significant only at the 10 percent level of significance for the half normal distribution compared to the exponential distribution which is significant even at the 5 percent level. This implies that the variation in the model is not due to inefficiency effects among the farmers. Accordingly, the half-normal distribution is inappropriate for the analysis.

A model with an exponential distribution was estimated and tested using the same LR test (see Table 3). At the 5 percent level of significance the exponential model is a better fit of efficiency variations of the model. The null that $sigma\_\mu = 0$ is rejected at the 5 percent of significance. The Chi-square variable is 3.63 with a p-value of 0.028. As can be observed from Table 4, inputs and land are significant at the 5 percent level of significance. This means that increasing land under cane production by 1 percent will lead to an increase in output by 75 percent. On the other hand there is a significant negative relationship between

output and inputs meaning increasing inputs by 1 percent will decrease output by 4.5 percent.

Technical efficiency scores of farmers and its determination

Using the stochastic production frontier model, we predict technical efficiency scores. The results show a mean score of 0.89, with maximum and minimum scores of 0.97 and 0.52 respectively. This means for the lowest level of efficiency there is about 48 percent chance of increasing production using the same available inputs. Clearly, the mean efficiency score is on the higher side. This implies that most of the farmers are technically efficient.

Equation (2) is estimated to analyse determinants of technical (in) efficiency among the farmers and the results are presented in Table (4). Several variables are statistically significant in explaining the variability of technical efficiency among cane growers. Experience in cane growing is statistically significant at 1 percent in both models; and it has the expected positive sign. Cane growers, therefore, should be encouraged to remain in the business because their productivity is observed to improve with increasing number of years in cane growing.

Table 4: Estimates of Technical Efficiency Tobit Model

Model 1				Model 2		
R-squared = 0.497				R-squared = 0.492		
Variable	Estimate(Std. Err.)	p-value		Estimate(std. Error)	t-ratio	p-value
constant	-.3687(.307)	0.239		-.385(0.308)	-0.225	0.221
training	-.0077(.028)	0.784		-.007(0.028)	-0.27	0.791
weeding	0.0454(0.25)	0.084*		0.045(0.026)	1.76	0.087*
agesq	0.00001(0.94)	0.140				
land	0.0025(0.002)	0.257		0.003(0.0022)	1.17	0.249
hlab	-0.00006(0.00006)	0.336		-0.00006(0.00006)	-0.97	0.339
exper	0.112(0.029)	0.000***		0.1114(0.029)	3.81	0.001***
distance	0.0001(0.00008)	0.121		0.0001(0.00072)	1.52	0.138
age				0.001(0.0007)	1.33	0.192
educ	-0.0076(0.0035)	0.038**		-0.0074(0.0035)	-2.10	0.043**
gender	0.0544(0.029)	0.072*		0.0527(9.14)	1.80	0.081*
inputs	1.38(9.11)	0.140		1.33(0.3088)	1.46	0.154
fldays	-0.0002 (.00027)	0.575				

The dummy variable *gender* has also has the expected positive sign and is statistically significant at 10 percent level, suggesting that sex of a cane grower influences technical efficiency. Specifically, fields which are led by male farmers tend to be technically more efficient than those that are under female leadership.
Weeding methods are another important factor in influencing technical efficiency. The variable has the expected positive sign and is statistically significant at the 10 percent level, indicating that weeding using herbicides is a better way than weeding by the use of hoes or fire. Finally, formal education is statistically significant at the 10 percent level and it has the expected positive sign. Formal education improves understanding of new and advanced farming techniques leading to greater productivity.

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LIEN ENTRE DEPENSES PUBLIQUES ET CROISSANCE ECONOMIQUE DANS LES PAYS DE L'UEMOA : QUELLES IMPLICATIONS POUR LA COORDINATION DES POLITIQUES BUDGETAIRES ?

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Abstract. The causal relationship between public expenditure - economic growth has been the subject of deep concern among economists. This paper examines for the period 1967 to 2007, heterogeneous public expenditure-economic growth causality in West Africa Economic and Monetary Union (WAEMU) and analyzes the implication of fiscal coordination. Causality was determined in each country from a methodology based on cointegration analysis leading to representations of vector error correction and Toda and Yamamoto causality test (1995). The existence of heterogeneous causality between public expenditure and economic growth in WAEMU zone leads to consider a new model of fiscal coordination integrating this heterogeneous, including the adoption of a new more flexible fiscal standard for each country.

JEL Classification: E12, E27

Keywords: public expenditure, economic growth, fiscal coordination, causality

1. Introduction

L'économie internationale a connu de profondes mutations ces dernières décennies de par le phénomène de la mondialisation. Cette dernière s'accompagne de l'intégration croissante des économies nationales : les Etats ratifient des conventions internationales, adoptent des accords commerciaux ou encore créent des monnaies communes. Le volet monétaire joue un rôle non négligeable dans l'intégration des économies internationales. Ainsi, l'Afrique de l'Ouest n'est pas en reste : huit pays se sont regroupés au sein de l'Union

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Economique et Monétaire Ouest Africaine (UEMOA) et partagent une monnaie commune qu'est le franc CFA rattaché à l'euro. Une analyse rétrospective effectuée par Rosenberg (1995) sur les pays de l'UEMOA a permis d'identifier trois grands domaines dans lesquels ces pays ont porté préjudice à d'autres membres de la zone et au commerce intérieur de la zone : les droits de douane, la fiscalité intérieure indirecte et les politiques budgétaires. Les travaux consacrés aux unions monétaires concluent en général que les externalités engendrées par les politiques budgétaires préjudiciables (les politiques de déficit systématique, en particulier) se trouvent exacerbées (De Gauwe, 1992). Ces externalités budgétaires sont dues à l'évolution divergente des politiques budgétaires et pourraient être prévenues moyennant une meilleure coordination entre les membres de la zone.

Contrairement à l'abondante littérature empirique sur les effets de la politique monétaire, la politique budgétaire était, jusqu'à récemment, l'objet de moins d'attention de la part des économistes. Ce manque d'intérêt contrastait avec la multiplication des débats publics sur les effets macroéconomiques des finances publiques. En outre, alors qu'il existe globalement un consensus sur les effets de la politique monétaire, la thèse selon laquelle la politique budgétaire est un outil efficace de la politique économique ne fait pas l'unanimité au sein des économistes. Blanchard et Perotti (2002), puis Perotti (2002), ont relancé le débat sur l'efficacité de la politique budgétaire en proposant une évaluation de ses effets dynamiques sur les variables macroéconomiques, en particulier sur le PIB. C'est ainsi que des auteurs ont essayé d'analyser le rôle des dépenses publiques dans la croissance économique d'un pays.

Dans la zone UEMOA, l'exercice a été effectué de différentes manières et il a été montré que le sens de la causalité entre les dépenses publiques des Etats et leur croissance n'est pas toujours le même d'un pays à l'autre et même cette causalité varie en fonction de la structure des dépenses effectuées.

L'intégration monétaire entre les pays et plus particulièrement entre les pays de l'UEMOA trouve sa justification dans la mise en place d'intérêts communs et plus encore dans la théorie des zones monétaires optimales. En effet, depuis les travaux de Mundell (1961) en passant par McKinnon (1963) puis par Ingram (1962, 1973), les pays ont beaucoup plus intérêt à mettre en place une zone monétaire optimale selon des critères bien définis afin de profiter de certains avantages qui ne sont pas toujours évidents lorsqu'ils sont seuls.

Depuis quelques années, les pays de l'UEMOA se sont engagés dans une démarche d'harmonisation de leurs politiques économiques notamment les critères de convergence que doit respecter chacun des pays. Parmi ces critères, il a été demandé à chaque pays de l'union que le solde budgétaire de base hors dons sur le PIB soit positif. Or, lorsqu'on se réfère aux différentes études qui ont été menées sur les pays de l'union par rapport à la relation entre les dépenses publiques et la croissance, il a été montré que les dépenses publiques constituent une source de croissance pour certains pays alors que pour d'autres elles n'en constituent pas. Puisque ces différents pays se retrouvent dans une même zone monétaire et économique, il est primordial de se poser la question suivante : quelles sont les implications de ces différences ? Autrement dit, comment coordonner les différentes politiques publiques mises en œuvre dans chacun des pays afin d'éviter les externalités négatives causées par la politique d'un pays sur celle de son voisin sachant bien qu'ils sont tous dans une union économique et monétaire ?

Le présent document tente de répondre à ces différentes questions. Plus précisément il cherche à :
- ✓ Etudier la causalité entre dépenses publiques et croissance au niveau de chaque pays de l'UEMOA ;
- ✓ Comparer les résultats issus de la détermination de ces causalités ;
- ✓ Tirer les implications en termes de coordination de politiques budgétaires.

La suite du travail s'articulera de la façon suivante. La section 2 passe en revue la littérature théorique et empirique sur l'efficacité conjoncturelle des dépenses publiques. La section 3 est consacrée à la présentation des données qui serviront à l'étude ainsi que la méthodologie qui sera adoptée. Enfin, la section 4 donnera respectivement l'analyse empirique et la discussion des résultats.

2. Revue de la litterature

La question du rôle des dépenses publiques dans la croissance a été l'objet de plusieurs réflexions. Sa prise en compte dans les modèles récents de croissance montre toute son importance bien que son efficacité ne fait pas l'humanité au sein des économistes. Nous présentons les débats théoriques et empiriques sur les effets des dépenses publiques sur la croissance économique.

2.1. Débats théoriques sur l'efficacité des dépenses publiques

2.1.1. Les dépenses publiques comme moteur de croissance

Les débats autour de la politique budgétaire qui la considèrent comme un instrument de politique macroéconomique se sont focalisés sur le solde public. Selon les keynésiens, les soldes publics peuvent constituer un moteur de lissage de fluctuations conjoncturelles. En effet, une augmentation des dépenses publiques produit un effet sur la dépense privée (Mills et Quinet 1992). Dans un modèle de croissance à générations imbriquées sans altruisme intergénérationnel, Diamond [1965] analyse le rôle de la dépense publique dans la croissance. Il montre qu'un recours permanent à l'endettement affecte de deux façons l'équilibre du marché des capitaux pourvu que le ratio dette par tête soit constant.

Certains auteurs, notamment Stieglitz et Weiss (1981) ont mis en lumière la place des dépenses publiques dans la résolution des problèmes d'imperfection de l'information aussi bien au niveau du marché des capitaux que du marché du travail. Selon ces auteurs, en raison d'un manque d'information, une banque peut refuser de prêter à des clients pourtant solvables. Au niveau du marché du travail également, les entreprises ne peuvent évaluer la productivité des candidats aux emplois. Pour cela, elles ont tendance à relier la productivité au niveau de salaire demandé. Ainsi, ils aboutissent aux résultats que la dépense publique peut dans ces cas de figures constituer un instrument valable de rétablissement de l'équilibre entre la demande et l'offre.

Les modèles récents de croissance endogène (Romer, 1986, Lucas, 1988, Barro, 1990) estiment pour la plupart qu'en dehors de la prise en compte des externalités, l'Etat exerce une influence directe sur l'efficacité du secteur privé. Ainsi Barro (1990, 1991) améliore le modèle primitif de croissance endogène en intégrant les dépenses publiques. Il a bâti son raisonnement à partir d'une fonction de production de type Cobb-douglas en faisant deux principales hypothèses. Il suppose qu'il n'existe qu'un seul secteur de production et que les rendements

d'échelle sont constants. Il parvient à la conclusion suivante : le volume de dépense publique qui maximise le taux de croissance est tel que le ratio des dépenses publiques au PIB soit égal à la part de revenu national qui reviendrait à l'Etat si les services publics constituaient un facteur de production rémunéré fourni dans un cadre concurrentiel.

Rajhi (1996), quant à lui, développe un modèle qui tient compte des dépenses de l'Etat comme input de la fonction de production. Cependant il abandonne les deux principales hypothèses de Barro (1991). Outre cela, il considère des dépenses publiques supposées accroître la productivité aussi bien dans le secteur des biens de consommation que dans le secteur de l'éducation et elles sont financées d'une manière forfaitaire. Théoriquement, ce modèle réussit l'adjonction des dépenses publiques dans un cadre de croissance endogène avec des rendements d'échelle croissants (Nubukpo, 2003). S'agissant des canaux par lesquels les dépenses publiques peuvent avoir des effets sur la croissance, Tanzi et Zee (1997) en proposent deux. Il s'agit :

➢ directement, par des investissements publics en infrastructure ou des investissements des entreprises publiques qui viennent accroitre les capitaux de l'économie;

➢ indirectement, à travers les dépenses d'éducation, de santé et d'autres services qui contribuent à l'accumulation du capital humain. Ces dépenses ont pour effets d'augmenter la productivité marginale des facteurs de production.

Mais sans remettre systématiquement en cause l'efficacité de la politique budgétaire, certains économistes reconnaissent les effets néfastes d'une utilisation immédiate des finances publiques dans le but d'une régulation conjoncturelle.

2.1.2. L'inefficacité des dépenses publiques

Il n'en manque pas des critiques formulées à l'encontre de l'utilisation des dépenses publiques en vue de la relance d'une économie.

Pour certains, la dépense publique ne traduit pas le choix optimal pour le bien-être social. Arrow (1963) fait remarquer que, le processus de vote présente de nombreuses imperfections soutenu également par Samuelson par la notion de « cavalier libre ».

Les dépenses publiques peuvent induire des comportements de substitution des agents privés (Mills et Quinet, 1992). Cela peut être formalisé de la manière suivante : soit Q la demande privée d'un bien. On suppose qu'elle est décroissante avec le prix (P) de ce bien et du niveau de la dépense publique (G). En notant T^* le taux d'imposition estimé par les agents, on suppose enfin que la demande est croissante de l'illusion fiscale associée au financement de cette dépense publique.

$$Q = a - bP - cG + d(G - T^*)$$

c est le degré de substitution entre la fourniture publique et privée du bien. Dans le cas où la dépense de l'Etat se substitue parfaitement à la dépense privée (c=1) et où G-T^*=0, l'impact de la dépense publique sera nul.

Un certain nombre d'auteurs avec de nouvelles théories se sont dressés contre l'utilisation des finances publiques comme politique économique. Il s'agit de la nouvelle théorie anti-keynésienne des finances publiques (NAK). Selon la NAK, la politique budgétaire expansionniste a des effets dépressifs sur le niveau de production. Cette littérature soutient qu'une politique budgétaire restrictive a des

effets favorables (au pire neutres) sur le niveau de l'activité économique. En effet, ces effets passent par quatre canaux de transmission:

i. La baisse des dépenses publiques induit une anticipation de baisse des impôts. Cela amène les ménages à anticiper une augmentation de leur revenu. D'où une augmentation de la demande privée, et ce d'autant plus que la baisse des dépenses publiques est perçue comme permanente (Giavazzi et Pagano, 1990).

ii. La baisse anticipée des impôts entraîne une anticipation de la réduction des effets de distorsion de la fiscalité par les agents. Cela entraine une augmentation de la production et du revenu. En raison de ces anticipations, la hausse de la consommation présente est supérieure à la baisse initiale des dépenses publiques (Perotti, 1999).

iii. La baisse des dépenses de l'Etat par la réduction de l'emploi public et la baisse anticipée de la taxation du travail entraînent une baisse des salaires, donc une hausse des profits des entreprises, ce qui favorise l'investissement (Alesina et al., 2002).

iv. La baisse des dépenses publiques entraîne une augmentation de l'investissement. En effet, la réduction des dépenses publiques entraine une anticipation de baisse durable des taux d'intérêt de court terme qui fait baisser du même coup les taux longs.

2.2. Travaux empiriques

Plusieurs études empiriques ont essayé d'analyser les effets de la dépense publique sur la croissance. De façon spécifique il s'agissait pour certaines d'évaluer le lien de causalité qui pourrait exister entre les deux variables macroéconomiques, ce pour confirmer ou infirmer les idées soutenues dans les débats théoriques.

Les résultats empiriques sur le lien de causalité entre les dépenses publiques et la croissance restent beaucoup plus controversés. En effet, le fait de faire valoir que le premier est à l'origine du second ou vice versa constitue l'objet d'un débat animé et les résultats empiriques varient d'un pays à un autre. Alors que certaines études mettent en évidence une relation de causalité dans un seul sens, d'autres établissent au contraire une causalité réciproque. De plus, toutes les dépenses publiques n'ont pas les mêmes effets. Si certaines ont un effet de court terme, d'autres au contraire ont un effet de long terme et d'autres n'ont même pas d'effet.

Concernant les pays en développement, l'on peut citer l'étude de Ouattara (2007) appliquée aux pays de l'UEMOA qui met en évidence sur la base des tests de causalité que la croissance et les dépenses s'influencent réciproquement. Cette causalité à double sens a été aussi obtenue par Cheng et Wei (1997) dans le cas de la Corée du Sud sur la période (1954-1994). La particularité de cette étude réside dans le fait que ces auteurs, en intégrant la demande de monnaie dans leur système de vecteurs et après le test de stationnarité de Phillips-Perron suivi du test de causalité de Granger, aboutissent à la conclusion selon laquelle qu'il y a causalité à double sens entre les dépenses publiques et la croissance économique en Corée du Sud et que la demande de monnaie influence la croissance économique. La principale critique que l'on peut formuler en l'encontre de la démarche de Ouattara est qu'il a raisonné sur la base des données de panel en mettant tous les pays de l'UEMOA ensemble, ce qui cache donc les spécificités relatives à chacun des pays concernés. Dans le même sens, Ben et Hassad

(2006) dans leur analyse en coupe transversale sur l'efficience du financement des services publics et croissance dans 45 pays en développement, sur la période 1990-2002, ont montré par une estimation économétrique que les dépenses ne sont pas encore porteuses de croissance dans les Pays en Voie de Développement. Par ailleurs, ces auteurs montrent que les dépenses publiques d'éducation et de santé sont porteuses de croissance économique si ces dépenses sont utilisées d'une manière efficace. Au lieu de procéder à une analyse en données de panel, Nubukpo (2003) dans son étude sur les pays de l'UEMOA (période 1965-2000) établit sur la base d'un modèle à correction d'erreur appliquée à chaque pays, qu'à court terme, les dépenses publiques totales n'ont pas d'impact significatif sur la croissance dans la majorité des économies de l'Union. A long terme, la hausse des dépenses publiques a un impact sur la croissance nettement différencié par pays. Par ailleurs, il montre que la prise en compte de la composition des dépenses publiques conduit à mettre en évidence l'effet négatif des dépenses de consommation publique sur la croissance à court et à long termes dans l'Union. S'agissant des dépenses publiques d'investissement, leur impact est positif, essentiellement à long terme, sur la croissance des économies de l'UEMOA. Cependant, Nubukpo n'a pas étudié la causalité entre les dépenses et la croissance pour savoir si d'un pays à l'autre laquelle des variables cause l'autre ou si les deux s'influencent réciproquement. A l'aide d'un modèle à correction d'erreur, Morley et Perdikis (2000), concluent dans le cas de l'Egypte, à l'existence à long terme d'un effet positif des dépenses publiques totales sur la croissance, notamment après les réformes fiscales de 1974 et 1991. Cependant, à court terme aucun effet significatif n'a pu être mis en évidence. Au contraire, Nelson et Singh (1994) n'ont trouvé aucun effet significatif des déficits budgétaires (autre mode de financement des dépenses publiques) sur la croissance dans les pays en développement au cours des années 1970 et 1980.

Cherchant à faire ressortir des relations causales entre l'investissement public et la croissance économique, Ashipala et Haimbodi (2003) s'intéressent au cas de la Namibie. Leur objectif principal était de vérifier empiriquement l'hypothèse selon laquelle l'investissement public cause l'investissement privé. Les résultats auxquels ils aboutissent grâce aux tests de causalité montrent deux relations de long terme entre le niveau d'activité économique (mesuré par le PIB), l'investissement public et l'investissement privé. Ces relations de long terme indiquent d'une part qu'une augmentation de l'investissement public a un effet positif sur la croissance économique en Namibie et d'autre part l'existence d'une complémentarité entre investissement public et investissement privé. Concernant l'investissement public et la croissance économique, Keho (2004), utilisant un modèle économétrique dynamique et une série de tests statistiques, établit pour la Côte d'Ivoire l'existence d'une complémentarité à long terme entre investissement privé et public et un effet positif de l'investissement public sur la croissance de long terme. En établissant son analyse sur la base de la causalité de Granger, dans une dynamique de court terme, il montre que c'est la croissance qui cause l'investissement public en Côte d'Ivoire et non l'inverse. Signalons que cette étude ne s'est pas intéressée aux dépenses publiques de façon générale mais à une de ses composantes.

Safa (1999) s'investit dans la vérification empirique de la loi de Wagner sur les données de la Turquie sur la période (1950-1990). Partant des modèles multivariés en termes de cointégration, l'auteur cherche les relations de long terme

entre les dépenses publiques et la croissance du PIB réel. En utilisant la cointégration et la causalité au sens de Granger, il conclut au rejet de la loi de Wagner sur les données de la Turquie.

Tableau 1 : Tableau récapitulatif des études empiriques

Auteurs et année d'étude	Pays	Résultats obtenus
Ouattara (2007)	Pays de l'UEMOA Période : 1980-2004	La croissance et les dépenses s'influencent réciproquement.
Ben, S. et Hassad, M. (2006)	Coupe transversale, 45 pays en développement. Période : 1990- 2002	Les dépenses publiques ne sont pas encore porteuses de croissance dans les pays en développement.
Keho, Y. (2004)	Côte d'Ivoire Période : 1965-1999	A long terme l'investissement public a un effet positif sur l'investissement privé et la croissance. A court terme, c'est la croissance qui cause l'investissement public et non l'inverse.
Ashipala, J. et Haimbodi, N. (2003)	Namibie Période : 1980-2001	A long terme un effet positif entre le niveau d'activité économique (mesuré par le PIB), et entre l'investissement public et l'investissement privé.
Nubukpo (2003)	Pays de l'UEMOA Période : 1965-2000	A court terme les dépenses publiques n'ont pas un impact dans tous les pays. A long terme les dépenses ont un impact sur la croissance des différents pays.
Morley et Perdikis (2000)	Egypte Période : 1974-1991	Les dépenses publiques ont un effet positif sur la croissance à long terme.
Kweka, J. et Morrissey, O. (1999)	Tanzanie Période : 1965-1996	Ils obtiennent une relation non entre l'investissement public et privé. Egalement, il existe une causalité à sens unique allant de la consommation publique vers la consommation privée
Safa, D. (1999)	Turquie Période : 1950-1990	Rejet de la loi de Wagner sur les données de la Turquie. Autrement dit, le PIB ne cause pas les dépenses publiques.
Cheng, S. et Wei, L. (1997)	Corée du sud Période : 1954-1994	Causalité à double sens entre dépenses publiques et la croissance économique. La demande de monnaie influence la croissance économique.
Khalifa H. Ghali (1997)	Arabie Saoudite Période: 1963-1993	l'hypothèse selon laquelle les dépenses publiques causent la croissance économique n'a pas été vérifiée.
Nelson et Singh (1994)	Pays en développement de 1970-1980	Aucun effet significatif n'a été trouvé.

Source : Les auteurs

La causalité au sens de Granger sur les données de la Tanzanie permet également à Kweka et Morrissey (1999) d'aboutir aux résultats peu convaincants sur les relations causales entre les dépenses publiques totales et le PIB. En procédant à une désagrégation des dépenses publiques, ces auteurs concluent à une relation ambigüe entre l'investissement public et privé. Cependant, une causalité à sens unique est concluante de la consommation publique vers la consommation privée. A partir d'un modèle Vectoriel Autorégressif (VAR), Ghali (1997) a tenté d'expliciter la nature de la causalité entre les dépenses publiques et la croissance économique en Arabie Saoudite. En accordant une attention au test de causalité au sens de Granger, l'auteur montre que l'hypothèse selon laquelle les dépenses publiques causent la croissance économique est rejetée et, partant de ce fait, la politique fiscale visant le contrôle des déficits budgétaires s'avère inefficace.

3. Données et methodologie

3.1. Données

Un certain nombre de variables sont souvent utilisées pour représenter l'activité économique. Comme proxy de l'activité économique, on utilise le plus souvent soit le Produit Intérieur Brut (PIB), ou le Produit National Brut (PNB) et dans certains cas, celui du revenu national ou la production industrielle. Dans le cas de notre étude, nous considérons le PIB réel comme proxy de l'activité économique et les dépenses publiques seront prises dans toutes ses composantes. Les données que nous allons utilisées sont issues du CD Rom de la Banque Mondiale et complétées pour quelques années par des données issues des documents de la BAD. Les séries vont de 1967 à 2007. Pour ce qui concerne les dépenses publiques du Niger, les données proviennent des documents de la BAD et couvrent la période 1989-2007. Par ailleurs, ces données feront l'objet d'une transformation logarithmique. Les notations adoptées seront les suivantes :
LPIB = logarithme du PIB réel
LDEP = logarithme des dépenses publiques.

3.1. Méthodologie

Dans cette étude, nous utiliserons la cointégration et le modèle à correction d'erreur pour étudier la relation de causalité entre le PIB et les dépenses publiques au sein de la zone UEMOA. Notre méthodologie est basée sur une approche en trois étapes. La première étape consiste à vérifier les propriétés des séries chronologiques (stationnarité et ordre d'intégration) à l'aide des tests de racine unitaire de Dickey-Fuller, Phillips-Perron (PP) et le test Kwiatkowski, Phillips, Schmidt et Shin (KPSS). La deuxième étape utilise la théorie de la cointégration développée par Engle et Granger (1987) pour examiner la relation de long terme entre le PIB et les dépenses publiques. Enfin, dans la troisième étape, le test de causalité de Granger dans le cadre d'un modèle à correction d'erreur est effectué pour déterminer la direction de la causalité entre le PIB et les dépenses publiques.

3.2.1. Tests de stationnarité

La spécification d'un modèle nécessite que les variables soient stationnaires, ce pour éviter le risque de régressions fallacieuses. Il existe

plusieurs tests statistiques pour déterminer l'ordre d'intégration des séries. Il faut noter que tous ces tests comportent des biais, ce qui fait penser que la détermination de l'ordre d'intégration ne saurait être rigoureuse à partir d'un seul test (Keho, 2004). C'est pour cette raison que nous allons utiliser plusieurs tests : Le premier test est le test usuel de racine unitaire de Dickey-Fuller (ADF). Ce test prend en compte uniquement la présence d'auto-corrélation dans les séries. L'hypothèse nulle est la présence de racine unitaire (non stationnaire). En plus du test ADF, il y a le test de Phillips-Perron(PP) et le test de Kwiatkowski, Phillips, Schmidt et Shin (KPSS). Le test KPSS repose sur la décomposition de la série étudiée en une partie déterministe, une marche aléatoire et un bruit blanc. L'hypothèse nulle du test est la stationnarité des séries.

3.2.2. Test de cointégration

Après avoir effectué les tests de stationnarité puis déterminer les ordres d'intégration des séries, l'étape suivante consiste à examiner l'existence d'une relation de cointégration entre les séries. Car lorsque des séries sont cointégrées alors il y a une relation de long terme qui les unit. Un vecteur (n, 1) (Z_t) est cointégré si chaque composante Z_{it} est intégré d'ordre d et il existe β un vecteur (1, n) tel que βZ_t soit intégré d'ordre inferieur, c'est-à-dire d'ordre d-b avec $1 \leq b \leq d$. L'analyse de la cointégration se fera d'une part suivant la procédure de Johansen (1988) qui est plus efficace que la procédure en deux étapes de Engle et Granger (1987) surtout quand on est face à un échantillon de faible taille (Keho, 2004) et d'autre part suivant la procédure de Pesaran et al (2001). La mise en œuvre du test de cointégration selon la procédure de Johansen requiert au préalable l'estimation d'un modèle Vectoriel Autorégressif (VAR).
Considérons le modèle VAR(p) suivant :

$$X_t = A_0 D_t + \Pi_1 X_{t-1} + \cdots + \Pi_p X_{t-p} + U_t \qquad (1)$$

où (X_t) est un vecteur (n, 1) des variables ; D_t un vecteur de termes déterministes ; et U_t est un vecteur d'impulsions ($U_t \leadsto iid(0, \Omega)$). Selon le théorème de représentation de Engle et Granger (1987), le modèle vectoriel autorégressif précédent admet une spécification vectorielle à correction d'erreur (VEC) de la forme :

$$\Delta X_t = A_0 D_t + \Pi X_{t-1} + \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_p \Delta X_{t-p+1} + U_t \qquad (2)$$

où les matrices Π et Γ_i contiennent respectivement les coefficients de long terme et de court terme. La détermination du test de Johansen repose sur le rang (r) de Π.
La procédure du test de Johansen permet de spécifier trois modèles :

- (a) Si le rang de Π est égal à n, alors X_t est stationnaire en niveau. Dans ce cas l'estimation traditionnelle du VAR en niveau est appropriée ;
- (b) Si le rang de Π est nulle, alors $\Pi = 0$. Dans ce cas, il n'existe aucune relation de cointégration entre les variables du modèle et l'estimation appropriée est celle du VAR en différence première ;
- (c) Si Π est de rang r inferieur à n, il existe deux matrices α et β de dimension (n, 1) telles que $\Pi = \alpha\beta^t$ où β représente la matrice de

cointégration qui rend stationnaire la combinaison βX_{t-1} et α la matrice constituée des coefficients d'ajustement de court terme.

Le test de Johansen repose sur deux statistiques de rapport de vraisemblance. Le premier test pose comme hypothèse $H_0 : rang(\Pi) = r$ contre l'hypothèse $H_1 : rang(\Pi) = n$. La statistique est :

$$Trace = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \text{ pour } r = 0, \dots, n - 1 \qquad (3)$$

où $\hat{\lambda}_i$ i^{ième} valeur propre maximale. Le second test pose comme hypothèse $H_0 : rang(\Pi) = r$ contre l'hypothèse $H_1 : rang(\Pi) = r + 1$. La statistique du test est la valeur propre maximale définie par :

$$\hat{\lambda}_{max} = -T ln(1 - \hat{\lambda}_{r+1}) \qquad (4)$$

Ces statistiques ne suivent pas une distribution du Chi-deux. Les valeurs critiques asymptotiques ont été calculées à l'aide de simulations numériques. Dans la pratique, le test se fera de façon séquentielle pour $r = 0, 1, \dots, n - 1$.

Pesaran et al. (2001) proposent une méthode pour tester l'existence d'une cointégration entre des séries. Il s'agit d'une méthode plus générale que celle développée précédemment. En effet, pour effectuer ce test, les séries n'ont plus l'obligation d'être intégrées du même ordre. On peut donc utiliser des séries qui sont intégrées d'ordre 0 ou 1 alors que dans le cas du test de Johansen, les séries doivent être intégrées du même ordre. Ainsi, Pesaran et al formulent un modèle à correction d'erreur qui dans notre cas peut se présenter comme suit :

$$\Delta LPIB_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta LPIB_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta LDEP_{t-i} + \alpha_3 LPIB_{t-1} + \alpha_4 LDEP_{t-1} + \mu_t$$

$$(5)$$

Le test de Fischer est appliqué aux premiers retards des deux variables en niveau pour tester la cointégration. L'hypothèse nulle du test est :

$$H_0 : \alpha_3 = \alpha_4 = 0 \qquad (6)$$

La F-statistique est comparée aux deux valeurs tabulées par Pesaran et al (2001). La première valeur correspond à la valeur lorsque la variable explicative est I(0) et la deuxième valeur correspond au cas où celle-ci est I(1). Si la F-statistique est inferieure à la faible valeur, alors il n'y a pas de relation de cointégration. Si elle est entre les deux valeurs, aucune conclusion claire ne peut être tirée. Mais si la F-statistique est supérieure à la valeur élevée, alors il y a cointégration entre les séries. Après qu'on ait déterminé la relation de cointégration, la relation de long terme s'écrit comme suit :

$$LPIB_t = \alpha_0 + \alpha_1 LDEP_t + \mu_t \qquad (7)$$

Avec $\alpha_1 = -\frac{\alpha_4}{\alpha_3}$. Quant à la relation de court terme, elle est estimée par la formule :

$$\Delta LPIB_t = \alpha_0 + \alpha_1 ECM_{t-1} + \sum_{i=1}^{m} \alpha_{2i} \Delta LPIB_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta LDEP_{t-i} + \mu_t$$

$$(8)$$

où ECM_{t-1} est la valeur retardée des erreurs obtenues à partir de la relation de long terme.

3.2.3. Test de causalité

Notre étude cherche à tester la relation de causalité entre les dépenses publiques et le PIB. Dans cette perspective, elle mobilise la notion de causalité au sens de Granger (1988). Une variable Y cause au sens de Granger une variable X si les valeurs passées de Y contribuent à expliquer la valeur contemporaine de X par rapport aux seules valeurs passées de cette dernière. Sur le plan statistique, le test de causalité au sens de Granger revient à un test de significativité globale des coefficients associés aux valeurs passées de la variable causale dans l'équation de la variable causée. Le cadre statistique de ce test suppose la stationnarité des variables en jeu. Selon Granger, une variable stationnaire X cause une autre variable stationnaire Y, si la connaissance des valeurs passées de X rend meilleure la prédictibilité de Y. En d'autres termes, la variable X ne cause pas Y (au sens de Granger) si :

$$Pr(Y_{t+m}/\Psi_t) = Pr(Y_{t+m}/\Omega_t) \qquad (9)$$

où $Pr(*)$ désigne la probabilité conditionnelle, Ψ_t est l'ensemble d'information disponible à la date t et Ω_t l'ensemble d'information obtenu en excluant toute information relative à X de Ψ_t. Si donc les valeurs retardées de X et de Y améliorent l'explication de Y par rapport aux seules valeurs retardées de cette seule variable, alors X cause Y au sens de Granger. Les tests de causalité de Granger consistent alors à examiner si la valeur contemporaine de Y est liée significativement aux valeurs retardées de cette même variable, et des valeurs retardées de X que l'on considère comme la variable causante. Deux grandes familles de tests de causalité au sens de Granger sont envisageables. On distingue, en premier lieu, les procédures de tests dites séquentielles qui imposent d'étudier de manière précise la stationnarité des variables et la présence éventuelle d'une relation de cointégration avant de conduire le test de causalité. Lorsque les séries sont intégrées d'ordre un et cointégrées, l'estimation d'un VAR en différences premières n'est pas appropriée; il convient de reparamétrer le modèle sous la forme d'un modèle vectoriel à correction d'erreur (Engle et Granger, 1987; Johansen, 1988). L'existence d'une relation de cointégration suggère une causalité dans au moins une direction. Les approches séquentielles permettent ainsi d'effectuer un test de causalité sur la dimension de court terme et un test sur la dimension de long terme (Toda et Phillips, 1993). Ces tests s'effectuent à partir de l'estimation du modèle sous la forme (VAR), éventuellement cointégré (VECM). La représentation vectorielle à correction d'erreur permet d'écrire :

$$\Delta LPIB_t = \sum_{j=1}^{p-1}\left[\Theta_{1j}\Delta LPIB_{t-j} + \Theta_{2j}\Delta LDPUB_{t-j}\right] + \alpha_1 ECM_{t-1} + \xi_{1t} \quad (10)$$

$$\Delta DPUB_t = \sum_{j=1}^{p-1}\left[o_{1j}\Delta LPIB_{t-j} + \phi_{2j}\Delta LDPUB_{t-j}\right] + \alpha_2 ECM_{t-1} + \xi_{2t} \quad (11)$$

Les tests de causalité consistent à tester à l'aide des tests de Fisher ou de Wald, la nullité des coefficients Θ_{2j}, ϕ_{1j} et α dans les équations précédentes.

Cependant, le recours à ce protocole de tests préliminaires peut conduire à des biais importants potentiels à chaque étape tels que l'inférence causale devienne incertaine (Keho, 2008). Selon Toda et Yamamoto (1995), ce qui importe fondamentalement pour l'économiste n'est pas de savoir si les variables sont intégrées voire cointégrées, mais de tester des restrictions matérialisant des hypothèses théoriques. L'approche du test de causalité développée par Toda et Yamamoto (1995) permet d'étudier la causalité dans un système de variables non stationnaires éventuellement cointégrées. La nécessité d'étudier la cointégration est outrepassée par une surparamétrisation non optimale du VAR. Concrètement, la procédure de Toda et Yamamoto se réalise en deux étapes. Tout d'abord, il s'agit de déterminer l'ordre d'intégration maximal (d_{max}) des séries et le nombre de retards optimal (k) du processus VAR en niveau. Cette étape est réalisée en utilisant les tests de stationnarité. Ensuite, il faut estimer un modèle VAR en niveau augmenté d'ordre $d = k + d_{max}$. Si les séries sont stationnaires, aucun retard additionnel n'est introduit dans le VAR, et la procédure de test suit l'approche standard. En revanche, si les séries sont intégrées d'ordre un, alors un seul retard supplémentaire est introduit dans le modèle. Le modèle qui sert de base pour l'inférence causale est spécifié de la façon suivante :

$$LPIB_t =$$

$$\alpha_0 + \sum_{i=1}^{k} \alpha_{1i} LPIB_{t-i} + \sum_{j=k+1}^{k+d_{max}} \alpha_{2i} LPIB_{t-j} + \sum_{i=1}^{k} \phi_{1i} LDEP_{t-i} + \sum_{j=k+1}^{k+d_{max}} \phi_{2i} LDEP_{t-j}$$

$$\varsigma_1 t + \mu_t \qquad (12)$$

$$LDEP_t =$$

$$\beta_0 + \sum_{i=1}^{k} \beta_{1i} LDEP_{t-i} + \sum_{j=k+1}^{k+d_{max}} \beta_{2i} LDEP_{t-j} + \sum_{i=1}^{k} \theta_{1i} LPIB_{t-i} + \sum_{j=k+1}^{k+d_{max}} \theta_{2i} LPIB_{t-j}$$

$$\varsigma_2 t + \lambda_t \qquad (13)$$

Pour réaliser le test de causalité sur le modèle « augmenté », on applique des tests de restrictions uniquement sur les *k* premiers coefficients des modèles (12) et (13). Les autres coefficients sont en réalité nuls et sont une surparamétrisation volontaire qui sert à incorporer dans le VAR la dimension potentiellement cointégrée des variables. Ainsi, dans l'équation (12), l'hypothèse que LDEP ne cause pas LPIB revient à tester formellement la nullité des coefficients ϕ_{1i}. De même, dans l'équation (13), l'hypothèse que LPIB ne cause pas LDEP revient à tester la nullité des coefficients θ_{1i}. La statistique de test de Wald modifiée suit asymptotiquement une distribution chi-deux et reste indépendante de l'ordre d'intégration des variables. La procédure de test est robuste même si les variables sont intégrées d'ordres différents ou possiblement cointégrées (Keho, 2008).

4. Resultats empiriques

4.1. Analyse descriptive

Le tableau 2 donne l'évolution du taux de croissance du PIB en moyenne annuelle des pays de l'UEMOA sur la période 1967-2007. On peut ainsi observer dans le cas du Bénin et du Niger que la période 1996-2000 a été celle qui a enregistré le plus fort taux de croissance (5,35%) alors que la période

correspondante pour le Burkina Faso, le Sénégal et le Mali est 2001-2007 où le taux de croissance se situe respectivement à 6,23%, 4,97% et 7,40%. Par contre pour la Côte d'Ivoire et le Togo, cette période est 1967-1980. La longue période de crise des années 80 et début 90 a marqué un ralentissement de l'activité économique à tel point que les pays comme le Mali, le Niger et le Togo ont enregistré un taux de croissance négatif.

Tableau 2: L'évolution du PIB des pays de l'UEMOA(%)

Pays	1967-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2007
Bénin	2,80	4,66	0,89	4,25	5,35	4,75
Burkina Faso	2,97	4,18	2,64	3,84	4,32	6,23
Côte d'Ivoire	6,71	0,32	1,18	1,51	3,21	0,34
Sénégal	2,05	3,23	3,22	1,53	4,42	4,97
Mali	3,98	-2,25	3,86	2,99	5,19	7,40
Togo	4,81	-0,24	2,51	0,61	4,52	1,14
Niger	-	-2,32	2,60	0,81	3,23	1,50

Source: Banque Mondiale (2007) et Banque Africaine de Développement (2007)

Le tableau 3 quant à lui retrace l'évolution en moyenne annuelle du taux de croissance des dépenses publiques. Signalons que lorsqu'on parle de dépenses publiques, on parle des dépenses effectuées par l'Etat en matière de santé, éducation ou formation, des dépenses de fonctionnement de l'administration et des autres dépenses effectuées dans les autres secteurs. Lorsqu'on regarde l'évolution de ces dépenses dans le cas des pays de l'UEMOA, il est à remarquer que de façon globale le taux de croissance de ces dépenses varie d'une période à l'autre et d'un pays à l'autre. Lorsqu'on compare les deux périodes 1991-1995 et 1996-2000, on constate qu'après la dévaluation du FCFA, seules les dépenses de la Côte d'Ivoire ont connu un taux de croissance négatif (-0,98%). Le Bénin (14,79%) et le Sénégal (10,74%) sont les deux pays ayant enregistré le taux de croissance le plus élevé au cours de la période 1996-2000.

Tableau 3: L'évolution des dépenses publiques des pays de l'UEMOA(%)

Pays	1967-1980	1981-1985	1986-1990	1991-1995	1996-2000	2001-2007
Bénin	5,11	-1,18	2,26	5,21	14,79	1,74
Burkina Faso	8,25	15,45	0,60	2,15	5,37	4,73
Côte d'Ivoire	9,30	-6,49	-4,74	7,62	-0,98	3,98
Sénégal	1,60	2,41	6,62	1,32	10,74	4,31
Mali	4,94	3,18	6,46	-1,93	7,26	5,09
Togo	9,71	-5,51	9,16	-7,66	5,77	-0,88
Niger	-	3,35	6,31	-6,06	5,17	6,16

Source: Banque Mondiale (2007) et Banque Africaine de Développement (2007)

4.2. Test de stationnarité

Le tableau 4 indique qu'à l'exception de la variable dépense publique (DEP) du Mali, les autres séries sont intégrées d'ordre 1. En effet, les tests ADF, PP et KPSS effectués sur les séries en niveau montrent qu'aucune de ces séries n'est stationnaire. Pour ce faire, il a fallu différencier une fois les différentes séries et d'effectuer les mêmes tests précédemment pour obtenir leur stationnarité. Ainsi,

il faut signaler que pour effectuer certains tests comme les tests de cointégration, la méthodologie exige d'abord d'effectuer les tests de stationnarité afin de voir le comportement des séries analysées.

Tableau 4 : Résultats des tests de stationnarité

Pays	Variables	En niveau			En différence première			Conclusion
		ADF	PP	KPSS	ADF	PP	KPSS	I()
Bénin	LPIB	7,25	7,72	0,18*	-5,40*	-5,35*	0,34	I(1)
	LDEP	-2,47	-2,52	0,11	-6,29*	-6,29*	0,05	I(1)
Burkina Faso	LPIB	2,50	8,43	0,16*	-5,94*	-8,25*	0,07	I(1)
	LDEP	-3,06	-2,33	0,13	-5,96*	-6,07*	0,07	I(1)
Côte d'Ivoire	LPIB	-2,74	-4,00	0,16*	-3,33*	-3,64*	0,13	I(1)
	LDEP	-2,33	-2,43	0,12	-5,32*	-5,27*	0,17	I(1)
Mali	LPIB	4,26	-4,26	0,15*	-6,32*	-4,86*	0,30	I(1)
	LDEP	-3,97*	-4,03*	0,05	-	-	-	I(0)
Niger	LPIB	-2,571	-2,663	0,079	-4,856*	-4,849*	0,134	I(1)
	LDEP	0,763	1,475	0,137	-4,932*	-5266*	0,252	I(1)
Sénégal	LPIB	4,29	-6,28	0,19*	-7,68*	-7,89*	0,36	I(1)
	LDEP	-3,34	-3,34	0,19*	-6,59*	-7,52*	0,28	I(1)
Togo	LPIB	-3,10	-3,14	0,10	-6,43*	-6,45*	0,05	I(1)
	LDEP	-2,63	-2,64	0,17	-6,34*	-6,34*	0,20	I(1)
Note : * indique le rejet de l'hypothèse nulle au seuil de 5%.								

Source : Calculs de l'auteur

4.3. Test de cointégration

Comme pour la plupart des pays les deux séries sont non stationnaires. Il s'agira ainsi dans cette sous section de faire le test de cointégration pour chaque pays. Le test de cointégration que nous mettons en œuvre ici est le test de Johansen et celui de Pesaran et al. (2001). Les résultats du test de Johansen sont résumés dans le tableau 5 et ceux de Pesaran et al dans le tableau 6.

Tableau 5 : Résultats du test de cointégration de Johansen

Pays	H0	H1	$\lambda - trace$	Valeur critique à 5%	$\lambda - Max$	Valeur critique à 5%
Bénin	r=0	r=1	25,77*	20,26	18,84*	15,89
	r<1	r=2	6,94	9,16	6,94	9,16
Burkina Faso	r=0	r=1	13,41	15,49	11,88	14,26
	r<1	r=2	1,54	3,84	1,54	3,84
Côte d'Ivoire	r=0	r=1	14,65	15,49	8,73	14,26
	r<1	r=2	5,92	3,84	5,92	3,84
Niger	r=0	r=1	17,42	25,87	13,14	19,39
	r<1	r=2	4,28	12,52	4,28	12,52
Sénégal	r=0	r=1	16,80*	15,49	14,03	14,26
	r<1	r=2	2,77	3,84	2,77	3,84
Togo	r=0	r=1	9,89	15,49	9,36	14,26
	r<1	r=2	0,54	3,84	0,54	3,84
Note : r est le nombre de vecteurs de cointégration. (*) rejet de H0 au seuil de 5%.						

Source : Calculs de l'auteur

Les résultats du test de cointégration de Johansen montrent que seulement les variables de deux pays (Bénin et Sénégal) sont cointégrées.

Tableau 6 : Résultats du test de cointégration de Pesaran et al (2001)

		k	table	F-stat	valeurs critiques à 5%		Cointégration	θ_2
					$1^{\text{ière}}$ valeur	2nde valeur		
Bénin	LPIB	1	CI(v)	1,48	6,56	7,30	Non	-
	LDEP		CI(i)	4,34*	3,15	4,11	Oui	0,98 (14,90)*
Burkina Faso	LPIB	1	CI(i)	18,82*	3,15	4,11	Oui	0,64 (16,24)*
	LDEP		CI(v)	5,56	6,56	7,30	Non	-
Côte d'Ivoire	LPIB	1	CI(i)	5,61*	3,15	4,11	Oui	0,47 (2,33)*
	LDEP		CI(i)	4,19*	3,15	4,11	Oui	0,27 (2,32)*
Mali	LPIB	1	CI(i)	5,35*	3,15	4,11	Oui	0,73 (15,34)*
Niger	LPIB	1	CI(v)	2,66	3,15	4,11	Non	-
	LDEP		CI(i)	2,10			Non	-
Sénégal	LPIB	1	CI(v)	2,59	6,56	7,30	Non	-
	LDEP		CI(iii)	6,96*	4,94	5,73	Oui	1,12 (23,93)*
Togo	LPIB	1	CI(v)	5,97	6,56	7,30	Non	-
	LDEP		CI(iii)	2,75	4,94	5,73	Non	-
Notes : les valeurs critiques sont issues de Pesaran et al (2001). θ_2 est le coefficient de la variable explicative dans la relation de long terme. (*) indique le rejet de l'hypothèse nulle ($\theta_2 = 0$) au seuil de 5%.								

Source : Calculs de l'auteur

4.3. Estimation et test de causalité

Tableau 7: Résultats du test de causalité de Granger

Pays	Variables dépendantes	Variables causales		ECM (-1)
		$\Delta LPIB$	ΔDEP	
Bénin	$\Delta LPIB$	-	0,44 (0,513)	1,11 (0,299)
	$\Delta LDEP$	1,97 (0,168)	-	6,88 (0,012)*
Burkina Faso	$\Delta LPIB$	-	0,12 (0,735)	0,29 (0,595)
	$\Delta LDEP$	1,34 (0,255)	-	7,03 (0,011)*
Côte d'Ivoire	$\Delta LPIB$	-	0,06 (0,698)	3,65 (0,070)**
	$\Delta LDEP$	3,34 (0,023)*	-	4,44 (0,047)*
Niger	$\Delta LPIB$	-	2,46 (0,131)	0,69 (0,414)
	$\Delta LDEP$	0,19 (0,664)	-	2,27 (0,138)
Sénégal	$\Delta LPIB$	-	0,03 (0,869))	0,03 (0,870)
	$\Delta LDEP$	0,05 (0,831)	-	11,09 (0,002)*
Togo	$\Delta LPIB$	-	0,15 (0,697)	1,30 (0,298)
	$\Delta LDEP$	2,39 (0,131)	-	5,09 (0,03)*
Note : les valeurs entre parenthèses donnent les p-value.				

Source : Calculs de l'auteur

Les résultats du test de causalité de Granger sont présentés dans le tableau 7. Il indique la relation de causalité entre les dépenses publiques et la

croissance économique dans chaque pays. Mais il faut signaler qu'à travers ce test, la relation de causalité n'existe pas pour certains pays.

Le test de causalité au sens de Granger proposé par Toda et Yamamoto révèle une hétérogénéité au niveau des différents pays. Il ressort (tableau 8) qu'il n'y a pas de causalité à double sens. Pour le Bénin et la Côte d'Ivoire, il apparait une relation de court terme du PIB vers les dépenses publiques (DEP). Ce même résultat a été trouvé par Keho (2004). Pour le reste des pays, à l'exception du Togo où aucune causalité n'a été relevée, il s'agit d'une relation de causalité allant des dépenses publiques vers le PIB.

Tableau 8 : Résultats du test de causalité de Toda & Yamamoto

	LPIB cause LDEP		LDEP cause LPIB		Conclusion
Pays	x^2	P-value	x^2	P-value	
Bénin	3,69	0,055**	0,05	0,930	LPIB cause LDEP LDEP ne cause pas LPIB
Burkina Faso	1,94	0,860	15,93	0,007*	LDEP cause LPIB LPIB ne cause pas LDEP
Côte d'Ivoire	13,66	0,018*	2,26	0,810	LPIB cause LDEP LDEP ne cause pas LPIB
Mali	2,69	0,260	2,88	0,089**	LDEP cause LPIB
Niger	0,17	0,684	2,82	0,093**	LDEP cause LPIB LPIB ne cause pas LDEP
Sénégal	0,02	0,876	4,32	0,038*	LDEP cause LPIB LPIB ne cause pas LDEP
Togo	0,93	0,968	3,31	0,619	LPIB ne cause pas LDEP LDEP ne cause pas LPIB

*Notes : *(**) indique le rejet de l'hypothèse nulle au seuil de 5%(10%).*
Source : Calculs de l'auteur

4.4. Discussion des résultats et implications de politiques économiques

Dans cette partie, nous analysons les relations causales entre les dépenses publiques et la croissance économique pour chacun des pays de l'UEMOA. Signalons que la technique de causalité que nous analysons ici est celle de Toda et Yamamoto (tableau 8).

De façon générale, les résultats du test de causalité font remarquer que le sens de la causalité n'est pas le même d'un pays à un autre, ce qui permet d'affirmer qu'il y a une certaine hétérogénéité de la causalité entre les dépenses publiques et la croissance économique au sein des pays de la zone UEMOA.

Le tableau 8 résume l'ensemble des relations de causalité des différents pays. D'après ce tableau, nous pouvons regrouper la causalité en deux groupes :

(1) : *Le premier groupe* qui concerne le *Bénin* et la *Côte d'Ivoire* est celui pour lequel c'est le Produit Intérieur Brut (PIB) qui cause les dépenses publiques. Dans ces deux pays, la loi de Wagner est donc vérifiée. En effet, d'après cette loi, « plus la société se développe, plus l'État est dispendieux », ce qui signifie que la part des dépenses publiques dans le PIB augmente avec le revenu par tête. Ainsi, selon Adolph Wagner, l'augmentation des dépenses publiques s'explique par l'apparition de deux catégories de nouveaux besoins : plus l'économie se

développe, plus l'État doit investir en infrastructures publiques et d'autre part, plus le niveau de vie de la population augmente, plus celle-ci accroît sa consommation de biens dits supérieurs, comme les loisirs, la culture, l'éducation, la santé, etc. qui sont des biens dont l'élasticité-revenu est supérieure à 1. En d'autres termes, la consommation de ces biens augmente plus vite que le revenu de la population. Par ailleurs, d'après nos estimations, à long terme, l'impact du PIB sur les dépenses publiques est positif dans ces deux pays. Cet impact est de 0,98 pour le Bénin et de 0,27 pour la Côte d'Ivoire Le coefficient associé à la force de rappel est négatif dans les deux pays (-0,35 pour le Bénin et -0,38 pour la Côte d'Ivoire) et significativement différent de zéro au seuil de 5%. Ce qui vient confirmer le fait qu'à long terme les déséquilibres entre les dépenses publiques et le Produit Intérieur Brut se compensent de sorte que les deux séries ont des évolutions similaires.

(2) : *Le deuxième groupe* qui concerne le *Burkina Faso*, le *Mali*, le *Niger* et le *Sénégal* est celui pour lequel ce sont les dépenses publiques qui causent le Produit Intérieur Brut. Dans ces pays, la loi de Wagner n'est donc pas vérifiée. Nos estimations font état de ce qu'à long terme, l'impact des dépenses publiques sur la croissance est différencié par pays : il est positif pour le Burkina Faso (0,64) et le Mali (0,73) et non significatif pour le Niger et le Sénégal. Par ailleurs, signalons qu'à court terme, les estimations relatives aux pays pour lesquels l'impact des dépenses publiques totales sur la croissance s'est avéré non-significatif, font quand même ressortir un signe négatif entre ces deux variables.

Au total, il ressort des estimations effectuées que la causalité entre les dépenses publiques et la croissance économique est réellement hétérogène au sein de la zone UEMOA. Mais l'impact de l'une ou l'autre variable est différencié par pays. En effet, l'examen des différentes forces de rappel (ou coefficients de correction d'erreur) des équations du modèle à correction d'erreur, montre une forte hétérogénéité des délais de réponse de la croissance économique aux dépenses publiques et des dépenses publiques à la croissance économique dans les différents pays de l'union.

Pour cela, l'intérêt premier de la convergence étant une meilleure transmission des mesures de politique communautaire à l'ensemble des économies de l'union, la recherche d'une convergence accrue des économies de l'Union paraît être à cet égard, la solution idoine susceptible de faire bénéficier les économies de l'union pour éviter l'impact négatif que certains pays pourraient exercer sur leurs voisins (Rosenberg, 1995).

D'un côté, la nécessité de mettre en place un mécanisme de coordination des politiques budgétaires semble faire aujourd'hui l'objet d'un consensus et d'ailleurs elle est reconnue dans le texte du traité d'intégration économique de l'UEMOA ratifié par les Chefs d'Etat des pays membres à la veille de la dévaluation. De l'autre côté, compte tenu de l'hétérogénéité existante, il convient d'améliorer la coordination des politiques de dépenses publiques afin que les externalités positives que cette coordination engendre puissent aller aux pays de l'union. Comment concilier alors hétérogénéité et coordination optimale? Cela peut se faire en réfléchissant sur une nouvelle règle budgétaire plus appropriée qui aurait ainsi par rapport à celle qui existe actuellement, le double avantage d'allier souplesse et crédibilité tout en favorisant le rattrapage économique au sein de la zone. Une règle budgétaire souple est une règle qui ne sanctionne pas

fréquemment les autorités budgétaires. Or, les gouvernements de la zone UEMOA n'arrivent pas tous et toujours à respecter les critères de convergence budgétaire actuels. En outre, elle semble être systématiquement contraignante pour les petits Etats de l'union qui violent régulièrement les normes et pour qui la causalité entre dépenses publiques et croissance existe. Par ailleurs, une règle budgétaire est crédible lorsqu'elle sanctionne à bon escient. Or, la règle budgétaire à l'échelle communautaire dans la zone UEMOA interdit tout déficit public. On a par conséquent l'impression que les gouvernements sont limités dans leurs actions alors que les besoins cruciaux de développement se font ressentir. Un plafond imposé sur le déficit public courant peut avoir un biais structurellement dépressif sur la croissance. En effet, les dépenses publiques influencent la croissance pour certains pays.

Si, comme le suggèrent certains travaux théoriques et empiriques récents, la croissance potentielle est influencée par les dépenses publiques qui contribuent à la formation du capital productif ou à accroître sa productivité, les règles de politiques budgétaires qui poussent les gouvernements à réduire ce type de dépenses en cas de difficultés sont doublement néfastes : non seulement, elles engendrent des variations pro-cycliques des politiques budgétaires, mais encore elles abaissent, à chaque récession, le sentier de croissance potentielle de l'économie.

Puisque les dépenses publiques sont indispensables pour certains pays pour impulser la croissance économique et puisqu'une croissance économique élevée engendre des dépenses publiques plus grandes pour d'autres pays, il est indispensable qu'au sein de la zone UEMOA les politiques des droits de douane, des impôts indirects intérieurs, des contingents d'importation et autres doivent faire l'objet d'une coordination effective afin de ne pas engendrer des pertes de recettes pour les pays car la plupart du budget des différents pays de la zone est essentiellement fiscale. Si un pays applique par exemple des droits d'accise de manière à attirer tous les importateurs vers lui, ils causent ainsi un préjudice à son voisin car même les importateurs de son voisin voudront passer par ce pays. Les recettes du voisin se verront donc diminuer, ce qui peut engendrer une faible croissance si ce sont les dépenses qui causent la croissance dans le pays voisin.

5. Conclusions

Dans ce travail, la relation entre les dépenses publiques et le produit intérieur brut a été examinée aussi bien selon la démarche de Granger que de Pesaran et al. [2001] puis de Toda et Yamamoto [1995]. La relation de causalité entre les dépenses publiques et la croissance économique est en général ambiguë. L'objet de la présente étude était de déterminer de façon économétrique le sens de causalité dans le cas des pays de l'UEMOA. Pour cela, grâce au test de causalité de Toda et Yamamoto, nous avons pu montrer qu'il existe une hétérogénéité de la causalité entre les dépenses publiques et la croissance économique.
Le principal enseignement de la présente étude est que les dépenses publiques peuvent favoriser la croissance des économies des pays tout comme la croissance peut favoriser le fait que les Etats de certains pays soient dispendieux. L'hétérogénéité de la zone UEMOA est telle que les pays présentent des dynamiques dépenses publiques-croissance différentes et donc des politiques

budgétaires optimales qui seraient différentes. Cependant, il convient de ne pas oublier que ces pays sont membres d'une même union monétaire. S'il ressort clairement de nos résultats que les stratégies budgétaires optimales pour ces pays ne sont pas similaires, il ne faudrait pas oublier que les politiques budgétaires en zone UEMOA sont contraintes par une norme qui limite à zéro le déficit public, ce qui peut réduire considérablement la marge de manœuvre des autorités nationales dans les pays où la stratégie budgétaire optimale consiste à relever directement le taux d'investissement public.

Ainsi, la pratique d'une politique monétaire unique dans une union hétérogène tend à conclure à la nécessité d'intégrer l'hétérogénéité dans la règle monétaire standard, autant, la question de l'hétérogénéité de l'union doit également être présente dans le processus des arrangements budgétaires en union monétaire. Si les avantages de la coordination par rapport aux politiques différenciées ne sont plus à démontrer, ce qui importe c'est de choisir la bonne coordination qui pourra à terme égaliser entre tous les pays partenaires, les coûts et avantages liés à l'appartenance à l'union.

Pour cela, il est possible de concevoir une règle sur le déficit public qui évite de graves préjudices pour les pays. Ainsi, les autorités chargées de la prise des décisions au sein de l'union doivent réfléchir à la détermination d'un seuil budgétaire optimal différent pour les pays. Un indicateur budgétaire pertinent comme le déficit structurel, c'est-à-dire après corrections des effets conjoncturels sur le déficit total, devrait être pris en compte pour pouvoir révéler l'orientation discrétionnaire de la politique budgétaire de la zone UEMOA. Cette conception d'une nouvelle règle budgétaire en zone UEMOA est particulièrement indiquée dans la mesure où, la plupart des huit pays de la zone étant producteurs et exportateurs des matières premières comme le coton, le café, le cacao, l'arachide, leurs soldes budgétaires sont fortement sensibles aux évolutions du prix de ces matières sur les marchés mondiaux.

Enfin, les dépenses publiques d'investissement ne doivent pas être contraintes par une norme commune dans l'union. Cela accorderait aux pays de la zone UEMOA des marges de manœuvre conséquentes, leur permettant de mettre en œuvre une relance de grande ampleur pour compenser les effets de la stagnation actuelle de l'activité et, pour certains pays qui en ont besoin, de rattraper économiquement leurs partenaires en améliorant leur offre d'infrastructures publiques et d'éducation, sources de croissance potentielle.

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THE EXPERIENCES OF IMPLEMENTING LEADER APPROACH, WITH SPECIAL ATTENTION TO EFFECTIVENESS, EFFICIENCY AND SUSTAINABILITY

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Abstract. This paper discusses the role of local parnerships in promoting competitive and sustainable rural development, and the experiences of implementing LEADER approach from the perspective of effectiveness, efficiency and sustainability. In the late 1980s, the EU's rural development policy shifted towards endogenous development, as introduced into the practice of rural development in the framework of the LEADER programme. The basic institutions of implementing the LEADER approach are the LAGs (Local Action Groups as local partnerships), which have a great role in the local development with their proactive operation. Due to the ever-increasing role of the LEADER approach played in realization of rural development policy the LAGs have become key actors of the institutional system of rural development. Their operation can effectively contribute to the realization of the European rural development policy at local level, to the competitive and sustainable development of their area. Compliance with this role requires an active and conscientious work of the LAGs both in the process of programming and implementation. The impact assessment of implementating LEADER approach showed that in spite of several positive examples, there are many factors which hinder the wide adoption of the features of the programme into practice, thus realization of results and impacts expected from it in the process of local development. Therefore, it is absolutely necessary to maintain and strengthen the factors of success and to avoid factors which weaken or hinder the effective adaptation of the method. Thereby it can be hoped that the possibilites provided by the LEADER approach can be utilized in the local rural development.

JEL Classification: D74, D78, H79, H83, J18, Q01, Q18, Q19, R11, R58

Keywords: rural development, local partnerships, LEADER approach, effectiveness, efficiency, sustainability

1. Introduction

During the 1980s throughout Western Europe the need to the new approach of rural development raised in order to counterbalance the unfavourable effects of the significant socio-economic changes, to meet the new challenges and

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to answer the specific development needs of rural areas. As a result, in the EU's rural development policy the emphasis was put on the application of endogenous development which was introduced into the practice of rural development in the framework of the LEADER programme.

Due to the ever-increasing role of the LEADER approach played in realization of rural development policy the Local Action Groups (LAGs) have become key actors of the institutional system of rural development. By way of their activity in supporting and improving the local development they mean a spatial organizing force in rural regions. Their operation can effectively contribute to the realization of the European rural development policy at local level, to the competitive and sustainable development of their area. The timeliness and importance of the topic is supported by the fact that the significance of applying the LEADER method in rural development is on the increase within the EU. On 18 November 2010, Dacian Cioloş, EU Commissioner for Agriculture and Rural Development presented the Commission Communication on the future of the CAP post 2013, and stressed that the new CAP will further integrate the LEADER approach (CEC, 2010). This is showing up in the proposal for a new rural development regulation, published by the European Commission in October 2011, according to which the LEADER approach will continue to play a key role in the development of rural areas and the spreading of innovation (CEC, 2011).

## 2. Endogenous development and the LEADER approach

Previously, the decision makers considered rural regions as homogenous areas where the same factors and possibilities determine the development. As the European Spatial Development Perspective (CEC, 1999) pointed out, this attitude does not correspond to the realities of the EU, as the characteristic of the European countryside is varied and diverse, which appears in the diversity of people and the communities as well as nature, landscapes and activities. Consequently, development possibilities and trends of rural areas represent significant differences. All this makes it necessary for development programmes and measures to take local features and specificities into consideration. So, different means and different policies must be applied for their development. According to Szörényiné Kukorelli (2005), high levels of differentiation in rural areas contributed to the evolution of the characteristically European model of rural development as mentioned above in the 1990s, promoting local developments by introducing bottom-up policies. Consequently, sustainable rural development based on local consensus can only be realized by strengthening local society, by increasing its ability to assert interests; therefore solutions and strategies to boost the above are required to be implemented. An innovative solution for this is provided by the LEADER programme called into life by the European Commission, the principal feature of which is an approach of so-called endogenous development based on internal resources and local communities in a bottom-up arrangement. According to Barke and Newton (1997), endogenous development implies a process of local social mobilisation and requires an organizational structure which brings together different interests to achieve common goals, a locally agreed strategic planning process and an agreed allocation of resources with the specific purpose of developing local capacity in terms of skills and competencies.

In accordance with the above, the main objective of the LEADER programme is to build on the internal resources of rural regions and support the population living there in considering their long-term development opportunities and implementing plans designed in collaboration (Nemes, 2000). The main characteristic of the LEADER programme is decentralized rural development method in which local partnerships play a crucial role (Kis, 2006).

In conformity with the principle of subsidiarity, a development programme is to be designed and managed by development groups (LAGs as local partnerships) established at sub- or micro-regional level, coordinating the representatives of entrepreneurs, NGOs and the public sector by involving the population living there. Thus, LEADER breaks away from centralized, centrally managed, top-down support systems, one of the specificities of which is that local problems, opportunities and solutions are not known at a central level, therefore in many cases they do not offer real roads for development as they do not enable the implementation of development programmes based on local needs.

As a result of the above, application of the endogenous development or the LEADER approach has become an organic part of the European rural development policy (Figure 1). It is underpinned by Vince (2008), who argues that EU's rural development policy increasingly put more emphasis on the endogenous, LEADER-type development.

Figure 1: The 3P triangle of rural development (levels of realization of the rural development policy)
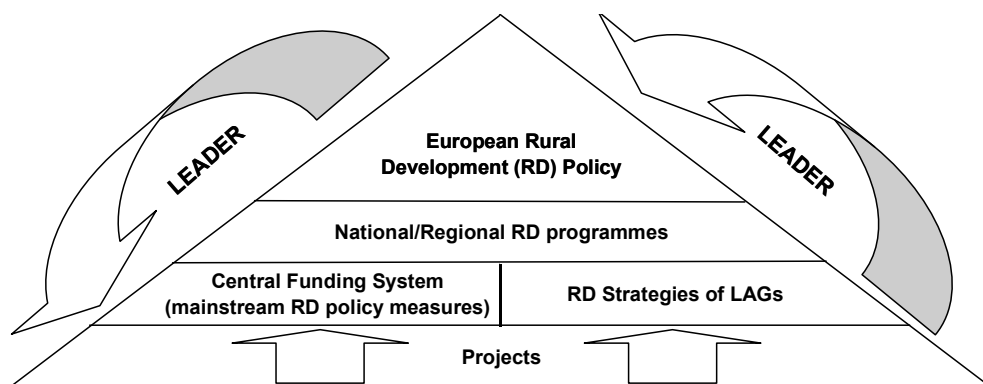
Source: Own presentation
Note: The share of the „Rural Development Startegies of Local Action Groups" not proportional with the financial contribution of the EAFRD, which represents around 6% at EU level between the periods of 2007-2013.

The multi-level interpretation as shown by the figure above makes possible to integrate each level (the 3P refers to the first letter of policy, programme and project), since realization of the rural development policy can be interpreted as a purpose-mean type realization of the levels built on each other; the important part of which is the application of the LEADER approach. It is proved by the fact that since the introduction of the LEADER programme, as a Community Initiative, in 1991 – introduced in order to explore and form new, innovative approaches of rural development – it has become the important element of the mainstream rural

development policy (mainstreaming) due to the success of the programme started as an experimental form of local rural development. „The EU's declared objective for LEADER was to find innovative solutions to rural problems which could reflect what is best suited to specific areas and also serve as models for developing rural areas elsewhere" (Sucksmith, 2000: 1). However, the LEADER is not only a successful form or way of rural development but also a concept, a model that pervades and embraces the whole process of programming and execution of rural development from the policy level to the implementation of projects. Nemes and High (2009) call attention to the fact that while the LEADER principles and methods infiltrating to the mainstream EU policies, the LEADER programme itself lost much of its initial flexibility, innovativity.

3. Local rural development and partnerships

Moseley (2003a: 1) argued, as a thesis of his book, „…that rural development can only be pursued successfully at the local level, none of them is more important than local development…". In his books, Moseley (2003a,b) wrote about five reasons why should insist on local dimension of rural development. These are: (a) local diversity, (b) rural issues (problems) are interlocking, (c) local identification and mobilisation, (d) adding value to local resources, and (e) a defence against globalization. Moseley (2003a: 7) defines local development as „the pursuit of development at a local scale with the aim of addressing local concerns, adding value to local resources and mobilising local actors"…, and he adds that „local rural development is local development as nuanced by rurality."
According to Walsh (1996) local development is „more than a scaling down of interventions previously organised from the top by centralised policy making units, and delivered through sectoral agencies with little emphasis on coordination or integration… it is a radical response that seeks to achieve new objectives in relation to the development process by focusing on concepts such as multi-dimensionality, integration, coordination, subsidiarity and sustainability" (Walsh, 1996: 159). In this context Walsh (1996) suggested three specific but interrelated rationales and/or tasks for local development: (a) to overcome market failures, (b) to improve local capacity, and (c) to facilitate local empowerment. They have the following meaning: (a) doing socially useful things that are generally unattractive to the market, such as delivering services in sparsely populated areas and integrating environmental concerns with economic development; (b) improve the ability of people and organisations to engage, actively participate in development process; and (c) giving local actors more authority and power to influence (Moseley, 2003a). At the heart of local developments are partnerships that engage people and organisations from the public sector, the business community and civil society in specifically addressing development goals (Nelson and Zadek, 2000). But, what are partnerships? How do they function, and what is their role?
OECD (1990: 18) defined partnership as „systems of formalised co-operation, grounded in legally binding arrangements or in formal undertakings, co-operative working relationships and mutually adopted plans among a number of institutions". Mitchell (1997: 156) provides the following, somewhat different definition of partnership, which is „…a mutually agreed arrangement between two or more public, private or non-governmental organizations to achieve a jointly

determined goal or objective, or to implement a jointly determined activity, for the benefit of the environment and society".

Hutchinson and Campbell (1998) note that there is no single and universally accepted definition of partnership. Different commentators from the various fields of study define partnership in different ways. Despite this a number of common elements can be identified, which characterise partnerships. Common partnership characteristics are as follows: (a) bringing together a range of interests drawn from more than one sector; (b) seeking to develop common aims and a strategy to achieve them; (c) sharing risk, resources and skills; and (d) seeking to achieve mutual benefit and synergy.

As Cawley (2009) notes, that in 1988, when the European Commission published the document entitled "The Future of Rural Society", partnership became part of the EU's commitment to subsidiarity, a principle which seek to involve local communities in policy making at the level at which policy is implemented. The commitment by the European Commission to subsidiarity was reaffirmed at the Cork Conference in 1996 (CEC, 1997: 2): "Given the diversity of the Union's rural areas, rural development policy must follow the principle of subsidiarity. It must be as decentralised as possible and based on partnership…"

In order to achieve objectives and successfully implement local development initiatives it is necessary to adopt certain basic principles, which can be categorized as follows (Walsh, 1996): (a) partnerships structures (as an organizing model); strategic planning (as a methodology); and animation, facilitation and capacity building (as processes for implementation). In connection with the above Ray (1998: 80) highlights that "the LEADER approach was defined by the European Commission more as a set of principles than through pre-ordained, technocratic, sectoral measures". The basic principles underlying the LEADER approach are the followings (CEC, 2006): (a) area-based approach, (b) bottom-up approach, (c) local partnerships (local action groups, LAGs), (d) facilitating innovation, (e) integrated and multi-sectoral actions, (f) networking, (g) cooperation.

With respect to the above, in his book, Moseley (2003b) gives an overview about the outcomes of rural development partnerships, and how partnerships add value to rural development. Moseley identifies six outcomes that strongly and three outcomes that moderately related to partnerships (see Table 1).

All in all, according to Moseley (2003b: 6) „the hope has been that partnerships respond more successfully to the diverse and interrelated issues that characterize rural areas today than do agencies and other actors working alone". There is, underlying all of this, a belief that local partnerships add value to the resources they are endowed with, that they are more than mere tools of cooperation and/or coordination, they generate true partnership effect, which can stimulate socio-economic development (Moseley, 2003b). This is confirmed by Nelson and Zadek (2000) who emphasise that partnerships can achieve beneficial outcomes in a more effective and efficient way than the participants acting alone. According to the authors partnerships provide added value because they enable partners to pool their resources. They argue that added value or additional benefits over additional cost of partnership is the ultimate indicator of partnerships' success or failure (Nelson and Zadek, 2000).

Table 1: The outcomes of rural development partnerships

Outcomes strongly related to partnerships	Outcomes moderately related to partnerships
Effectiveness (the ability of the partnership to achieve its goals)	Legitimation (the formal or informal acceptance of the partnership or its contribution (products and services) by the local community)
Endogenous development (development that mainly driven from within and oriented towards the local area)	Organizational sustainability (the ability of the partnership to sustain itself and its work into the future)
Capacity building (the improvement of the technical, social and organizational skills of people in the partnership and the area)	Sustainable development
Integrated development (whereby projects are synergistically linked)	
Innovation (the introduction of new behaviour and practices)	
Community involvement (whereby the local community is actively involved in the work of partnership)	

Source: Moseley, 2003b

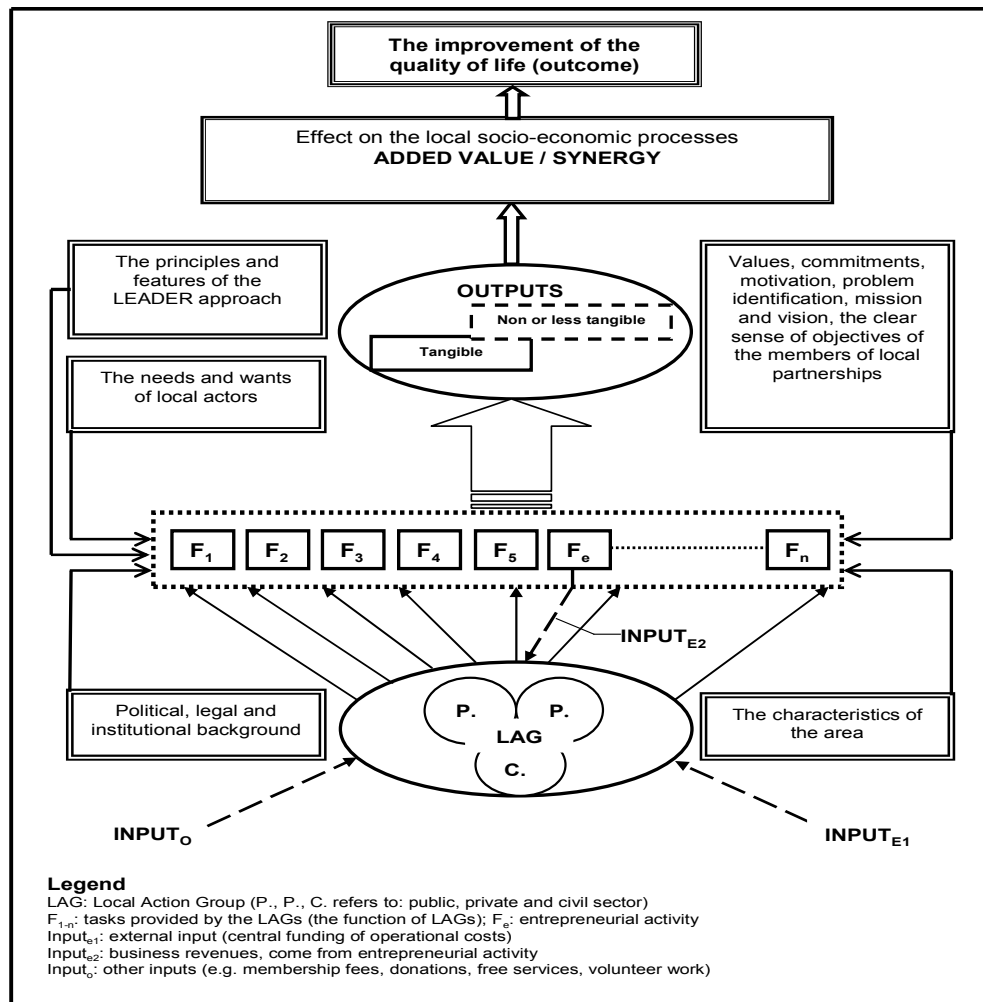## 4. The role of local partnerships in rural development

In the framework of the LEADER programme, important elements of the institutional system enforcing rural development policies include LAGs – organizations for development established in rural areas throughout Europe –, intended to elaborate and implement strategies for sustainable development. As a consequence of the above, LAGs play an important role in the implementation of rural policy objectives in local level. However, in conjunction with strategy implementation, the role of LAGs in the efficient use of funds is not ended by planning and drawing up local development strategies. As funds are used, specific activities and developments are realized at a project level, local players' capacity building and ability to act are required to be boosted in order to provide a basis for the successful and efficient use of development funds. Thus, efficient strategy implementation and furthering the development of a given rural area requires on-going active work, in the course of which LAGs must become real organizing forces in the development of their area (Kis and Szekeresné Köteles, 2010).

The role of action groups in the implementation of Local Rural Development Strategies cannot be restricted only to the distribution of the development funds coordinated by them: their operation spans over a much wider range of activities in which the mobilization of local communities, partnership building, generation of cooperations, skills development, promotion of sustainable development, and endeavours to interlink developments for complexity should appear as important aspects. Actually, efficient strategy implementation requires an increase in the ability and cooperation of local players, necessitating the completion of a variety of tasks. It is important to stress that rural development, as well as local development is a process as a result of which the objectives set can

be realized. So, the process itself is at least as important in the course of the implementation of the LEADER programme as measurable and quantifiable results.

Figure 2: The impact mechanism and determinations of the operation of LAGs

The figure contains the following labels:

The improvement of the quality of life (outcome)

Effect on the local socio-economic processes
ADDED VALUE / SYNERGY

The principles and features of the LEADER approach

The needs and wants of local actors

Values, commitments, motivation, problem identification, mission and vision, the clear sense of objectives of the members of local partnerships

OUTPUTS
Non or less tangible
Tangible

F_1 F_2 F_3 F_4 F_5 F_e .... F_n

INPUT$_{E2}$

Political, legal and institutional background

P. P.
LAG
C.

The characteristics of the area

INPUT$_O$

INPUT$_{E1}$

Legend
LAG: Local Action Group (P., P., C. refers to: public, private and civil sector)
F_{1-n}: tasks provided by the LAGs (the function of LAGs); F_e: entrepreneurial activity
Input$_{e1}$: external input (central funding of operational costs)
Input$_{e2}$: business revenues, come from entrepreneurial activity
Input$_o$: other inputs (e.g. membership fees, donations, free services, volunteer work)

Source: Kis, 2011

The previously mentioned support that in case of the LEADER programme, which is characterized by participation, cooperation, partnership and community initiatives, community development and capacity building (formation and development of abilities) should absolutely precede or complement the actual implementation of local development strategies. Since, first it is necessary to assure the broad participation, people and organizations should be involved in the process of development; communities, cooperations, partnerships should be formed and strengthened and then make the community able to form their own future, to manage their life. Only after this it is expected that the local development

work effectively and efficiently serves the fulfillment of needs and improvement of life quality of people living there. At the heart of the LEADER philosophy is the belief in local communities that they are able to solve their problems in the community level. For this, it is necessary to build communities apt to act in the establishment of which community development and capacity building can assist. Consequently, first, communities or society must be built, develop, which is the basis for everything else. In the Figure 2 I am showing the impact mechanism of LAGs' operation and factors which determine their activities.

In case of rural areas it is typical that they have to face many challenges and they have to find the path for development that suits their particular conditions. In this process the local governments, civil organizations, enterprises and their partnerships based on efficient relationships between them have a decisive role. The one of the significant insitutionalized forms of this type of cooperations are the LAGs (local partnerships) formed within the LEADER programme. The LAGs can use various inputs for their activities, and several factor determine the scope of their tasks to be performed, which can be divided in five main groups according to their nature: (a) principles and features of the LEADER approach; (b) needs and wants of the local actors; (c) characteristics of the area; (d) features/quality of the LAGs' members (values, commitment, motivations, problem recognittion, mission, objective orientation of the members of the local partnership); (e) political, legal and institutional background (Kis, 2011).

Naturally, the specific tasks are realized locally, since endowments of the area, development needs, and characteristics of the LAGs' members change from settlement to settlement, from region to region. Thus, it is difficult to describe them specifically. The operation of LAGs, and thus the success of the application of the LEADER approach are considerably influenced by the role of legislation, cooperation and coordination of the managing authority responsible for the implementation of the rural development programme and the organizations involved in this process. Yet, we can say that in the given conditions success of the LEADER programme considerably depends on the capacity of the local community to act and assert its interests, therefore it is absolutely necessary to improve them in which the LAGs have a prominent role. The proactive operations of LAGs, their activities to organize local society make it bossible and greatly contribute to achieve that social changes assist the realization of economic objectives, enabling more effective and efficient development work.

Through their activities, tasks and functions the LAGs induce a synergy effect which is actually the positive contribution of the LAGs to shaping territorial processes. In this way, synergy is the added value of the LAGs operation, a joint effect coming from the improvement of the relations between the stakeholders. The added value is certainly not equal to the resource distribution role of the LAGs, it is more than that. This surplus or synergistic effect can be created only with community development and capacity building. Synergy results in new structures, it puts in place new mechanisms which, due to their favourable effects on socio-economic processes lead to the improvement of the quality of life. Consequently, through their role in local development, the LAGs mean a significant community organizing force, so they are important institutions of local development, of the implementation of rural development.

5. Focusing on the effectiveness, efficiency and sustainability of local rural development

In this part, I am eaxamining the experiences of implementing LEADER approach from the viewpoints of effectiveness, efficiency and sustainabilty, using the relevant analysises published on this subject. First of all, I consider necessary to clear up some concepts and relationships.

In general, effectiveness can be described as the achievement of the objective set. We can say that something is effective when it realized the objective set, gained the set result. Thus, effectiveness is the measure of the achievement of the planned result, expression of how much it was successful to form objectives into results. In this present case, effectiveness can be defined so if it was successful, or how much it was successful to realize the objectives set in the Local Rural Development Strategy. Of course, in case of the LEADER approach effectiveness cannot be separated from the added value coming from the successful adaption of the method put into practice. Since the LEADER does not strive only to implement the project, to simple realize the objectives or to achieve tangible results. It is clear from the previously mentioned that the further aim of implementing the LEADER approach is to gain non or less tangible result, to create a kind of surplus or a joint effect, which is not possible with other types of development interventions.

Efficiency always means a relationship between a certain output and a certain input category, which in case of evaluation of spatial development programmes the indicators of output, result and effect are related to resource (input) indicators (Nábrádi et al., 2009). These definitions can be found in the EU's financial regulation, as well, which specifies that the Union's budget shall be used with regard in particular to the principles of efficiency and effectiveness. According to the regulation, efficiency is concerned with the best relationship between resources employed and results achieved, while effectiveness is concerned with attaining the specific objectives set and achieving the intended results (EC, 2002). The concept of sustainability and sustainable development – stressing the coordination of economic, social and environmental considerations – is an indispensable basic principle of all developments in the 21st century, including rural development. According to the definition published in the famous Brundtland Report the sustainable development is a form of development „…which meets the needs of the present generation without endangering the chance of the future generations to be able to meet their own needs" (Csete and Láng, 2005). If the objective is sustainability, the sustainable development means the way there to the realization of which the local development provides the best solution (Moseley, 2003a).

The basic conception behind the LEADER approach is that, the local strategies carried out according to the basic principles and features of the programme make a more effective and efficient development possible and contribute to a greater extent to the sustainable local development than the traditional, top-down type of development (EC, 2006). Thus, the success of the programme depends on how and to what extent the basic principles and features are put into practice.
Now, I am examining the application of the LEADER method in the local rural development from the viewpoints of effectiveness, efficiency and sustainability,

based on the evaluation of the last two LEADER programmes – LEADER II (ÖIR, 2003) and LEADER+ (ECA, 2010). Experts' evaluations examining the adaptation of the LEADER approach called the attention to the fact that there are many factors which affect the successful adoption of the method and indicates that it cannot be adopted by putting its principles and features into practice every time and every place. According to the examined viewpoints Table 2 shows the factors which helped or hindered the positive effect of the LEADER method in the local development. It can be seen from the table that there is a significant difference between the findings of two expert analyses, which is food for thought.

Table 2: The impact of the implementation of the LEADER features on effectiveness, efficiency and sustainability

Success factors	Hindering factors
Effectiveness	
*Adaptability to every rural socio-economic and governance context	*A too short implementation time
*Capacity to bring local actors, administrations, and support structures closer together	*A disempowering administrative environment
*Ability to mobilise additional efforts of committed local actors	*The prior existence of similar initiatives at the local level
*Responsiveness to small-scale activities and projects	**Overly bureaucratic implementation, lengthy procedures (long and detailed grant application forms required, delays of payments)
	**The lack of measurable objectives, specific to the area in the strategies, that can be achieved by the LEADER approach; more intention and less about the situation it aims to achieve
	**Monitoring focusing on detailed information about projects rather than on achieving objectives and adding value
	**Local strategy objectives were not a determining factor in project selection
	**Insufficient capacity building, animation and stimulation
	**The lack of focus on achieving local strategy objectives
	**The selection of weak strategies with non-specific objectives and a lack of clear intervention logic
	**Poor or non-existent provision for monitoring and evaluation of the strategies
Efficiency	
*The closing of the gap between a top-down programme and local needs / aspirations	*A too short implementation time

|	
*A mentality change from passive to active attitude	*A disregard of the bottom-up approach
*The responsibility conveyed to local partnerships	*A weak and unrepresentative local partnership (lack of legitimation)
*Direct and indirect effects on strategic issues (e.g. job creation and new investments in key sectors, diversification)	**Less effort to maximise the efficiency of the grant expenditure (e.g. the objective is to spend the maximum amount possible, rather than to achieve the maximum results possible)
**Sharing of experiences and promote best practices	**Deadweight effect (e.g. funding already completed projects)
	**Award grants to independent projects and supporting promoters in their normal activities
	**Monitoring focusing on detailed information about projects rather than on achieving objectives and adding value
	**Conflict of interest – LAGs providing grants to its own members
	**Insufficient capacity building, animation and stimulation
	**Overly bureaucratic implementation, Inflexible, lengthy procedures (long and detailed grant application forms required, delays of payments etc.)
	**Most of the strategies contained few concrete details about how the LEADER approach would be implemented
Sustainability	
*New avenues for creating added value or synergies between existing value added chains	*The disruption of the local partnership and of technical assistance by cutting funds abruptly at the end of the period
*Capacity building at the local level around partnership	*High fluctuation rate of key actors
*Increased public-private co-operation	*The continued dominance of a single sector or of public actors in the local partnership
*Integration of environmental concerns	*The relatively small size and impact of the intervention compared to other influence factors
*The programme provided the European, yet global perspective how to implement local development	**Insufficient capacity building, animation and stimulation
	**The selection of weak strategies with non-specific objectives and a lack of clear intervention logic

*Source: Own presentation based on *ÖIR (2003) and **ECA (2010)*

Summing up the results, it can be stated that according to the analysis carried out by the Österreichisches Institut für Raumplanung (ÖIR, 2003) it has been proved appropriately that the implementation of LEADER method considerably contributed to the effectiveness, efficiciency and sustainability of rural

development processes and measures, and to the creation of added value. However, the report of the European Court of Auditors (ECA, 2010) found that there is little evidence on the effectiveness of LEADER programme in achieving rural development objectives or the added value of the LEADER approach.

In another study of ÖIR, on the basis of the impact assesment of the implementation of the LEADER approach, it was concluded that in certain areas as a result of participation, partnership and cooperation the social capital has obviously strengthened which had a positive effect on the efficiency and sustainability of developments. The results obtained from the analysis are shown in Figure 3, which illustrates that in the early phase of classical (mainstream) programmes can be implemented with better cost efficiency, but as a result of participation, partnership and capacity building the social capital is increased. This enrichment of social capital leads to an increase in efficiency in programme implementation, thus in a longer term the cost efficiency of the LEADER-type programme exceeds the similar index of the mainstream programmes (ÖIR, 2004).

Figure 3: Social capital and cost-effectiveness in LEADER-type programmes
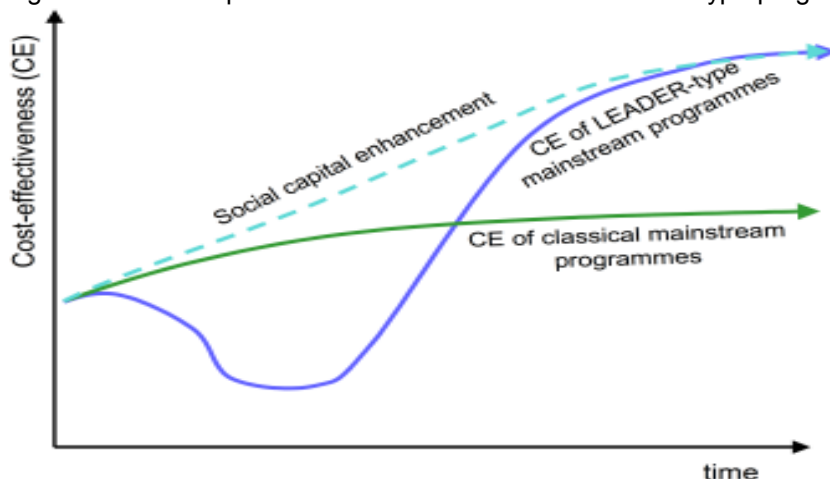
Source: ÖIR, 2004

The ECA report states that LAGs did not achieve the full advantages of the LEADER approach and did not make efforts of their own accord to increase the efficiency and effectiveness of programme implementation. The report has shown that in case of the LEADER, the added value and the efficient and effective implementation of local strategies cannot be taken for granted. It is the Court's opinion that it is absolutely necessary to respect and observe the basic principles of the LEADER approach in order to realize the expected results and added value, when implementing LEADER-type local rural development. The report, on the whole, is critical and damning, although it mentions that there are examples where the programme is working well and lived up to expectations (ECA, 2010).
On the basis of the ÖIR study, it is clear that the successful adaption of the LEADER approach benefits rural areas, the key element of which is the creation and strengthening of social capital. However, the ECA report points out that the expected benefits of the LEADER approach does not follow automatically its

application to the local rural development. What should be done? How can the result of the LEADER be improved?

To improve the effectiveness and efficiency of the programme and its impact on sustainability, first of all, it is necessary to strengthen and maintain the factors of success, secondly, to transform and to avoid the factors which hinder or reduce the successful adaption of the LEADER method. The following should be mentioned in this context.

The basis of the success of the LEADER approach is the attitude which is appropriate to the conception and ideas of the method. Acceptance of the principles and values of the LEADER and identification with them are of great importance in it. It is important to stress that rural development, local development is a process as a result of which the objectives set can be realized. Capacity building and community development are its important elements that help to form and strengthen skills and abilities by which communities become able to manage local development, to realize their common goals effectively and in a sustainable way. A basic component of the LEADER philosophy is trust in local communities that they can solve their own problems in a community arrangement. However, this necessitates capacity building in the population and organizations of the area to enable them to do so, thereby being able to work towards helping themselves to improve the quality of their lives. Capacity building can include a variety of activities, such as training for participants and stakeholders, assisting the flow of information between them, improving communication, encouraging connections, encouraging thinking differently, establishing norms and values, presenting on the advantages and opportunities of cooperation, etc. As a result of capacity building, local communities become more active, effective and efficient in the processes of programming, strategy development, and implementation as well. The capacity building, the essence of which lies in the creation and development of social capital that could benefit the whole community, is a process which should necessarily precede and complement the design and implementation of local development strategies. It is a means to achieve that social changes assist the realization of the objectives set out in the strategy, enabling more effective and efficient development work and contributing to sustainable local rural development. It is important to emphasize that it can take several years to enhance the capacity of local communities to take action according to the local circumstances.

Although, the LAGs are primarily responsible for implementing LEADER approach and they are who can create the expected added value through their activities, I think it is important to stress that the success of local development work is highly influenced by the horizontal and vertical relationships between the stakeholders. In this regard, the decentralization along the management chain in accordance with the principles of subsidiarity, the cooperation and coordination between the different actors can be highlighted. Effective and efficient planning and implementation of local strategies for sustainable development requires that the central power, guided by clear principles and values, should form a well-defined, transparent regulation, financial and institutional structure. Establish a system of monitoring and evaluation is an essential part of it, which provides guidance for the LAGs and allows measuring and monitoring their performance. The LAGs should therefore recognize their mission, and from the financial and regulatory side, they must be enabled to fulfill the tasks and functions expected from them.

6. Conclusions

In the 1980s, the EU's rural development policy shifted towards endogenous development, as introduced into the practice of rural development in the framework of the LEADER programme. The LEADER as the new model of rural development policy, the new paradigm of development focuses on participation, cooperation and utilization of the local resources.

The basic institutions of implementation of the LEADER programme are the LAGs, which have a great role in the local development with their proactive operation. In my opinion, the most important task of the LAGs is to improve the social capital available in their areas of operation, the utilization of which as a real resource is based on the cooperation of local actors. Cooperation enables the inclusion of social capital – as a resource to support action – in spatial processes, thus creating a new combination of resources which may greatly contribute to the success of the LEADER programme and to the development of settlements and areas affected by LAGs on the basis of local resources.

Community development and capacity building provide assistance in creating and developing social capital, as a result of which relationships as usable resources, that is, functional communities are created. In order to become real organizing force in their area, the LAGs should play a catalyst role which can create synergy which results in the improvement of life quality by its positive impact on the socio-economic processes.

The impact assessment of the implementation of the LEADER approach showed that in spite of several positive examples, there are many factors which hinder the wide adoption of the features of the programme into practice, thus realization of results and impacts expected from it in the process of local development. Therefore, it is absolutely necessary to maintain and strengthen the factors of success and to avoid factors which weaken or hinder the effective adaptation of the method. In this regard, the key challenge is that the LAGs should recognize their mission, the central power should support from the financial and regulatory side, respectively allow them to fulfill the tasks expected from them, thereby it can be hoped that the possibilites provided by the LEADER approach can be utilized in the local rural development.

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THE CONTRIBUTION OF THE ENVIRONMENTAL MANAGEMENT SYSTEMS TO ENSURING ENVIRONMENTAL REPORTING

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Abstract. The present study highlights an empirical analysis on how environmental management systems might explain the level of environmental reporting for a sample of 64 companies listed at Bucharest Stock Exchange. The variables (environmental management systems and environmental reporting) were collected from 2010 annual reports and company's websites. We conclude that entities which implementes environmental management systems become capable to measure manage and report more efficiently their environmental performance and are able to communicate to the stakeholders their efforts towards the reduction of pollution. In the case of entities listed at the Bucharest Stock Exchange, the existence of environmental management systems holding the ISO 14001 certification, determines the entities to report voluntarily information related to their environmental performance.

1. Introduction

Environmental reporting represents a tool for providing environmental information to the stakeholders and reflecting environmental performance and companies concerns on environmental issues (Shearer, 2002). Starting from the agency theory, the company is accountable for the decision to report environmental information, decision made by the management to serve the interests of the shareholders (Buniamin et al., 2011: 56). Kolk (2006) consider that for increasing shareholders insight and to influence corporate behaviour emphasis should be made at the internal context.

The way environmental aspects are controlled and managed within an entity varies depending on the size of the entity and the complexity of its environmental issues (IAPS, 1998). Thus, entities having a low level of environmental risk exposure or the small and medium size entities monitor and

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control their environmental issues by means of an internal control system, while the entities operating in areas with a medium level of environmental risk or the large entities monitor and control their environmental problems by means of internal control systems specific to environmental aspects, the so called environmental management systems. Within the present study, we are considering as analysis sample the Romanian entities listed to the Bucharest Stock Exchange, entities operating in industries with a high level of pollution related risk, by monitoring the way the existence of environmental management systems, certified by European or international bodies, determine the entities to become more transparent as far as the environmental transparency is concerned.

2. Research methodology

The present study highlights an empirical analysis on how environmental management systems might explain the level of environmental reporting for a sample of 64 companies listed at Bucharest Stock Exchange. The sample consist in 64 entities listed at Bucharest Stock Exchange in the first, second and third tier from areas of activity that may impact the environment: agriculture, forestry and fishing; the extractive industry; the manufacture industry; production and supply of electricity, thermal energy, gas, water; water distribution, sanitation, managing waste, recyclable materials recovery activities; construction; transport and storage; food industry, hotels, restaurants; the repair, retail, maintenance and installation of machinery and equipment; printing and reproduction of recorded media. The distribution of the companies is presented in Table 1.

Table 1. Distribution of the companies by sector of activity

	Frequency	Percent	Cumulative Percent
extractive industry	3	4.7	4.7
manufacture industry	44	68.8	73.4
energy, gas, water	1	1.6	75.0
construction	6	9.4	84.4
maintenance and installation	4	6.3	90.6
hotels, restaurants	3	4.7	95.3
transport and storage	3	4.7	100.0
Total	64	100.0	

Source: Author's own calculation

Like other studies (Cormier et al., 2005) we exclude from the sample the entities which activate in sectors with low or no impact on the environment like financial activities, real estate, renting and business activities, education, other work activities, social and personal, information technology, media, mortgage finance, research and development, telecoms.

The variables (environmental management systems and environmental reporting) were collected from 2010 annual reports and company's websites and

are presented in the next section. During the first part of this study we will direct our attention towards the environmental reporting within the Romanian entities and the environmental management systems certified at European or international level respectively, followed up in the second part by a focus on how the existence of certified environmental management systems determine the Romanian entities to report environmental performance information.

3. Environmental reporting in the case of Romanian companies

However, there is, so far, no legislation in this area, requiring companies in Romania, listed or not at the capital market to provide stakeholders separate reports or specific information related to environmental impact. Providing such information would be useful, especially for listed companies and for those operating in industries considered highly polluting. In other words, the entity's commitment regarding the environmental impact or environmental issues remains voluntary in the case of Romanian companies.

Although Budeanu and Thidell (2006) consider that despite the incipient stages of public disclosure of environmental information, Romanian enterprises are ready to catch up with Western practices. Ienciu et al. (2011) reflecting to the quality of environmental information voluntarily reported by Romanian listed companies compared with Hungarian companies for the period 2006-2008, conclude that the majority of environmental information provided by the Romanian companies is incomplete and irrelevant. The study sustains that the legitimacy theory is the most adequate for explaining and defining environmental reporting within Romanian companies because companies are looking only for those aspects that can ensure a positive image and a good place in the society. Jinddrichovska and Purcarea (2011) focus their study on corporate social responsibility in two countries: Czech Republic and Romania. The study considers that although the standard of environmental reporting is based on the same principles in both countries, the particular approaches differ. Also regarding Romania, more systematic regulatory approach may be adopted regarding environmental reporting. For assessing how environmental performance or environmental information is reported in 2010 by the Romanian companies listed at Bucharest Stock Exchange in the first, second and third tier (EnvRep) we developed a Disclosure Index (DI) on the following groups of information:

- [*d1*] Non-financial information regarding environmental objectives, management, policy and other aspects which can reflect environmental performance in non-financial information. This indicator can bring value"1" if company report this kind of information or "0" if company doesn't report the information.
- [*d2*] Key Performance Indicators regarding environmental impact (water, air, soil). Such indictors are stipulated by Global Reporting Initiative (2011), DEFRA (2011) and other organisations. The indicator is "0" if company does not report such indicators or can be "1" if company reports such indicators although this indicators are not correlated with indicators stipulated in international guidelines.
- [*d3*] Financial indicators (environmental investment, costs, provisions). Such indicators reflects in monetary terms companies attitude regarding the

environmental. The values can be "0" if company does not report this information or "1" if company report this kind of information.

This method for quantifying environmental information allows integration of different types of information into one single figure comparable between companies and is not very subjective because this is not a qualitative examination which depends on the researcher point of view which is not always the same with the investor's point of view regarding the relevance of environmental reporting. So, our EnvRep Disclosure Index (DI) is calculated as:

$$EnvRep = \frac{\sum_{i=1}^{n} di}{m} , \qquad (1)$$

Where, n – Number of element disclosed; m - Number of posible elements to disclose; di – group of elements disclosed. The descriptive results are presented in the Table 2.

Table 2. Descriptive statistics of Env_Rep DI

	Frequency	Percent	Valid Percent	Cumulative Percent
Minimum .00	5	7.8	7.8	7.8
.33	46	71.9	71.9	79.7
.67	5	7.8	7.8	87.5
Maximum 1.00	8	12.5	12.5	100.0
Total	64	100.0	100.0	
Descriptive characteristics	Mean	Median	Mode	Std. Deviation
	0.4145	0.3300	0.33	0.25993

Source: Author's own calculation

We can observe that most of the Romanian companies listed at Bucharest Stock Exchange (71.9%) report only non-financial information regarding environmental objectives, management, policy [*d1*]. From 64 companies only 8 companies report all types of environmental information, while 5 of them doesn't report any kind of environmental information. The Romanian companies don't report environmental information using national or international guidelines, the main source of environmental information being the annual reports. We conclude that like in 2006-2009 periods, in 2010 the quality and quantity of environmental information reported by Romanian company still suffer from irrelevancy and incompleteness. We consider that Romanian entities cannot be compared with western companies, the quality and quantity of environmental information reported by Romanian companies being low.

4. The environmental management systems existing within Romanian entities

An efficient pollution control cannot be exclusively depending upon technological solutions, but must be based on an environmental management system integrated to the entity's general management. These systems represent a

structural and systemic mean on integrating the environmental aspects in the whole of the entity's operations (Rojanschi et al., 2004). An environmental management system can be certified by the ISO (International Standardization Organization) or the EMAS (Eco-management and Audit Scheme). Both systems are self-regulatory, wherein the state sets institutional or organizational commitments with the purpose of proactively direct and promote an environmental friendly behavior (Oluoch-Wauna, 2001). The most important certified environmental management systems are the ISO 14001 (International Standardization Organization) and the EMAS[1] (Eco-management and Audit Scheme adopted by the European Union Council). The EMAS III is the most recent revision of the EMAS Regulation, valid since 2010. Rojanschi (Rojanschi, 2004: 403) offers a comparative approach on the two systems by evidencing their differences, as follows:

Table 3. Comparative analysis between EMAS / ISO 14001

EMAS	ISO 14001
Legislative regulation within the EU since 1993	International standards since 1996
Applicable only in the EU	Applicable world wide
Limited, at first, to industrial operations sites.	Applicable to products, services related operations (including non-industrial operations)
Requests an initial appraisal of the environmental impact	Preliminary environmental related analysis is not compulsory, merely recommended
Continuous improvement of environmental performance at the level of the best available technology	Continuous improvement of environmental management system is reflected by the increasing environmental performance
Requires a public environmental statement allowing the access to the environmental policy and program	Requires public access only to the environmental policy; Recommends external communication,
Frequency of environmental audit at least every three years	No environmental audit frequency specified
The novelty brought by the EMAS III is the entities' obligation to report environmental performance on the basis of a set of indicators on energetic and materials efficiency, water, wastes, biodiversity, emissions.	

Source: adaptation of Rojanschi, 2004: 403

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[1] It is a European environmental management system that became known in 1993 as a result of European Council's directive no 1836/1993, encouraging the European entities from the industry sector to voluntarily participate to a management and audit system which preserved since then the name of EMAS (Eco-management and Audit Scheme); Available at: http://ec.europa.eu/environment/emas/pdf/EMAS_General_Presentation_2011.pdf.

A significant difference between the two types of certification is the fact that EMAS applies only to Europe. In order to obtain such a certification, an independent analysis must be performed in order to confirm that the environmental management system is operational and it produces the required credible information (Langford, 1995). Initially, the environmental management system was applied only to industrial operating entities. Presently, any type of entity may apply for this certification.

Freimann and Walther (2001) have analyzed the significant differences between the ISO and the EMAS. On of them is represented by the fact that entities applying for EMAS must publish an environmental statement after having been audited by a certified person or company, while the ISO 14001 provides no such obligation. Companies adopting the ISO 14001 can voluntarily issue such a report. As a whole, the ISO appears less restrictive as far as regulations are concerned. The EMAS requirement that entities issue environmental reports and submit them to verification ensures in fact the utility of such reports (Beets and Souther, 1999). Despite the numerous advantages of the ISO 14001 there are also disadvantages (Boiral and Sala, 1998), one of them being the high cost of the implementation.

ISO 14001 basically recommends a statement regarding environmental protection, with no connection to the environmental performance. As far as the environmental performance is concerned, the international standard ISO 14031 offers guidance on the design and use of the environmental performance evaluation system within an entity, regardless of its type, size, location and complexity. The ISO 14031 applies to any type of environmental management system, included those not based on the ISO 14001 or the EMAS. By comparison to the ISO 14001, the EMAS III has more strict requirements regarding the environmental performance appraisal, its continuous improvement, the observance environmental law, the employees' involvement, the reporting of environmental indicators and information.

Some of the 64 Romanian entities analyzed in the present study have implemented environmental management systems, in accordance with the ISO 14001. None of them has the EMAS certification. The status of the existence of ISO 14001 certified management systems within the Romanian entities is presented in the table 4.

Table 4. Descriptive analyses of ISO 14001

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Does not exist ISO 14001	30	46.9	46.9	46.9
	Does exist ISO 14001	34	53.1	53.1	100.0
	Total	64	100.0	100.0	

We are thus able to notice that only 53.1% of the entities included in the study have a ISO 14001 certified management system and that none of them has EMAS certified management systems.

5. Environmental management systems and environmental reporting

Herschovis et al. (2009) considers environmental management systems as an instrument for the corporate strategy related to environmental aspects, an internal control system used with the purpose of improving the reporting within the entity. The specialized literature (Anandale et al., 2004; Khanna and Anton, 2002) show the adoption of environmental management systems is determined especially by the pressure exerted by users. Malmborg (2002) highlights that an environmental management system is an important instrument for communicating actions taken by the entity with regard to the sustainable development and environmental protection in response to the community's requirements. This proves that the existence of an environmental management system serves the reporting processes both to managers and external users and represents a response to the requirements from investors and other users in relation to the environmental performance within an entity (Ranking et al., 2011).

Although environmental management systems are designed to increase the environmental performance and the level of environmental reporting, their certification (either EMAS or ISO 14001) doesn't necessarily determine the increase of environmental performance. The main advantage of these systems' certification is the improvement of the entity's image, the increase of its credibility for investors, authorities and other stakeholders (Wagner, 2003). Therefore, our present study is intended as an analysis of whether there is a correlation or not between the level of environmental reporting (Env_Rep DI) and the existence of ISO 14001 certified environmental management systems, in other words, whether the existence of environmental management systems determines or not Romanian entities in becoming more transparent with regard to their environmental performance. The analysis of correlations between the two variables was conducted by means of the SPSS application, version 17.0 and is presented in table 5.

Table 5. Correlation between variables

			ISO 14001
Kendall's tau_b	Env_ Rep DI	Correl Coeff	0.285[*]
		Sig. (2-tailed)	0.018
		N	64
Spearman's rho	Env_ Rep DI	Correl Coeff	0.298[*]
		Sig. (2-tailed)	0.017
		N	64
Pearson Correl	Env_ Rep DI	Correl Coeff	0.304[*]
		Sig. (2-tailed)	0.015
		N	64

It becomes noticeable that the SIG < 0.05 and the coefficient of the correlation is below 0.500, meaning that there is a low intensity correlation between the existence of ISO 14001 certified environmental management systems

and the level of environmental reporting within Romanian entities. As a result, we believe that for Romanian entities listed at the Bucharest Stock Exchange the existence of an ISO 14001 certified environmental management system is an important factor for the improvement of environmental reporting and the increase in transparency of environmental information, respectively.

6. Conclusions

The voluntary implementation of environmental management systems suggests an entity's consent with regard to the environmental aspects' monitoring, management, measurement and reporting. The environmental management systems should assist entities in developing more ecological operations and to manage more efficiently their environmental costs and investments. The entities having implemented environmental management systems are regarded by the society as more responsible towards environmental protection which contributes to the increase of entity's image and credibility before users.

The entities having implemented environmental management systems are also able to measure manage and report more efficiently their level of air, water and soil emissions, rendering them more capable to communicate their efforts towards pollution reduction to the users.

We can therefore conclude that within the entities listed at the Bucharest Stock Exchange the existence of ISO 14001 certified environmental management systems determines the entities to report voluntarily information related to environmental performance, such as emissions level, actions taken to the reduction the emissions, etc.

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LEGAL AND ECONOMIC ISSUES OF THE AGRICULTURAL LAND RENT IN SLOVAKIA

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Abstract. The agricultural land in Slovakia is used mainly by tenants according to the land rent contracts. The land rent plays a very important role; therefore the Slovak law maker approved special legal regulation to stabilize the long-term rent of agricultural land. The paper analyses how these legal norms affects the economic behaviour of the land tenants doing their business activities in the agriculture. The research will be realised in county Galanta, one of the counties of Slovakia with the best condition for the agricultural business. The primary data were oriented mainly on the rent price, rent period, land quality, acreage of rented land and legal form of enterprises. According to the results the rent payment for one hectare of land is not influenced by the minimum rent payment stipulated by law. The larger acreage of land of one agricultural businessman press down the land rent payments. The legal forms of enterprises as well as the land rent period are ones of the dominant factors which influence the land rent payment. The location of agricultural businessmen in the county Galanta is also important factor influencing the land rent payment.

JEL Classification: Q15

Keywords: agricultural land, land rent, legal regulation, rent payment, rent period, revenues from the agricultural business

Introduction

Territory of Slovakia occupies 4 903 423 ha, from this agricultural land represents 2 380 000 ha (48.54 %). Structure of ownership relations to agricultural land in Slovakia is different from the structure of use relations. In private ownership is the land with acreage of 1 854 973 ha what represents 76% from the total acreage of agricultural land in Slovakia (Slovak Land Fund, 2002). However, in Slovakia the majority of land is cultivated by the tenants what is caused by the complicated land ownership relations as a consequence of the collectivisation during the socialism period. The investment in the agricultural land is too jeopardous because the economic return of such investment is in the improbably (Buday, 2007). Approximately 90% of agricultural land is currently being rented

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and tenancy will play a very important role in the future too. This tendency, which can be noticed in Slovakia, is a "European wide" tendency. There is a similar situation is in the European Union countries. In Germany 62.1 % of agricultural land is leased, in Belgium 67%, in France 64.9% (Tatík and Kniebugel, 2002).

However, there is no survey on the exact number of rent contracts administrated by a state body; therefore the statistical data come only from various researches. The results of such surveys performed in selected regions show that the agricultural businesmen farming under better natural conditions (e.g. county Dunajská Streda, Galanta, Nitra) rarely agree on the rent amount irrespective of the amount of average agricultural land price in the respective cadastral area. This rent amount generally exceeds the limit of 2.5% from the average agricultural land price and in some exceptional cases as much as 3% of the land price (Bandlerová, Rumanovská and Lazíková, 2005).

The staus quo related to the land ownership and the land use relations in Slovakia has its roots in the history. In the period 1948 – 1989 the land ownership of natural persons was deformed and the laws were oriented to the objective the state should be only owners of the agricultural land (Štefanovič, 2004). In 1990, the centrally planned economy system was transformed to the market economy mechanism. Landlords were offered the right of access to the lands and the new legislation was adopted aiming to improve the right of the landlords to access their lands. However, the access to land was not of any interest to most landlords anymore because they have been working in other sectors (already mentioned healthcare, education or industry) without any connection with their land for 45 years. This shows that they have already been interested in being engaged in the other sectors (Lazíková and Bandlerová, 2008). The government has put in efforts to encourage the landlords to farm on their lands; however most of the land has been used by the tenants during past 22 years (Lazíková and Bandlerová, 2009). That was the reason for the Slovak law maker to prepare the new legal regulation of the land rent with the aim to protect the interests of the land tenants.The new Law no. 504/2003 on agricultural land rent, agricultural enterprise rent and forestland rent (hereinafter referred to as the Law on agricultural rent) is the special law (*lex specialis*) to the Civil Code. This one regulates the rent in two different situations: (1) land rent for agricultural purposes (the law maker presumes short – term, fix-term and occasional rent of smaller and integrated land plots according to the explanatory report of the Act no. 504/2003); (2) land rent for agricultural business in the course of managing an agricultural enterprise, where the rented land is used for agricultural production; there are high-cost investments into maintenance, regeneration and increasing of land fertility, into the high-power technology for plant production and into transport, infrastructure and buildings (Explanatory report of the Act no. 504/2003). The Civil Code (*lex generalis*) represents the general regulation of rent. It regulates the rent in the part dealing with contractual law (§ 663 – 684).The land rent issues, which are not regulated by the Law on agricultural rent, are secondarily regulated by the Civil Code (Lazíková and Takáč, 2010). The Commercial Code, regulating the relations between businesses does not deal with the rent; however, there are regulations for 23 types of contracts. It means that the agricultural businesses, which are usually governed by the Commercial Code for their business relations, are instead governed by the Act on agricultural rent and Civil Code for the rent (§ 663 – 684). However, the general issues of contractual law, such as formation, termination or security for

performance of contracts, prescription and damages are regulated either by the Civil Code or the Commercial Code. If the rent is entered into between businesses and the object of the rent belongs to their business activities, these general issues will be regulated by the Commercial Code. If these conditions are not fulfilled, the Civil Code will be applied for these general issues of rent. In the case of mixed contracting parties (only one of them is a business and the tenant deals with his business activities) the Civil Code is applied unless a written agreement of both contracting parties on using the Commercial Code is concluded (Lazíková and Bandlerová, 2008). The last law on land rent is the Law no. 229/1991 on legal regulation of land ownership and the other agricultural property ownership as amended by later regulations (§ 22). This is called a statutory rent (rent implied by law). § 22 states:"*If there is no agreement between a tenant and a landlord, the rent shall be established between them at the moment of this Law coming into force (24th June, 1991). These contractual parties may terminate this kind of rent by giving notice before October 1 of the current year*" and the rent will terminate on October 1 next year. According to this provision, the rent implied by law is a default position applied only in the absence of a different agreement between the contracting parties (a tenant and a landlord). The tenant must pay rent from this time. The amount of rent is stipulated in the § 23 of the Law on agricultural lease being at least 1 per cent of the value of agricultural land evaluated according to a decree of the Ministry of Agriculture and Rural Development of the Slovak Republic (no. 38/2005 as amended by later regulations). The provisions of Civil Code and especially the Law on agricultural rent are also applied on this rent (Lazíková and Takáč, 2010).

1. Legal regulation of the agricultural land rent – selected issues

The rent contract is an agreement between a tenant and a landlord; the landlord has to leave the subject matter of the rent temporarily to the tenant who is entitled to use it; the tenant has to pay a rent payment to the landlord according to this mutual agreement. The rent contract is an oral or a written agreement depending on the mutual agreement of the parties. However in the case of a land rent for agricultural business, a written agreement is required (504/2003 § 14) otherwise the agreement for rent is void.

The agreement for rent must include three fundamental elements: identification of the parties, identification of the subject matter of the rent and the obligation to pay rent payment. Besides fundamental elements of the rent, it is advisable to make agreement on the other details of the rent relation to prevent misunderstanding or even lawsuit at the court: such as the period of rent; method of giving and using of the subject matter of the lease; frequency, form and method of rent payment; ordinary and extraordinary costs; security for the rent; termination of the rent contract and default interest, etc (Lazíková and Takáč, 2010).

1.1 Fundamental elements of rent contract

The subjects of the rent contract are the parties (a tenant and a landlord) of the mutual agreement for the rent. The tenant is a natural person or a legal entity entitled to use the subject matter of the rent. The landlord is a natural person or a legal entity entitled to leave the subject matter of the rent to the tenant. The right to rent the agricultural land is given not only to Slovak citizens but also to

foreigners from both within and outside the European Union according to the Act No. 202/1995. However, the foreigners cannot own agricultural land and forestland situated in the Slovak republic. The foreigners can receive the property right to the agricultural land or forestland only by inheritance; a special regulation is applied to the foreigners from EU. They will be entitled to receive the agricultural land in Slovakia after the April, 30th 2014 (the Council decision no. 2011/241/EU) before this time, only EU foreigners who have cultivated this land for at least three years after the accession of Slovakia into EU can receive the property rights to the agricultural land.

According to the Civil Code the subject matter of rent is any tangible thing which is able to be the subject matter of the legal relations. Agricultural land is considered to be a real estate and so can be the subject matter of the rent. The Law no. 162/1995 Coll. considers arable land, vineyards, hop-fields, orchards, gardens and permanent grasslands (pastures and meadows) to be agricultural land.

Rent payment for the use of agricultural land is payable annually for the previous year up to October 1, unless the parties have made different agreement. It is advisable to stipulate the payable amount in the contract. If the parties fail to do so but the contract implies at least the obligation of the tenant to pay the rent payment, the contract is still valid. However, there is an exception to this rule stated by law: in the case of entrepreneur rent, that means the rent of the land for agricultural purposes in course of enterprise, the law requires an agreement on the rent or agreement on the means of its determination. The minimum amount is 1% of the land value. The land value is stipulated for this purpose by the governmental decree No. 38/2005, which determines the value of the land based on the quality and land value which is determined according to the land evaluating and ecological units but does not take the market price of the land into account.

1.2 Some recommended elements of the rent contract

Rent contract can be terminated in various ways (1) by lapse of time if the rent was time limited; (2) by notice if the contract is concluded for unlimited period of time; (3) by withdrawal based on law or if the relevant conditions agreed on in the rent contract are given; (4) by immediate termination of the lease if this possibility is stated in the rent contract; (5) by agreement of both parties on termination of the rent contract; or (6) by destruction of the leased thing (Lazíková and Takáč, 2010).

The lease contract formed for a specific period of time terminates at the moment of lapse of the stated time given the rent is not extended by implied agreement. The rent duration is a matter of an agreement by the parties to the contract, however, the Law on agricultural rent seals the minimum 5 year duration in the case of land rent for agricultural purposes in course of operation of the enterprise. By this provision, the law maker attempts to stabilise the rent relationships regarding the agricultural land and motivate a tenant to invest in the agricultural land (as he shall retain the land for at least 5 years) (Lazíková and Bandlerová, 2008). There were considerations (as the explanatory report to the law no. 504/2003 Coll. indicates) if "legal conditions of detention of land and land benefits do or do not obstruct the investment in the land and proper management and if the tenant has the possibility of full benefits of his investments to maintenance and improvement of soil fertility."

At the same time, protection is provided to the subject matter of rent itself – land as natural resource – against plunder so that the tenant would not use the land in such a manner to use all nutritive substance in one or two years and then return the deprived soil to the landlord after short term rent. If the tenant is bound by a 5 year rent he needs to take care of the land and maintain its fertilising otherwise he would produce loss and at the same time he would be obliged to pay the rent payment because in the case of zero outputs he has no right for decrease or waiver of the payment as he lost the incomes by his own default (Lazíková and Takáč, 2010).

In case the rent contract in course of enterprise of business is time limited, the duration of the rent must not exceed 15 years. The law maker sought the adequate time from the tenant's point of view as well as landlord's. 15 years is long enough time for a tenant to obtain the returns of his investment in the agricultural land at least partially and at the same time it is not extensively long as to deprive the landlord of his relationship to the land as its owner. However, arable land is not the only possible subject matter of the rent but other types of agricultural land come into consideration as well. In this case, the time of economic return is needed to be evaluated differently for every type of agricultural culture which is why the law maker extends the maximum possible time of rent, as opposed to the general provision of 15 year duration, as following: (1) maximum of 25 years duration in the case of a rent dedicated to establishment or revitalisation of orchard; (2) maximum of 30 year duration for the vineyard, hop orchard or orchard and decorative shrubs nursery establishment.

In case of entrepreneur rent, the Law no. 504/2003 Coll. gives to the tenant the first option to renew the rent contract regarding the agricultural land if his due payments under the rent contract were paid in full and on time. However, the tenant is not entitled as stated above if: (1) the landlord himself or his relative wants to establish a business in agriculture; (2) the tenant is to be the legal entity of which the landlord is a member or a partner; (3) the land in question is assigned for other than agricultural purposes according to special legal regulations. The so called prior right to conclude the rent contract is a right of tenant who can decide to use it after the termination of rent contract; the landlord is obliged to respect the decision of the tenant and without his refusal to conclude the new rent contract, the landlord is not entitled to do the new rent contract with the third party; however this legal rule is broken in the praxis very often. The main problem consists in the fact that many landlords and tenants do not know this legal rule; the landlord usually terminates the land rent contract and supplies the land to the tenant willing to pay higher rent payment without respecting the prior right of present tenant.

2. Economic issues of the land rent

This part of paper analyses how the previous aspects of the land rent legal regulation influences the economic behaviour of agricultural businessmen. The research was doing in the county Galanta with the acreage of 641 km^2 situated in the plain of the south-western Slovakia. The next table describe the structure of the agricultural land in this county.

Table 1 The structure of agricultural land in the county Galanta

	Arable land	Permanent grass land	Vineyards
Total area in ha	48 610	528	1 037
Rented land of respondents in ha	22 268	75	290
Rented land of respondents in per cent from the total area	45.8	14.2	27

Source: self-calculation

There were 19 agricultural enterprises included in the research, of it 10 limited liability companies, 5 agricultural cooperatives cultivated the land and 4 individual farmers.

2.1 The influence between the minimum rent payment on the market rent payments

The first issue is to determine the influence of the minimum amount of rent payment for agricultural land according to the Law No. 504/2003 Coll. (Land Rental Law) on the decision of the businessmen in the land rental market. According to the land rent legal regulation, the contracting parties are free to negotiate the rent payments in their land contract. However, there is an exception to this rule stated by the Law; in the case of the rent of the land for agricultural purposes in the course of the enterprise; the law requires an agreement on the rent and prescribes the minimum rent payment as 1 per cent of the land value determined according to the government decree no. 38/2005 Coll.

The determination of the minimum rent payment can find its meaning only if the rent payment agreed between the contract parties would be lower than that stipulated by the law. Otherwise, the minimum rent payment stipulated in the Law is obsolent in our observed county.

Our findings are presented in the figure 1. The axis x represents the number of observed respondents and the axis y represents the high of the rent payment in EUR per hectare. The red space represents the market rent payments of each businessman and the blue one represents the minimum rent payments according to the Law.

According to the figure 1 we can states that the legal regulation does not influenced the market subjects by the decision making on the high of the rent payments. The high differences between the minimum rent payments and market rent payments are caused by the high interests for doing business in agriculture in this county. The favourable natural conditions are one of the main factors which established the competitive business environment among the agricultural businessmen. Therefore, they are motivated to supply the higher rent payment if they want to receive the additional units of land for their business activities. According to the research we can concluded that the market rent payment is created by the supply and demand of the land for the rent purposes and does not depended on the minimum rent payment stipulated by the Law no. 504/2003 Coll. in county Galanta.

Figure 1: The comparison the minimum rent payment and the market rent payment
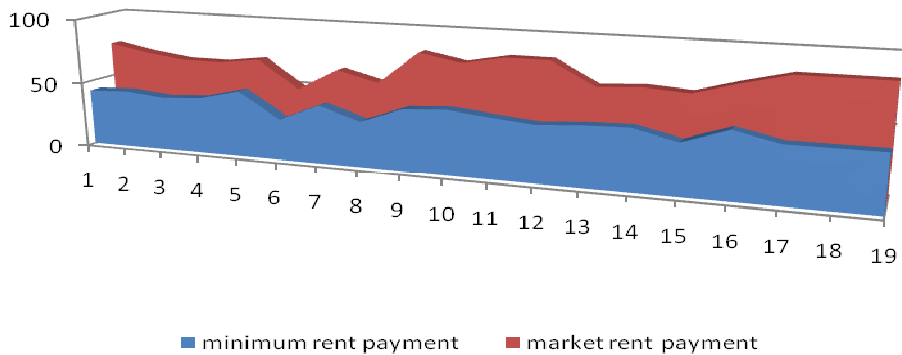
Source: self – calculation

2.2 The influence of the rent period, legal form of enterprise on the rent payments

We have set hypothesis that the agricultural businessmen according to the legal forms prefer different rent period. To provide confirmation of this hypothesis we have collected data (Figure 2).

Figure 2 : Rent payment and rent period according to the legal forms of agricultural businessmen

1 – limited liability company; 2 – agricultural cooperative; 3 – individual farmer

Source: self-calculation

The first group includes 10 limited liability companies. The rent payment is about 70 eur.ha^{-1}. The rent period is usually ten years, it means longer than the minimum rent period prescribed by Law no. 504/2003 Coll. (5 yeras). Their business activities are distributed for longer time period. The second group includes 5 agricultural cooperatives, which pay for one hectare of rented agricultural land about 67 EUR. The agricultural cooperatives prefer the longest rent period about 10 or 15 years or for the unlimited period of time. We can conclude that the minimum rent period stipulated by law does not influence the business plans of the legal entities doing business in agriculture.

The third group includes 4 individual farmers who pay 83 EUR per hectare of rented agricultural land. They pay higher rent payment than the legal entities if they want to be competitive on the land rent market and receive the additional land unit. They cultivate smaller acreage of land than the legal entities therefore the additional land units is more important for them like for the bigger agricultural legal entities. However, the rent period is shorter than in the case of legal entities, only about 5 years. They use the minimum prescribed by Law no. 504/2003 Coll., therefore, there is a question: Did they use the shorter rent period than 5 years if they would be not limited by the 5-yeras period stipulated by the Law? According to the information from the interview with the individual farmers we can state they would like to prefer also the shorter rent period than 5 year stipulated as minimum rent period.

According to Figure 2, we researched the fact, if there is a statistical significant difference among the rent payments paid by the businessmen of various legal forms. For this purpose we use the ANOVA model (Table 2).

Table 2. ANOVA model of statistical significant difference among the rent payments paid by the businessmen of various legal forms

SUMMARY					
Groups	Count	Sum	Average	Variance	
Agricultural cooperatives	10	701	70,1	54.54	
Limited liability companies	5	338	67,6	149,3	
Individual farmers	4	332	83	0	
ANOVA					
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	616.42	2	308.21	4.532	0,0275	3,633
Within Groups	1088.1	16	68.006			
Total	1704.5	18				

Source: self-calculation

According to this analysis of variance (F=4,53 > Fkrit = 3,63) we can state that there is a statistical significant difference among the rent payments of different

legal forms of agricultural businessmen. The presented model is statistical significant because of P- value = 0,02 < 0,05; however this model does not give an answer if the statistical significant difference is between each legal forms or only between some of them. Therefore we use the multiple Range Tests to find it out (Table 3).

Table 3. Statistical significant difference between the legal forms of agricultural businessmen

Multiple Range Tests for Col_2 by Col_1
Method: 95,0 percent LSD
Col_1 Count Mean Homogeneous Groups
1 5 67,6 X
3 10 70,1 X
2 4 83,0 X
Contrast Difference +/- Limits
1 - 2 * -15.4 11.7273
1 - 3   -2.5 9.5753
2 - 3 * 12.9 10.3425

denotes a statistically significant difference.
*** 1 – limited liability companies; 2 – agricultural cooperatives; 3 – individual farmers*
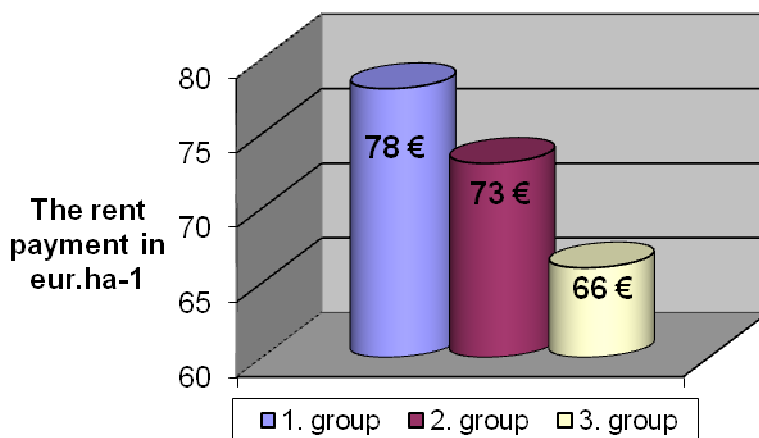*Source: self-calculation*

According to the table 3 the statistical significant difference are only between the rent payments paid by the limited liability companies and individual farmers as well as between the agricultural cooperatives and individual farmers; it means between the legal entities and individuals. The statistical significant difference between the legal entities was not confirmed. We expect that the rent payment will be higher in the case of longer rent period when the landlords cannot use their own property because of rent but the opposite matter of fact is confirmed. According to the results of our research, we can conclude that the highest rent payment pay the individual farmers who use the minimum rent period. On the contrary, the lowest rent payment supplies the agricultural cooperatives which prefer the longest rent period (for 10-15 years). The average acreage of agricultural cooperatives is app. 1536 hectares of land and the individual farmers usually cultivate only 50 hectares of land. Therefore the agricultural cooperatives have not interests to receive the additional land with the higher costs but the individual farmers accept also the higher rent payment to use the additional units of land. On the other hand, the rent payment is usually fixed in the rent contract and it is not changed during the all period of rent relation. The individual farmers preferring the shorter period of rent contract change the rent payment each 5 years and the agricultural cooperatives only each 10-15 years. That is the second reason why the legal entities pay lower rent payments than the individual farmers.

2.3 The influence of the land location on the rent payments

The minimum rent payment stipulated by the Law no. 504/2003 Coll. is 1 per cent from the land value. The land value is stipulated by the government

decree including the land quality but the land location, infrastructure in the local areas and other market factors are not taken into account. Therefore we have oriented on the issues how the location of the land influences the rent payments.

The observed businessmen were divided into three groups according to their location. The first group includes 8 businessmen (3 individual farmers, 4 limited liability companies, 1 agricultural cooperatives) on the north- eastern of county Galanta. There is the highest number of the agricultural businessmen and too strong competitive business environment which presses up the rent payments. The difference between the minimum rent payment and market rent payment is about 97 per cent. This location is typical by the high quality of land and well transport infrastructure with the neighbouring counties. The second group of businessmen is situated on the southern part of the county (there were situated the respondents: 4 limited liability companies, 1 individual farmer and 1 agricultural cooperative). The average rent payment in this part of the county is about 73 EUR per hectare. The difference between the minimum rent payment and market rent payment is about 58 per cent. The competition is not as high as in the first group of the businessmen. The lowest interests to doing business in the south of county Galanta consists in the less developed transport infrastructure and longer distance to the markets increases the production costs. The third group includes five businessmen (2 limited liability companies and 3 agricultural cooperatives). They are situated on the western of county Galanta. The market rent payment is only 66 EUR per hectare; it is only 44 per cent higher than the minimum rent payment. There is the worst land quality and the interest to do business in this location is too low. The transport infrastructure is developed quite well; however this part of county Galanta is far from the biggest cities and the access to this part of the county is possible only with own vehicles. The regular local transport is missing.

Figure 4. The influence of the land location on the rent payment

Source: self-calculation

Conclusions

The majority of agricultural land is rented and cultivated by the tenants, not by the owner. Therefore the Slovak law maker adopts a special legal regulation with the aim to stabilise the land rent relations, to protect the business interests of the agricultural businessmen and to protect the soil as the natural resource. There comes out a question what is the impact of this legal regulation on the economic behaviour of the agricultural businessmen. According to our findings we can state that (1) the agricultural businessmen as the tenants are not influenced by the minimum rent payment stipulated by law and the rent payment is stipulated by the land rent market, especially market factors such as rate of competition, number and legal forms of agricultural enterprises, the acreage of the cultivated land and location of the land as well; (2) the agricultural businessmen cultivated larger area of land prefer the longer rent period, however the rent payment are usually lower than in the case of agricultural businessmen who cultivated smaller land areas; these ones prefer the shorter rent period (they would like to prefer the shorter rent period than 5 years which is the minimum stipulated by law) but they supply higher rent payment; (3) the larger enterprises are usually agricultural cooperatives and limited liability companies and the smaller land areas cultivated usually individual farmers, therefore the legal forms of enterprises influence statistically significant the rent payment. There were statistically significant differences between the rent payments of the individual farmers and legal entities (limited liability companies and agricultural cooperatives); (4) the rent payments are influenced also by the cultivated land location; many smaller agricultural enterprises create the competitive business environment which presses up the rent payments; the businessmen cultivating the smaller land areas are motivated to receive the additional units of land also for the higher rent payment per hectare. On the contrary, the business environment with the small number of enterprises cultivating large areas of land are not motivated to receive the additional units of land and the rent payments are usually lower. The rate of the concentration of the agricultural businessmen is influenced by the land quality and infrastructure, mainly the transport infrastructure.

From the interview with the agricultural businessmen results that they would like to prefer to buy the agricultural land but their economic situation and complicated land ownership relations are the main factors why they rent majority of the cultivated land. The landlords have a tendency to ask the higher rent payments otherwise they terminated the rent contract and supply their land to a businessman who is willing to pay higher rent payments regardless on the agricultural or non-agricultural purposes. The landlords do not respect the prior rights of the tenants to conclude the new rent contract; in many cases both of the parties do not know that this right of tenants is stipulated by the law. The agricultural businessmen loss by this practices of the landlords many hectares of land and they have to change their business and investment plans and in many cases they are forced to terminate their agricultural business.

We can conclude that the present legal regulation of the land rent relations does not limited the business plans of the agricultural enterprises and protect sufficiently their rights and there is only the role of the landlords and tenants to know their own rights and obligations stipulated by the law and to be precise to determine their rights and obligations in the rent contracts. It is not formal

bureaucratic mechanism but very useful market measure how to protect their rights and business and investment plans.

Aknowledgments

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THE EFFICIENCY OF SOUTH AFRICAN MINING COMPANIES TO CREATE SHAREHOLDER AND STAKEHOLDER VALUE FROM ENVIRONMENTAL EXPLOITATION

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Abstract. The aim of the study is to estimate the relative efficiency of nine South African mining companies in converting their environmental impact into shareholders' gains and stakeholders' gains. A data envelopment analysis model was used to estimate the relative technical efficiency of the companies in converting environmental impact factors (greenhouse gas emissions, water usage and energy usage) into shareholder gains (EBITDA, dividends and reinvestments). Another model was used to estimate how these environmental impact factors are converted into stakeholders' gains (number of employees, taxes, donations and payments to suppliers of goods and services). The study found that all the companies in the selected sample perform relatively more efficiently in creating stakeholder gains than shareholder gains from the exploitation of the environment.

1. Introduction

For many years it was assumed that the creation of shareholders' value was the primary goal of any firm. This goal is achieved by maximising the fundamental value of a firm's ordinary shares (Arnold, 2005), that is, the value should be sustainable over the long term (Barker, 2001). Since 1987, a new imperative has been introduced as a result of the World Commission on Environment and Development's report that initiated the debate about sustainability, which identifies three dimensions of sustainable development, namely, environmental, economic and social sustainability (WCED, 1987). From this, John Elkington's concept of triple bottom line reporting arose (Elkington, 2004). Companies have started to show an increasing interest in the areas of corporate social responsibility as well as social and environmental accounting. As a result of this interest, a growing number of companies are publishing triple bottom line and sustainability reports (Brown and Fraser, 2006). Many companies

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are voluntarily reporting according to the Sustainable Reporting Guidelines (GRI, 2002), provided by the Global Reporting Initiative (GRI) to enhance the quality of environmental reporting (Ambe, 2008:54). In South Africa, the Code of Governance Principles for South Africa 2009 (better known as King III), states that a firm's strategy, risk, performance and sustainability are inseparable and therefore an integrated report is required of South African firms to give the "full circle" picture of a firm (Robberts, 2011). As a result of the King III report, the Johannesburg Securities Exchange (the JSE) added a new listing requirement of integrated reporting by listed companies from 1 March 2010 (Le Roux, 2011). With these developments in mind, Bosman (2010) concluded that the primary goal of creating sustainable shareholders' value is no longer exclusively relevant, but that the emphasis should shift to the creation of sustainable firm value. The importance of research on sustainable development is that a balance should be found between economic and social development that is compatible with the protection of the environment (Ciegis and Kareivaite, 2009). Harming the environment has a direct impact on the most serious threat to mankind, namely climate change (Moser, 2010; Morrissey and Reser, 2007).

In 1972, Bragdon and Marlin (1972) asked the question "does it pay to be green?" This encouraged other authors to challenge this idea, including Jaggi and Freedman (1992), Porter and Van der Linde (1995), Hart and Ahuja (1996), King and Lenox (2001), Rivera (2001), Orlitzky et al. (2003) and Ambec and Lanoie (2008). Further impetus was added by the Kyoto Protocol for Greenhouse Gas Emissions, the World Summit on Sustainable Development held in Johannesburg, South Africa, in 2002 and the United Nations Climate Change Conference held in Copenhagen, in December 2009, which reflect the concern of stakeholders about the negative impact that industries have on the environment and humankind (Ambe, 2008). Some progress has been made in recognising that the impact on the environment should be minimised and that both shareholders and stakeholders should be beneficiaries in the process of environmental exploitation. It is not clear from the literature; however, to what extent firms have shifted to the new broader focus of creating sustainable firm value.

The aim of this study is not to estimate directly how much shareholders should gain, relative to other stakeholders, from the negative environmental impact of the nine South African mining companies selected for the research; rather the aim is to estimate how efficient these companies are, relative to each other, in converting their environmental impact into shareholders' gains. A further aim is to determine how efficient the same companies are in converting their environmental impact into stakeholders' gains. The median difference and the linear relationship between shareholders' gains and stakeholders' gains were also determined.

To achieve the aims of the research, Data Envelopment Analysis (DEA) was used as it lends itself to aggregating the performance into a single measure where multiple inputs (environmental impact indicators) and outputs (economic and social gain indicators) are used (Coelli et al., 2005).

Against a backdrop that the emphasis of the primary goal of firms should shift, the central argument of this article is that not only shareholders, but also other stakeholders, should gain from the exploitation of the environment.

The organisation of the paper is as follows: The following section (2) provides a background to environmental impact indicators, the indicators relating to the creation of shareholders' gains and the indicators used to estimate

stakeholders' gains. Thereafter the theory is discussed in Section 3, i.e. mainly the DEA models. Section 4 describes the method of the study, where the sample and data are explained. Section 5 sets out the empirical results and the final section provide a discussion and conclusion.

2. Background

Creating sustainable firm value requires the efficient utilisation of the environment for the benefit of both shareholders and other stakeholders (Bosman, 2010). Estimating shareholders' gains differs from estimating stakeholders' gains. Shareholders are concerned about the market value of their investment and dividends (Correia et al., 2011). Stakeholders are concerned about aspects such as jobs, taxes, donations and the supply of products and services to the mining companies (AngloPlatinum, 2008).

To achieve the aims of the study, it was decided to investigate the South African mining industry, because these companies have a much greater impact on the environment in comparison to other companies (Antonites and De Villiers, 2003). For convenience, a sample of nine mining companies was used, as all of them report (and use as a benchmark for comparison with other companies) the following indicators to estimate their negative environmental impact, namely, greenhouse gas emissions, water usage and energy usage. Greenhouse gas emissions are measured in terms of carbon dioxide (CO_2) equivalents, which is a measure for describing how much global warming a given type and amount of greenhouse gas may cause, using the functionally equivalent amount of CO_2. Quantities of CO_2 are derived from measuring electricity purchased and emissions internally generated. Conversion factors for other gases were used, as recommended by the Intergovernmental Panel on Climate Change. The water usage is the quantity that is indicated "for primary activity only." Energy usage includes the following: Electricity purchased from the national utility ESKOM and energy from processes and fossil fuels consumed.

The conceptual scope of the study is simple, namely that natural resources are used to create value and utilising the natural resources leads to a negative environmental impact. The question is: Are the companies performing relatively equally well in converting their environmental impact into shareholders' gains and stakeholders' gains? What complicates this question is that, although the natural environment "belongs" to both shareholders and other stakeholders, the latter are not exposed to the same risks. Shareholders should be entitled to earn a premium to compensate for their risk exposure, while this is not applicable to the other stakeholders. Shareholders are interested in profits as a building block in creating shareholder value in the form of growth in the market value of their shares and dividends. In this study, three indicators of the creation of shareholder value (gains) were selected. The first is EBITDA, i.e. the earnings before interest and taxes, after depreciation and amortisation. Since the last two indicators are non-cash flow charges, this is an accounting measure of operating cash flow and avoids contaminating the results by the effects of gearing (Correia et al., 2011). All the companies selected for the research achieved positive EBITDA values. This is important because the most widely-used DEA models by Charnes et al. (1978) and Banker et al. (1984) require that all the input and output data are positive. The second is the cash component paid to shareholders, namely dividends. Dividends

paid as a measure of financial performance must be used with great caution, as they are often functions of dividend policies. Therefore, the third indicator is linked with dividends paid, namely the value component to shareholders, estimated by the amounts reinvested. Thus, dividends paid (or not paid) should result in lower (or higher) amounts reinvested.

Stakeholders have other expectations from a company and different stakeholders also have different expectations. In this study, four indicators were used to measure stakeholder gains. The first is the number of employees. This includes full-time employees from all operations plus contractors working on a temporary and full-time basis on the mine. The second is the gross payment of taxes to the government. The broader community is the beneficiary in this regard. Donations, where selected sectors of the community are the beneficiary, are the third indicator. The fourth indicator is the amount paid to suppliers of goods and services to the mining companies. This is represented by the operating costs, i.e. purchase of goods and services needed to operate the mines and produce refined minerals, including market development and promotional expenditure. All the mining companies in the sample disclose these aspects.

3. Theory

To summarise the argument presented in this study, shareholders' and stakeholders' gains are achieved at the expense of the natural environment, as estimated by greenhouse gas emissions, and water and energy usage. In creating sustainable firm value, firms should maintain a balance between shareholders' and stakeholders' interests, but since shareholders are exposed to investors' risk while stakeholders are not, and the indicators of shareholders and stakeholders interests (gains) are widely divergent in nature, shareholders' and stakeholders' gains cannot be directly compared. The relationship between the estimated gains can be compared by means of correlation analysis and the difference between them can be determined, for example, by z or t-values (Wegner, 2007).

DEA was used to estimate the relative performance, i.e. the technical efficiency of converting greenhouse gas emissions, water usage and energy usage into gains for shareholders and stakeholders. Technical efficiency is used as a tool to estimate how well inputs are converted into outputs (Avkiran, 1999). DEA is a non-parametric linear programming technique that measures the relative efficiency of a comparative ratio of outputs to inputs for each mining company (Ray, 2004). Unless managers are concerned that variables should be restricted because they are over-represented or under-represented, common practice allows the optimisation model to determine the weight for each variable (Avkiran, 1999). DEA is a relative efficiency measure that accommodates multiple inputs, multiple outputs and other factors in a single model (Halkos & Salamouris, 2004). The main usefulness is its ability to identify inefficient firms, to generate potential improvement for them and indicate efficient firms that should be used as a benchmark by the inefficient ones (Avkiran, 1999).

The fundamental assumption of DEA is that if company A is able to produce $Y(A)$ units of output with $X(A)$ inputs, then other producers should also be able to do the same if they operate efficiently. The core aim of the exercise is to find the "best" virtual producer for each real producer and then compare the producer with its best virtual producer in order to determine its efficiency. The best

virtual producer is found by means of linear programming (Anderson, 1996). DEA effectively estimates the frontier by finding a set of linear segments that envelop the observed data. Analysts choose between using constant returns to scale (CRS) and variable returns to scale (VRS). The first implies a proportionate rise in outputs when inputs are increased; in other words, a firm's efficiency is not influenced by the scale of operations (Avkiran, 1999:211). This is a significant assumption, since CRS may only be valid over a limited range and its use should be justified (Anderson 1996). "VRS implies a disproportionate rise or fall in outputs when inputs are increased" (Avkiran, 1999); in other words, if a firm grows in size, its efficiency will not remain constant, but will either rise or fall.

In this article, two DEA models were used. The equation is given in the next section as part of the DEA methodology. Model 1 was developed to estimate the technical efficiency with regard to shareholders, while Model 2 was developed to estimate it with regard to stakeholders. The following summarises the DEA models that were specified: Inputs (Model 1 and Model 2): Greenhouse gas emissions in tons (x_1), water usage in m^3 (x_2) and energy usage in GJ (x_3). The outputs for Model 1 are: Dividends (y_1), reinvestments (y_2) and EBITDA (y_3). The outputs for Model 2 are: Number of employees (y_1), taxes (y_2), donations (y_3) and amounts paid to suppliers of goods and services (y_4).

The question that this study seeks to answer is whether mining companies are equally (relatively) efficient in converting environmental exploitation into shareholders' gains and stakeholders' gains. Because shareholders bear a risk on their investment and because the companies are managed on their behalf, the expectation is that the companies should perform relatively more efficiently with regard to shareholders' gains than for other stakeholders' gains. Since both groups should gain from the impact on the environment, a further expectation is that the gains for shareholders should correlate with the gains of stakeholders. Therefore, the null-hypothesis is as follows:

H_0: There is no difference between the efficiency in converting the environmental impact alternatively into shareholders' gains and into other stakeholders' gains.

4. Method

4.1 Sample and data

A sample of nine South African mining companies was selected for the study and their financial information from reporting years 2005 to 2009 was used. Only these nine companies provided sufficient data for the study and 2005 was the cut-off point since a limited number of mining companies reported on environmentally related issues prior to 2005. All of these South African mining companies subscribe to the South African Business Council for Sustainable Development hosted by the National Business Initiative (NBI); and report on sustainability, based on the GRI guidelines. The nine companies operate in the following sectors of the mining industry: three in the gold-mining sector (AngloGold Ashanti, Goldfields and Harmony), four in the platinum-mining sector (AngloPlat, ImpalaPlat, Lonmin and Northam), one in the coal-mining sector (AngloCoal) and one is a diversified natural resources company (BHP Billiton). Documentary data from company sources, such as annual reports and sustainability reports, were

used to acquire the information needed for this study. Company reports that use US$ were converted to ZAR by using the average exchange rate in each year.

4.2 DEA methodology

Different kinds of mines have different impacts on the environment, e.g. a typical platinum-mining company's greenhouse gas emissions and water and energy usage will differ from, e.g. a typical gold-mining company in refining one ounce of platinum and one ounce of gold, respectively. Therefore, the focus of this study is not on refined minerals as outputs, but on shareholders' and stakeholders' gains. Therefore, all nine companies (from the different sectors) were grouped together in the DEA. From these results, it was possible to estimate the best-practice frontier for all the companies to convert their environmental impact into alternatively shareholders' and stakeholders' gains. The software package of Zhu (2004) is purpose-built to solve the DEA problem and was used in this paper to generate estimates of the annual input-orientated technical efficiency for each company over a five-year period. The input-orientated approach minimises inputs, while the outputs are kept at their current levels. This approach seems most appropriate here. A single estimate of productive efficiency, which lies between zero (meaning the company is totally inefficient) and one (which signals that the company is fully efficient), is calculated. Furthermore, the less restricted VRS approach, as discussed above, was used. The DEA equation is as follows (Zhu, 2004):

$$\min \theta - \varepsilon \left(\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+ \right)$$

subject to

$$\sum_{j=1}^{n} \lambda_j \chi_{ij} + s_i^- = \theta \chi_{io} \qquad i = 1,2,....,m;$$

$$\sum_{j=1}^{n} \lambda_j \gamma_{ri} - s_r^+ = \gamma_{ro} \qquad r = 1,2,....,s;$$

$$CRS \qquad \lambda_j \geq 0 \qquad j = 1,2,....,n.$$

The input-orientated formula calculates input minimisation (where θ indicates the efficiency score). Each observation, DMU_j (Decision-making unit) (j = 1, ..., n), uses m inputs X_{ij} (i = 1, 2, ...,m) to produce s outputs Y_{rj} (r = 1, 2, ...,s), where DMU_o represents one of the n DMUs under evaluation, and X_{io} and Y_{ro} are the ith input and rth output for DMU_o, respectively. In order to take any slack into consideration, the inclusion of the non-Archimedean ε effectively allows the minimisation over θ to pre-empt the optimisation involving the slacks, s_i^- and s_r^+. [For a more applications of DEA methodology, see Dramani et al. (2011), Van der Westhuizen (2011) and Zhu (2004).]

The final step was to determine whether the difference between the outcomes of the two DEA models is significant and whether the correlation between them is significant.

5. Results

Table 1: Technical efficiency in converting environmental impact factors into shareholders' gain (DEA Model 1)

Company	2005	2006	2007	2008	2009	Average
Platinum						
AngloPlat	0.467	0.869	1.000	1.000	0.682	0.804
ImpalaPlat	0.454	0.699	0.807	1.000	0.724	0.737
Lonmin	1.000	0.861	0.835	1.000	1.000	0.939
Northam	1.000	1.000	0.925	1.000	0.952	0.976
Average						0.864
Gold						
AngloGold	0.339	0.352	0.426	0.535	0.547	0.440
Goldfields	0.248	0.340	0.396	0.532	0.557	0.415
Harmony	0.240	0.216	0.239	0.278	0.415	0.277
Average						0.377
Coal						
AngloCoal	0.990	1.000	1.000	1.000	0.966	0.991
Diversified						
BHP Billiton	0.751	0.543	0.860	1.000	1.000	0.831
Average	0.610	0.653	0.721	0.816	0.760	0.712

Source: Own calculations with software from Zhu, 2004

Table 1 exhibits the relative performance (technical efficiency) of the nine mining companies in converting the environmental impact indicators into shareholders' gains. These are the results from DEA Model 1. AngloCoal is the best performer, with an average technical efficiency estimate of 99.1 percent, implying that this company should reduce its inputs by 0.9 percent without reducing its outputs. Northam is the second highest performer. The gold-mining companies are clearly the worst performers. The average technical efficiency estimate for platinum-mining companies is 86.4 percent but only 37.7 percent for gold-mining companies. This implies that, on average, platinum-mining companies should reduce their greenhouse gas emissions, and water and energy usage, by 13.6 percent, while still generating the same EBITDA, paying the same dividends and reinvesting the same amounts. This is much lower than the 62.3 percent by which gold-mining companies should reduce the three environmental impact indicators, while keeping their output variables at the same levels.

Table 2, as with Table 1, exhibits the relative performance (technical efficiency) of the nine mining companies in converting the environmental impact indicators into stakeholders' gains. These are the results from DEA Model 2. The highest individual performer is again AngloCoal, which was fully efficient over the whole period under investigation. Northam is the second best performer. The average technical efficiency estimate for platinum-mining companies is 96 percent, yet only 77.5 percent for gold-mining companies. This implies that, on average, platinum-mining companies should reduce their greenhouse gas emissions and water and energy usage by only four percent, while still employing the same number of workers and spending the same amount on taxes, donations and payments to suppliers of goods and services. This is much lower than the 22.5

percent by which gold-mining companies should reduce the three environmental impact indicators, while keeping their four output variables at the same levels.

Table 2: Technical efficiency in converting environmental impact factors into stakeholders' gain (DEA Model 2)

Company	2005	2006	2007	2008	2009	Average
Platinum						
AngloPlat	0.962	1.000	1.000	1.000	1.000	0.992
ImpalaPlat	0.652	0.825	1.000	1.000	1.000	0.895
Lonmin	1.000	0.865	0.966	1.000	1.000	0.966
Northam	1.000	1.000	0.925	1.000	1.000	0.985
Average						0.960
Gold						
AngloGold	0.815	0.731	0.778	0.799	0.794	0.783
Goldfields	0.658	0.637	0.605	0.698	0.953	0.710
Harmony	0.883	0.856	0.757	0.835	0.823	0.831
Average						0.775
Coal						
AngloCoal	1.000	1.000	1.000	1.000	1.000	1.000
Diversified						
BHP Billiton	0.763	1.000	0.881	1.000	1.000	0.929
Average	0.859	0.879	0.879	0.926	0.952	0.899

Source: Own calculations with software from Zhu, 2004

Table 2, as with Table 1, exhibits the relative performance (technical efficiency) of the nine mining companies in converting the environmental impact indicators into stakeholders' gains. These are the results from DEA Model 2. The highest individual performer is again AngloCoal, which was fully efficient over the whole period under investigation. Northam is the second best performer. The average technical efficiency estimate for platinum-mining companies is 96 percent, yet only 77.5 percent for gold-mining companies. This implies that, on average, platinum-mining companies should reduce their greenhouse gas emissions and water and energy usage by only four percent, while still employing the same number of workers and spending the same amount on taxes, donations and payments to suppliers of goods and services. This is much lower than the 22.5 percent by which gold-mining companies should reduce the three environmental impact indicators, while keeping their four output variables at the same levels.

Table 3 has been added to put the data in Tables 1 and 2 into perspective. Table 3 exhibits the return on equity of the mining companies from 2005 to 2009. In this case, AngloCoal is profitable for all years, yet profitability is relatively low. The platinum-mining companies, except for Lonmin, are extremely profitable and two of the three gold-mining companies made, on average, a loss during the five-year period.

Table 3: Return on equity (% p.a.)

Company	2005	2006	2007	2008	2009	Average
Platinum						
AngloPlat	21.38	41.89	43.35	49.77	10.67	33.41
ImpalaPlat	37.12	31.37	21.94	40.53	14.70	29.13
Lonmin	3.33	4.66	5.63	1.98	-1.25	2.87
Northam	15.56	35.21	55.69	51.41	7.57	33.09
Average						24.63
Gold						
AngloGold	-7.61	-2.81	-26.85	-74.14	-12.41	-24.76
Goldfields	1.14	7.58	6.63	10.92	3.82	6.02
Harmony	-15.60	-2.26	1.44	-0.99	9.91	-1.50
Average						-6.75
Coal						
AngloCoal	2.41	1.50	0.88	2.45	9.02	3.25
Diversified						
BHP Billiton	5.56	6.73	6.42	5.06	1.81	5.12

Source: McGregor database, 2010

Table 4: Descriptive statistics of the technical efficiencies relating to shareholders and stakeholders (n = 45)

	Shareholders	Stakeholders
Arithmetic mean	0.712	0.899
Standard error	0.042	0.019
Median	0.807	0.966
Mode	1.000	1.000
Standard deviation	0.284	0.124
Sample variance	0.081	0.015
Kurtosis	-1.418	-0.439
Skewness	-0.411	-0.909
Range	0.784	0.395
Minimum	0.216	0.605
Maximum	1.000	1.000
Sum	32.047	40.462
Count	45	45

Source: Own calculations with Microsoft Excel

In order to test the null hypothesis, the performance differences are investigated. Table 4 exhibits the descriptive statistics of the technical efficiencies pertaining to stakeholders and those pertaining to shareholders. The following should be emphasised:

- The mean and median relating to stakeholders (89.9 and 96.6 percent) are much higher than those pertaining to shareholders (71.2 and 80.7 percent).
- The relatively large difference between the means and medians implies that normal distributions do not exist. The skewness factor confirms it. Therefore, the median should be used to compare the data.

- The mode in both sets of data is 100 percent. This can be explained from Table 1 where the companies were fully technically efficient 14 times out of 45. According to Table 2, the companies were fully technically efficient 22 out of the 45 times.

Since it is clear that the data as described in Table 4 are not normally distributed, a non-parametric comparison should rather be used to determine whether the difference between the medians is significant (Steyn et al., 1999). The problem is then that too many of the data points are 100 percent and will have the same ranking order (Steyn et al., 1999). Although the data are not normally distributed, it was decided to calculate the z-value to determine whether the median difference is significant. The result of $z = 4.048$ ($p < 0.001$) that was obtained from the data must be interpreted with great care, but such a small p-value indicates that the median differences are probably in favour of the stakeholders. Nevertheless, focusing on the percentages, the median pertaining to stakeholders (96.6 percent) implies that greenhouse gas emissions and water and energy usage should be reduced by all the companies together by 3.4 percent without reducing their workforce, taxes, donations and payments to suppliers. The median pertaining to the shareholders (80.7 percent) implies that greenhouse gas emissions and water and energy usage should be reduced by all the companies together by 19.3 percent without reducing their EBITDA, dividends and reinvestments. Based on this evidence, it is probably acceptable to conclude that the null hypothesis with regard to the difference in medians should be rejected.

Finally, a correlation coefficient was calculated between the nine average technical efficiencies of stakeholders and shareholders. Nine observations constitute a small sample, but using all 45 observations may introduce a problem of autocorrelation owing to the fact that the data represent a time series. The correlation coefficient is 0.883, with $p = 0.002$, implying that the null hypothesis should be rejected at a significance level of one percent, where $p < α = 0.01$ (two-tailed).

6. Discussion and conclusion

This study investigated the performance of nine South African mining companies in converting environmental impact factors into shareholders' and stakeholders' gains. DEA was used to estimate the performance by calculating the relative technical efficiencies of the nine companies over a five-year period. One limitation of the study is that only a limited number of companies were included in the sample, because not all the companies submitted sustainability reports according to GRI guidelines. Clear trends could be identified with regard to four platinum- and three gold-mining companies, but since only one diversified and only one coal-mining company were included, trends were difficult to identify for these companies.

The study found, firstly, that the single coal-mining company was the highest performer in converting the environmental impact indicators into both stakeholders' and shareholders' gains. The four platinum-mining companies performed well pertaining to stakeholders and shareholders and they were all far more efficient than the gold-mining companies. The fact that all three gold-mining companies performed the worst as a group, as well as individually, is a clear

indication that gold-mining companies have a relatively greater impact on the environment than other mining companies in generating gains for both shareholders and stakeholders. They were relatively technically inefficient. Although no statistically significant tests were performed in respect of the differences in performance of the different mining companies, it is clear from Tables 1 and 2 that there are large differences between the different mining sectors in meeting the expectations of stakeholders and shareholders. Table 3 provides some perspective on this, indicating that platinum-mining companies are generally extremely profitable and two of the three gold-mining companies made, on average, a loss for the period under review.

Secondly, the main concern of this study was about the difference in mining companies' performances pertaining to shareholders and other stakeholders. The study found that all nine mining companies were performing relatively more efficiently in converting environmental impact factors into stakeholders' gains, than in the case of shareholders' gains, with median performances of 96.6 percent and 80.7 percent, respectively. These percentages and $p < 0.001$, although the data are not normally distributed, imply that the median difference between shareholders and stakeholders performance is significant. Therefore, mining companies find it easier to convert the environmental impact indicators (greenhouse gas emissions and water and energy usage) into stakeholders' gains (job opportunities, taxes, donations and payments to suppliers) than it is for them to convert it into shareholders' gains (profits, dividends and reinvestments). Extreme differences were found, especially for the gold-mining companies, where the technical efficiency estimate is 75.5 percent pertaining to stakeholders and only 37.7 percent for shareholders. Based on this evidence, it appears that the null hypothesis should be rejected, implying that the difference in the shareholders' gains and stakeholders' gains is significant. It is noteworthy that the difference is in favour of the stakeholders. In the discussion of the theory, it was stated that the expectation is that shareholders should be in a favourable position since they have to bear investors' risks and because the companies are managed on their behalf.

Thirdly, the study found that there is a strong positive correlation between the efficiency scores of shareholders' gains and stakeholders' gains. Based only on the averages of the annual performance estimates, the correlation coefficient is 0.883, with a p-value of 0.002, implying that the null hypothesis should be rejected at a significance level of one percent. That implies that when there is a change in the gains of shareholders, there is also a change in the same direction in the gains of stakeholders, and *vice versa*.

The research question was: Are mining companies relatively equally efficient in converting environmental exploitation into shareholders' gains and stakeholders' gains? Performances were estimated for each of the nine companies for each year, relative to all the other companies in all the years and it appears that these companies perform relatively more efficiently in creating stakeholders' gains than shareholders' gains from their environmental impact. Therefore, it appears that it is relatively easier for the companies to meet stakeholders' needs in comparison with shareholders' needs, especially if it is kept in mind that the shareholders are bearing the risks. Possible reasons for this phenomenon are:

- Mines need a workforce, but in South Africa organised labour has a great deal of power, supported by stringent labour acts, which makes it difficult to adjust the size and remuneration of the workforce.
- Mining companies have no control whatsoever regarding taxes to be paid.
- Donations are the one component where mining companies should have full control. Possibly owing to pressure from the communities, the raw data indicated that all nine companies made donations in each year under review, even those companies that made losses in a particular year.
- The only control that a mining company has with regard to payments to suppliers of goods is to become more price efficient (find other suppliers that can render the same quality of goods and services at a lower price) and more quantity efficient (do not buy or use services that are not really essential).

From the evidence that the companies performed well in creating stakeholders' gains relative to shareholders' gains and that changes in the gains of the one group correlate highly with changes in gains of the other group, it is concluded that the emphasis of the companies is much broader, namely to create sustainable firm value. This shift is delicate, but the practical implication is that mining companies should be aware of this trend and the possible future effect of placing too little emphasis on creating shareholder value. Therefore, a fine balance should be maintained to ensure that stakeholders do not become the more important beneficiaries of environmental impact, while the risk-bearing shareholders are neglected. The value of this study is that it is the first to use DEA in relation to South African mining companies to determine the gains that shareholders receive versus the gains that stakeholders receive in the process of exploiting the environment. Further research is necessary to determine what the optimal balance between shareholders' gains and stakeholders' gains should be.

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