DETERMINANTS OF RETURN ON EQUITY FOR A SUSTAINABLE GROWTH OF THE MANUFACTURING INDUSTRY IN THE CZECH REPUBLIC

Daniel Anarfi[1], Kofi Ampadu Boateng[1], Kwabena Adu-Ababio[2]

[1] *Mendel University in Brno*
[2] *University of Ghana*

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ABSTRACT

The aim of this study was to examine the factors that determine return on equity (ROE) in the Manufacturing industry in the Czech Republic over a 10-year period of 2005 to 2014. The study combined firm level variables (DuPont model) and macroeconomic variables (Multifactor Arbitrate Pricing Theory – APT) to regress data obtained from Amadeus (Bureau van Dijk) and the World Bank respectively. The results show that profit margin and net asset turnover have a positive and significant effect on ROE. However, financial leverage had a negative and significant impact on ROE. With regard to macroeconomic variables, none of them affected ROE positively. GDP growth and Interest rate impacted negatively on ROE whilst unemployment, inflation and exchange rate do not have any impact on ROE. These results suggest that the firms can improve their ROE by developing cost leadership strategies and increasing sales revenue.

KEY WORDS

return on equity, company performance, manufacturing industry, Czech Republic

JEL CODES

G32, G39

1 INTRODUCTION

An analysis of economic performance and growth in a business or company is one of the pertinent aspects that must be met to ensure that the business is run properly. The accountant, investor, IT specialists, economists as well as shareholders have to assess these indicators to make sound adjustments and models accordingly (Damodaran, 2016). According to Lazonick and O'Sullivan (2000), return on equity (ROE) is one of the measures that is used in measuring the profitability of a business in relation to the book value of shareholder equity. It is therefore a parameter that is considered essential in decision making

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processes as companies and shareholders make appropriate decisions that are related to an entity's model.

The manufacturing industry is one of the most competitive and highly invested industries in the market (Goddard et al., 2005). The initial outlay that is required is very high making an analysis of the different models and aspects in the market critical towards giving the analysts a chance to make critical decisions on the best models that are to be adopted by the company. Depending on the products that are deemed necessary in the market, there are different figures that can be appropriated and developed to highlight the important aspects that are needed in the market (Král, 2004).

This paper assesses the factors that determine the return on equity in the Czech Republic. This means that there a need for an analysis of the differentiated aspects in the European market and how the external and internal conditions affect the manufacturing sector in the country (Damodaran, 2016). Literature review on these aspects will have to be assessed and differences in the models that are given will also be appropriated to have a proper perspective of the determinants that are critical to ROE.

2 LITERATURE REVIEW

Return on equity is equal to the net income that a company or business makes after there have been payment for preferred stock before the common stock dividend has been paid divided by the total equity. It is defined as the measure of return for the investments from equity that has been placed in the company by the shareholders (Portes and Rey, 2005). Businesses have to assess the market opportunities and models before making a decision on an industry to invest in since the industry in the market where the company invests determines the level of return on equity that the company stands to gain due to the market forces.

The manufacturing sector in Czech Republic is affected by the external forces and market models in the European Union (EU). Damodaran (2016) asserts that, the EU has a significant influence in the market since the Czech Republic is part of the EU and is affected by the same models and aspects of the market. Since the manufacturing sector requires coordination and interaction between different countries it is important to assess the market conditions in the area (Wagner, 2005). The level of income is affected by how well a company does in the market, with the international controls and models being important in highlighting the different models that are appropriated and created in these markets.

Pasiouras and Kosmidou (2007) observe that the performance of a company in the manufacturing sector in the Czech Republic is as similar in other countries and determines the level of ROE in the market. The cost of production of products is critical since it determines the level of income that can be appropriated and created in the same market. The cost of production affects the level of profits and income that is important in creating a proper model for the company (Damodaran, 2016). Depending on the availability and cost of raw materials therefore, it is important to ensure that the economic indicators and models that are needed in the market have been ascertained and create a working prospect that can help in differentiating the position of the companies in the industry (Wagner et al., 2002).

The ratio of equity that has been raised to support the company in the manufacturing sector is also a major aspect that determines ROE (Dunning, 2012). Depending on the level of control that has been supported by equity and the level driven by debt it is important to ensure that the two aspects are critically evaluated before coming up with a single structure that is meant to ensure that the market models are supported. The level of competition in the market is also a major determinant of ROE in the manufacturing sector. Although most companies do not face stiff competition

due to the level of investment required in the manufacturing sector, competition is also a major determinant of ROE in the market (Caner and Kontorovich, 2004). Competition determines the profits that companies stand to make and the level of creativity and modelling that is appropriated in the market. There are differences that can be cited and models that need to be addressed however, since the market models are appropriately controlled. It is therefore, critical to establish the position of a company in the market in comparison to other companies and derive the best models and strategies that can be used in giving the entity a competitive edge in the larger industry (Goddard et al., 2005). This helps the company in gaining a higher level of income and in turn ROE (Caves, 1974).

There are companies within the manufacturing sector that are critical in giving the people the best models and aspects that are significantly addressed. Depending on individual models, there are differentiated aspects that can be assessed and cases where ROE is not a measure of how well, or how bad a company has done in the market (Jermann, 1998). According to Arnold et al. (2011), a company may control a large ROE in respect to another entity but this does not represent the best models for change accordingly. Since the Czech Republic is perfectly poised to take advantage of the larger market, there are different models and critical controls that are significantly poised. Beck (2002) reiterates that the manufacturing sector in the country is affected by the region's advancement in technology and economic indicators respectively. The EU affects and reflects on all the countries that are member states, making manufacturing in the region advanced therefore, increasing the changes that are poised in the market as a result accordingly (Lyn and Zychowicz, 2003). It is important to ensure that the market indicators are perfectly developed and with a country that is in the EU it is easier to control the market forces and indicators to the company's advantage (Antoniou et al., 2002).

The manufacturing in the Czech Republic has all the ingredients for success, making the ROE in the region to be very high as a result. It is important therefore, to ensure that the market models and attributes that are derived are created in a way to ensure that all the controls are poised to take advantage of the market. The different determinants of ROE are measured before important decisions are made and companies need to have better approaches to take advantage of these market models.

3 METHODS AND DATA

3.1 Data Description

This paper chose the Manufacturing Industry in the Czech Republic as the population of study because of the availability of data and the success of the current growth of the industry. In total, 1,328 firms were sample from the population for a period of 10 years (2005–2014). To achieve a balanced data, all manufacturing firms who had operated for this period and had asset valuing 5,000 and above were considered. Therefore the sample consists of 12,935 observations.

3.2 Variables

In an attempt to identify the determinants of ROE of a firm from the panel data, most early writers have relied on ROE as the dependent variable (Boyd et al., 2007; Hagerman and Ratchford, 1978; Ndlovu and Alagidede, 2015) which is repeated in this study. Following the work of Ndlovu and Alagidede (2015), this study first considers the micro level independent variables which is the DuPont model to include Profit Margin (PM), Asset Turnover (AT) and Financial Leverage (FL):

$$\begin{aligned} \mathrm{ROE}_{it} &= \alpha + \beta_1 \,\mathrm{PM}_{it} + \beta_2 \,\mathrm{AT}_{it} + \\ &\quad + \beta_3 \,\mathrm{FL}_{it} + \mu_{it}, \end{aligned} \tag{1}$$

where ROE is the dependent variable, i and t both represent the firm and time, α represents the constant in the study and the coefficients of the variables are the β_1, β_2, β_3. The error term is represented by μ. The micro-level data were extracted from European micro database Amadeus provided by Bureau van Dijk. The Amadeus database contains annual accounts for about 1.5 million firms in Europe. The data extracted were already in a computed ratios of the firms. However, a firm's performance and profitability is not only affected by the internal factors but external factors as well. This study also adopts the APT model in other to include the Macro level variables in the DuPont model (Ndlovu and Alagidede, 2015). The model is specified below:

$$\begin{aligned} \mathrm{ROE}_{it} &= \alpha + \beta_1 \,\mathrm{PM}_{it} + \beta_2 \,\mathrm{AT}_{it} + \\ &+ \beta_3 \,\mathrm{FL}_{it} + \beta_4 \,\mathrm{UnR}_t + \\ &+ \beta_5 \,\mathrm{ExR}_t + \beta_6 \,\mathrm{GDPgR}_t + \\ &+ \beta_7 \,\mathrm{InR}_t + \beta_8 \,\mathrm{InfR}_t + \mu_{it} \end{aligned} \quad (2)$$

The new macro-economic variables which are included in the model are the Unemployment Rate (UnR), Exchange Rate (ExR), GDP growth Rate (GDPgR), Interest Rate-REPO (InR) and Inflation Rate (InfR). The macro-level data were also extracted from the databank of the World Bank. The panel level of the data sample allows the the application of fixed-effects methods on the micro level (Dischinger, 2010).

$$\begin{aligned} \mathrm{ROE}_{it} &= \alpha + \beta_1 \,\mathrm{PM}_{it} + \beta_2 \,\mathrm{AT}_{it} + \\ &+ \beta_3 \,\mathrm{FL}_{it} + \beta_4 \,\mathrm{UnR}_t + \\ &+ \beta_5 \,\mathrm{ExR}_t + \beta_6 \,\mathrm{GDPgR}_t + \\ &+ \beta_7 \,\mathrm{InR}_t + \beta_8 \,\mathrm{InfR}_t + \\ &+ \rho_t + \phi_i + \mu_{it} \end{aligned} \quad (3)$$

The new terms included in the model ρ_t and ϕ_i represents year effect dummy and firm fixed effect dummy respectively. The year effect dummy controls the unobserved common changes in the profitability of all firms in a given year and the firm fixed effects controls the unobserved characteristics of the firm that do not change over time (Dharmapala, 2014). According to the Hausman test, the fixed-effects OLS model is more preferable than the random-effects model. The following are the definition and description of the data variables.

Return on Equity: The ROE is one of the traditional profitability ratio that measures the ability of a firm to generate profits from its shareholders investments in the company.

$$\text{ROE (DuPont formula)} = \frac{\text{Net profit}}{\text{Revenue}} \cdot \cdot \frac{\text{Revenue}}{\text{Total assets}} \cdot \frac{\text{Total assets}}{\text{Shareholder's equity}}$$

Therefore ROE = Net profit margin · Asset turnover · Financial leverage.

Profit Margin: The profitability ratio which indicates the amount by which revenue from sales exceeds costs in a business.

$$\mathrm{PM} = \frac{\text{Net Income}}{\text{Sales}} \cdot 100$$

Net Asset Turnover: The efficient way a company can use its assets to generate sales.

$$\mathrm{NAT} = \frac{\text{Net Sales}}{\text{Average Total Assets}}$$

Financial Leverage (Equity Multiplier): The equity multiplier shows the percentage of assets that are financed or owed by the shareholders (denominated in EUR).

$$\mathrm{FL} = \frac{\text{Total Assets}}{\text{Total Shareholder's Equity}}$$

The World Bank definition of the Macro-level data are as follows:

Unemployment, total (% of total labour force): Unemployment refers to the share of the labour force that is without work but available for and seeking employment.

Exchange rate (CZK per USD, period average): The exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U. S. dollar).

GDP growth (annual %): Annual percentage growth rate of GDP at market prices based on constant local currency.

Interest rate (%): Lending rate is the bank rate that usually meets the short- and medium-term financing needs of the private sector.

Inflation, consumer prices (annual %): Inflation as measured by the consumer price index, reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.

4 RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Descriptive statistics is first presented showing both the financial variables and the macroeconomic indicators.

Tab. 1 shows mean, standard deviation, minimum and maximum values. On the average, manufacturing companies in Czech Republic representing our sample had a Return on Equity (ROE) of about 9.55 over the entire time period from 2005 to 2014 as used in the study. The mean of ROE varied greatly across the companies and periods, the standard deviation of ROE is 44.64, minimum and maximum values are −871.21 and 870.305, respectively. Whiles the mean of Profit Margin (PM) is 5.19, minimum value is −96.65 and maximum value is 100%. The averages of Net Asset Turnover (NAT) and Financial Leverage (FL) are approximately 3.94 and 3.32, respectively. Liquidity ratio which is one of the important ratios for the banks amounts to 31.5% on average, while it varies between 8.6% and 56.5%.

On the other hand, Tab. 1 also summarize the averages of the macroeconomic variables over the year 2005 through 2014. The average growth rate of real GDP is approximately 2.16% (minimum −4.8 in year 2005 and maximum 6.9 in year 2014). When the mean of inflation rate is 1.2%, real interest rate has a 5.61 mean value for 2005–2014 periods. Also exchange rate for the 10-year period from 2005–2014 is 19.969 while the mean of unemployment rate is 6.548.

4.2 Correlation Matrix

Secondly, correlation matrix for the variables is presented in Tab. 2 to measure the degree of association between them.

Correlation between ROE and an independent variable which shows a positive would mean that the two variables move together, on the other hand a negative correlation between ROE and an independent variable would indicate the opposite. From the Financial (Micro) variables, Tab. 2 shows in the correlation matrix that ROE has a positive correlation with only profit margin (PM) because the correlation between ROE Net Asset Turnover (NAT) as well as financial leverage (FL) were all negative. The Czech Manufacturing Industry (MI) has traditionally been an important contributor to economic growth and employment (PwC, 2016) therefore the industry is quite stable, high sales volume and enjoys economies of scale. Total revenues (CZK bn) from sales in 2008 and 2014 amounted to 3,960 and 4,097 respectively (according to Panorama of the manufacturing industry of the Czech Republic, 2014).

Operating cost in the MI in Czech Republic is also favourable since most of the raw materials are produced locally and firms are consumer of products and services from each other. According to the Czech Ministry of Trade the Automotive division which manufactured a total of 1,246,506 personal automobiles in 2014 depends on other manufacturing industry divisions like the electrical engineering, metal industry, chemical industry, rubbers and plastics industry, glass, textile and general engineering industry and other related branches and services. The negative correlation between ROE and NAT is largely due to the consistent increase of assets (short-term receivables) in the industry which is relative to sales growth. The report by the Czech Ministry of Trade revealed that between the period of 2008–2014 the Manufacturing Industry (MI) increased its

Tab. 1: Descriptive statistics for variables

Variable	Mean	Std. Dev.	Min	Max
roe	9.5464	44.6433	−871.217	870.305
pm	5.1923	10.0900	−96.645	100.000
nat	3.9438	18.7408	0.000	920.249
fl	3.3180	31.4663	−605.500	2705.645
unemp	6.5480	0.9774	4.390	7.930
int_rate	5.6100	0.4721	4.600	6.300
infl_rate	1.2500	1.4264	−1.500	3.500
growth	2.1600	3.4184	−4.800	6.900
exchg_rate	19.9690	1.9755	17.070	23.960

Tab. 2: Correlation matrix with significance levels

	roe	pm	nat	fl	unemp	int_rate	infl_rate	growth	exchg_rate
roe	1.0000								
pm	0.4511* (0.0000)	1.0000							
nat	−0.0221* (0.0117)	−0.0427* (0.0000)	1.0000						
fl	−0.1079* (0.0000)	−0.0333* (0.0001)	0.3058* (0.0000)	1.0000					
unemp	0.0110 (0.2087)	0.0222* (0.0109)	−0.0036 (0.6781)	−0.0031 (0.7237)	1.0000				
int_rate	−0.0453* (0.0000)	−0.0245* (0.0050)	−0.0098 (0.2623)	−0.0115 (0.1834)	−0.2360* (0.0000)	1.0000			
infl_rate	0.0264* (0.0026)	0.0183* (0.0363)	0.0153 (0.0803)	−0.0006 (0.9453)	−0.6328* (0.0000)	−0.1567* (0.0000)	1.0000		
growth	−0.0131 (0.1337)	0.0094 (0.2803)	−0.0085 (0.3319)	−0.0040 (0.6455)	0.0126 (0.1452)	0.0932* (0.0000)	−0.2086* (0.0000)	1.0000	
exchg_rate	0.0256* (0.0035)	0.0486* (0.0000)	0.0008 (0.9313)	−0.0090 (0.3004)	0.5791* (0.0000)	−0.2672* (0.0000)	−0.0769* (0.0000)	0.5567* (0.0000)	1.0000

asset short-term assets by 37% whilst revenue grew by 39%.

Although basically a lower level of assets is better in calculating NAT holding sales constant to improve the ROE but in this situation assets (short term receivables) needed to be consistently increased resulting from mass production to boost sales revenue. Although firms with higher leverage positions tend to have a capital structure that translates into a better performance according to Brealey et al. (2012). In other words, high leverage and profitability or performance should be positively correlated but the case is different in the Czech Manufacturing Industry. Equity-to-Asset in terms of interest on capital in the MI in the Czech Republic is much better than debt-to-total assets. This affirms the case of Rhyne and Otero (1992) who observed that firms with high capital structure with equity, tend to be more profitable. A higher debt over equity would mean more would be incurred in paying the cost of this capital than acquiring equity. The equity/assets in 2008 of the MI in Czech Republic was 26.82% compared to 2.98% of debt/assets. Again in 2014, debt/assets was 1.89% as against 39.81% equity/assets in the industry according to the Czech Ministry of Trade. This indicates that most equity forms the largest composition of the capital structure in the industry which is making the industry highly profitable.

Moreover, on the Macro level indicators, ROE is positively correlated with unemployment rate, inflation rate and exchange rate while the correlation between ROE and Growth rate and interest rate were negative.

Tab. 3: Determinants of return on equity

	(1)	(2)	(3)
Variables	**FE_Model roe**	**RE_Model roe**	**BE_Model roe**
pm	2.247***	2.131***	1.811***
	(0.045)	(0.039)	(0.079)
nat	0.508***	0.525***	0.653***
	(0.038)	(0.035)	(0.091)
fl	−1.213***	−1.197***	−1.192***
	(0.058)	(0.053)	(0.128)
unemp	−1.108	−1.142	36.908
	(1.246)	(1.245)	(40.401)
int_rate	−3.062***	−3.060***	−33.241**
	(0.730)	(0.729)	(13.082)
infl_rate	−0.385	−0.353	43.316**
	(0.638)	(0.637)	(21.200)
growth	−0.432*	−0.423*	22.882***
	(0.240)	(0.239)	(7.236)
exchg_rate	0.541	0.595	−27.770
	(0.554)	(0.553)	(17.084)
Constant	14.390**	14.008**	397.149***
	(6.524)	(6.529)	(134.605)
Observations	12,935	12,935	12,935
R-squared	0.214		0.365
Number of id	1,328	1,328	1,328

Notes: standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.3 Empirical Results from Panel Data Analysis

For empirical results we run three different but related models to ascertain the impact of some micro and macro indicators on the ROE on manufacturing firms in the Czech Republic. We first run a Fixed Effect model where we assume that unobserved effects are correlated with our macro and micro level indicators. We then specify a Random Effects model where the initial assumptions of correlation are reversed on the same covariates. To select the best model among these we run a Hausman specification test to select one model that best suits the scenario in the Czech Republic. Our final model tries to look at the averages of the dependent variable for all the manufacturing companies as one. In this case the research is able to gauge the effect of an average ROE on the interest indicators.

Tab. 3 shows the parameters of estimation and standard errors obtained from the application of fixed effects model, random effects model and the between effects model with the ROE as the dependent variable.

For the FE model we observed that with the firm level variables, profit margin (PM) is highly significant and positively related to ROE. This positive relationship shows that the Profit Margin (PM) have significant positive impact on Equity return. Also, Net Asset Turnover (NAT) is found to be significantly affecting the return of equity (ROE) in the Manufacturing Industry in Czech Republic. The results shows that the impact of Financial Leverage (FL) has a significant negative impact on ROE.

On the macro level indicators both GDP Growth and Interest rate were found to have negative significant level impact on ROE. The negative relationship of GDP is in contradiction to theory of Economics which assumes that that economic growth enhances profitability, however the reason may be attributed to the fact (but not limited to) two reasons. First

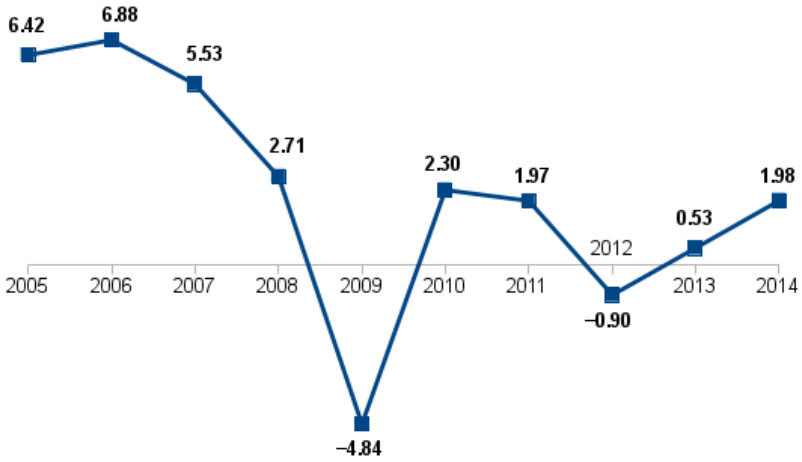

Fig. 1: GDP growth in % (from World Bank Data)

the GDP growth in Czech Republic under the period of study did not see any steady growth and stability. For instance, the GDP growth in 2006 was 6.87% but sharply declined and as at 2009 it was −4.822% according to the data from the World Bank as shown graphically in Fig. 1. It appears that the net effect of the GDP growth under the period of study could have resulted in the negative significant impact on ROE.

Another reason which could have accounted for the negative relationship between GDP and ROE is that, since the biggest firms in the sector are multinationals, their earnings or profit do not mostly contribute to aggregate GDP in the host country but rather repatriated to the home country and this sometimes create a discrepancy between the company's performance and the local economy. The remaining macroeconomic variables (Unemployment, Inflation rate, Exchange rate) all showed no impact on ROE. The negative effect of GDP is in line with results of Khrawish (2011), Sharma and Mani (2012) and Sufian (2011).

For the RE model the research observes that with the micro level variables, there is a significant positive relationship between Profit Margin (PM) and ROE. This indicates the positive impact PM has on ROE in the Manufacturing sector in Czech Republic. Net Asset Turnover (NAT) is also impacting positively on ROE at a high significant. Among the micro level variables only Financial Leverage (FL) which was found to be impacting significant negatively on ROE. On the macro level indicators both GDP Growth and Interest rate were found to have negative impact on ROE and the later having high significant level. The remaining macroeconomic variables (Unemployment, Inflation rate, Exchange rate) all showed no impact on ROE.

For the BE model the results showed a significant positive relationship between NAT, PM and ROE with a negative relationship with FL just as the FE model and RE model indicated among the micro-level indicators. On the macro-level, the results was slightly different from FE and RE models. The relationship between inflation rate, GDP growth and ROE is significantly positive whilst interest rate impacted negatively on ROE.

The Hausman test performed the Fixed and Random effect model calculated a χ^2 of 83.05 ($p > \chi^2 = 0.000$). With this result the study confidently rejected the null hypothesis for the alternate which confirms the results for the Fixed Effects model.

5 CONCLUSIONS

One of the important measure of a firm's performance is the Return on Equity. The ROE is therefore used in this paper to examine the determinants of performance in manufacturing industry in Czech Republic. For the purpose of this paper, panel data method (fixed effects model) is applied to data of 1,328 companies operating in the industry for a 10-year period of 2005–2014. It was found that profit margin and ROE has a significant positive relationship and this can be improved further if cost leadership strategies are employed by this companies. Also the results showed a positive relationship between Net Asset Turnover and ROE. This can also be enhanced by increasing their sales revenue either through increasing volume of sales or increasing prices depending on the level of elasticity. The impact of Financial Leverage on ROE was found to have a negative relationship. This indicates that having more debt than equity in the business impact negatively on return on equity.

However, macroeconomic variables such as GDP Growth and Interest rate has a negative impact on ROE whilst Unemployment, Inflation rate and Exchange Rate have no impact on the ROE in the Manufacturing Industry in Czech Republic.

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AUTHOR'S ADDRESS

Daniel Anarfi, Department of Accounting and Taxation, Faculty of Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic, e-mail: anarfidaniel@ymail.com

Kofi Ampadu Boateng, Department of Forest and Wood Products Economics and Policy, Faculty of Forestry and Wood Technology, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic, e-mail: kofikab@yahoo.com

Kwabena Adu-Ababio, Department of Economics, University of Ghana, Legon Boundary, Accra, Ghana, e-mail: kobbyaduababio@yahoo.com