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BABEŞ-BOLYAI



OECONOMICA

3/2010

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3

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THE INTERRELATIONSHIP BETWEEN DIFFERENT PERFORMANCE ESTIMATES

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Abstract. The main purpose of the study is to investigate the interrelationship of the following four performance estimates: Technical efficiency, by using Data Envelopment Analysis; financial soundness, by using Altman's revised Z"(EM)-model for emerging markets; financial ratios, using return on equity as an internal measure; and price/book value as an external measure. Annual financial statement data were used in two samples for 55 manufacturing companies listed on the JSE Limited (Johannesburg Stock Exchange) over a six-year period in a cross-sectional analysis. The study found that only the relationship between technical efficiency and return on equity was significant for all six years under review for both samples. The study concluded that no single performance estimate is able to replace all the other estimates. Further research should be done to determine which of these estimates provide the most sensible and accurate information to managers.

JEL Classification: C670, G100, M410

Keywords: Data Envelopment Analysis, Altman's model, return on equity, price/book value

1. Introduction

This paper is an empirical investigation into whether different firm performance measurement tools provide similar results. Several studies compared firm efficiency, using Data Envelopment Analysis (DEA), with financial ratios such as return on equity and price/book value (Van der Westhuizen and Oberholzer, 2009; Hassan Al-Tamimi and Lootah, 2007; Halkos and Dimitrios, 2004). Another study compared the results of two of Altman's financial distress models (Z-score

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and revised Z^{EM}-score) with the financial ratio price/book value (Correia, 2009). The study of Sueyoshi and Goto (2009) incorporated DEA-discriminating analysis into the original formulation used by Altman. The gap is that it is unknown whether there is a relationship between DEA efficiency and financial distress scores such as Altman's Z-score model. The degree that financial ratios are differently related to these two estimates (DEA and Altman's model) is also unknown. Therefore, the research question is what is the interrelationship between the results of performance measurement tools such as DEA efficiency estimates, financial distress scores and financial ratios? The main objective of the study is to determine the relationship between the technical efficiency and financial distress scores, technical efficiency and financial ratios, and financial distress scores and financial ratios. The secondary objective is to create a DEA model to aggregate the total firm performance (technical efficiency) in a single estimate.

Since financial distress models aggregate several financial data and/or ratios to determine a firm's financial soundness, it implies that they are comprehensive estimates (Taffler, 1984; Altman et al., 1977; Altman, 1968). For this reason, the DEA model and the financial ratios should also be comprehensive firm performance estimates. Therefore, the following four variables were selected in this study:

- DEA technical efficiency, which is an aggregation of the efficiency how scarce resources as inputs are converted in outputs that create shareholders' wealth;
- Altman's revised Z^{EM}-score for emerging markets, which is an aggregation of several financial ratios to indicate the degree of financial distress of firms;
- Return on equity, which is an aggregation of a number of financial ratios included in the Du Pont analysis to put profitability in perspective; and
- Price/book value, which aggregates the premium (discount) that investors are willing to pay upon a firm's net assets.

The central argument of the paper is that when a firm is, for example, technically efficient, it should also be in a sound financial (and not in a distress) position, be profitable and its shares will trade well above their book value. In other words, there is an interrelationship between these different performance estimates. The contribution of this paper is that it challenges the central argument and indicates the degree that it is rejected or not rejected. The practical implication is that managers and investors will have the knowledge as to whether these performance estimates can be used as substitutes of each other, since ratios like return on equity and price/book value are readily available where the technical efficiency and financial distress scores are not readily available and more complicated to calculate.

The organisation of the paper is a literature review in Section 2, to put the research question in perspective, the hypothesis in Section 3 and a discussion of the four variables in the study in Section 4. Section 5 explains the method and data of the study, followed by Section 6, the empirical results, and the study is concluded in Section 7.

2. Literature review

Data Envelopment Analysis (DEA) as a tool to measure efficiency has been a critical research area to improve organisations' performance (e.g. Asosheh et al., 2010; Chiang and Lin, 2009; Liu and Wang, 2009; Min et al., 2009). Many studies used DEA as a performance estimate for banks (e.g. Paradi et al., 2011; Van der Westhuizen, 2010; Cronje, 2002). Another phenomenon in DEA studies is that some authors estimate a general kind of efficiency (e.g. Avkiran, 1999; Malhotra et al., 2008; Mercan et al., 2003), while others focus on a specific kind of efficiency, such as operating efficiency and profit efficiency (e.g. Oberholzer et al., 2010; Hassan Al-Tamimi and Lootah, 2007). These estimates of general, operating and profit efficiencies make sense because it can be directly controlled by management. Many authors ignore market efficiency (Luo, 2003), an aspect where management does not have direct control. However, Seinfeld and Zhu (1999) developed a two-stage model to estimate market efficiency along with profit efficiency, which was adopted by Lo and Lu (2009), Chen et al. (2010) and Paradi et al. (2011).

Many of the bank studies used DEA along with financial ratio analysis to compare the relationship between these two performance estimates (e.g. Van der Westhuizen and Oberholzer, 2009; Hassan Al-Tamimi and Lootah, 2007; Halkos and Dimitrios, 2004). These studies found that DEA is more reliable and superior to financial ratios and compensates for the weaknesses of financial ratios and that it can be used as an alternative, or complement to financial ratios. Chen (2002) and Malhotra et al. (2008) solved the issue, i.e. the financial ratios versus DEA efficiency estimates debate, by using financial ratios in their DEA models. These previous studies will be helpful to develop a comprehensive DEA model to aggregate the efficiency of how scarce resources are converted to create shareholders' wealth in firms.

Although shares are usually sold at a premium over the book value, Correia (2009) found that 60 percent of the South African companies that are listed on the Alt-X (Alternative Exchange for emerging firms of the JSE Limited) shares' sell at a discount, implying the market value is less than its net asset value. This is unusual, because in the worst-case scenario of bankruptcy, the shareholders will still make a profit after the assets are sold at book value. Beattie (2009) emphasises that the relative book values between sectors may differ substantially. Therefore, it is important to be careful when the price/book value ratios of companies in different sectors are compared.

Many studies used the price/book value ratio as a determinant of performance. For example, Ramcharran and Kim (2008) used price/book value along with price earnings to predict market capitalisation values. While Capaul et al. (1993) used only price/book value, Dunis and Reilly (2004) used it along with price/earnings, price/cashflow, dividend yield and market capitalisation to identify significant differences between the performance of "value shares" (shares with a low price/book value ratio) and "growth shares" (shares with a relatively high price/book value ratio). Park and Lee (2003) concluded in their empirical study that price/book value is the most accurate estimate and outperformed ratios such as price/sales ratios and price/cash flow ratios in forecasting stock prices. Fairfield and Harris (1993) used price deviations from basic valuation models to test the intrinsic value of the nominator's price-to-book value and price earning anomalies. Ramcharran (2003) used country risk data to also estimate several nominators,

inter alia price/book value. Thus, many studies used price/book value as a proxy for other performance estimates, or other performance estimates as a proxy for price/book value. Price/book value is included in the study because it is a comprehensive estimate that aggregates firm performance from an external point of view by indicating the premium (discount) that investors are willing to pay upon the net assets of a firm.

In this study, the financial distress score was estimated by an accounting-ratio-based model. In their study, Agarwal and Taffler (2008) found that an accounting-based risk model outperformed a market-based model for predicting corporate failure. There are many accounting-based financial distress models (e.g. Taffler, 1984; Altman et al., 1977 and Altman, 1968). However, Correia (2009) used Altman's original model and the revised model (for emerging markets) along with price/book value to determine the financial distress/soundness of companies listed on the Alt-X and the main board of the JSE Limited. Major differences were found between the results of the original model's Z-score and the revised model's Z'(EM)-score. This study also used Altman's revised model, which is an estimate of financial soundness, where firms were ranked from the most distressed to the most financially sound position.

However, in spite of the widespread adoption of estimates such as DEA, financial distress models and financial ratios, i.e. return on equity and price/book value, there has been no empirical linkage between all of them. Accordingly, this study focused on the interrelationship between these four variables to determine whether they can serve as a proxy for each other.

3. Hypothesis

The central argument is used as the conceptual framework of the study, namely that a firm that performs well in one of the performance estimates, will also perform well in other performance estimates. Therefore, the four different performance estimates are expected to be interrelated. This is helpful to state the following null-hypothesis:

H₀: There is no significant monotone relationship between the following performance estimates: DEA technical efficiency, Altman's Z'(EM)-score, return on equity and price/book value.

4. Variables

4.1. Data Envelopment Analysis

DEA is a non-parametric linear programming technique that measures the relative efficiency of a comparative ratio of outputs to inputs for each decision-making unit (*DMU*), such as a firm (Ray, 2004; Avkiran, 1999). The main advantage of using DEA as a relative efficiency estimate is that it accommodates multiple inputs, multiple outputs and other factors in a single model (Halkos and Dimitrios, 2004). The main usefulness is its ability to identify inefficient firms, to generate potential improvement for such firms and to indicate efficient firms that could be used as a benchmark by the inefficient ones (Avkiran, 1999).

DEA can be used to estimate four main types of efficiency, namely technical, allocative, economic and scale efficiency. In practice, the measurement of these efficiencies involves the estimation of production frontiers. DEA effectively

estimates the frontier by finding a set of linear segments that envelop the observed data. Technical efficiency is an indication of how well inputs are converted into outputs, while allocative efficiency reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices (Van der Westhuizen, 2010). A firm is economically efficient if it is both technically and allocatively efficient, and a firm is scale efficient if it operates on a scale that maximises productivity (Coelli et al., 2005). DEA can determine efficiencies from an input-orientated (input minimisation) or output-orientated (output maximisation) point of view (Avkiran, 1999). Furthermore, analysts choose between using constant return to scale (CRS) or variable return 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). "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 stay constant, but will either rise or fall.

Avkiran (1999) provides a guideline when inputs and outputs are selected – the outputs should be the key business drivers that are critical to the success of the business, and the inputs should be the resources that lead to the key business drivers. The quest for value, that benefits the firm and society, is the result of directing "scarce resources to their most promising uses and most productive users" (Stewart, 1999). Thus, the performance of any business is measured in terms of how scarce resources are used as an input to obtain the maximum output to create shareholders' wealth. To reach the secondary objective of the study, a combination of approaches was used to create the DEA model. The input assets, and in some cases only tangible assets or fixed assets, were used by Chen (2002), Chen (1998) and Favero and Papi (1995). Shareholders' equity was used by Stavarek (2002) and Favero and Papi (1995). Expenditure was used by Van der Westhuizen and Oberholzer (2009) and Hassan Al-Tamimi and Lootah (2007). In this study, tangible assets, shareholders' equity at book value and total expenditure were used as the scarce input resources.

The reward that investors get from buying shares in a company is measured by the performance of two components, namely the cash component and the value component, which are the dividend payouts and the growth in the market value of the shares, respectively (Vigarito, 2005). Growth (change) in market share value cannot be used as an output variable, since it may take on a negative value as a result of the volatility in the market (JSE, 2009). The reason is that a DEA model, such as the most widely-used models by Charnes et al. (1978) and Banker et al. (1984), requires that all the input and output data are strictly positive. Market value of shareholders' equity can be used as an output variable and that will be justified by the fact that its book value is used as an input. Market value was also used as an output by Seinfeld and Zhu (1999) and Chen et al. (2010). Profit can also be considered as an output (e.g. Seinfeld and Zhu, 1999; Chen et al., 2010), but the problem is that it can also take on a negative value. Therefore, sales revenue is used as an output to justify total expenditure as an input.

The following DEA model was specified (in Rand, the South African currency):

Outputs:	$y_1 = \text{Sales}$
	$y_2 = \text{Market value of shareholders' interest}$
	$y_3 = \text{Dividend payouts}$
Inputs:	$x_1 = \text{Total expenditure}$
	$x_2 = \text{Tangible assets}$
	$x_3 = \text{Book value of shareholders' interest.}$

The results of this model will present an aggregated estimate of the operating efficiency (since sales is an output that is opposite to the input of scarce resources), profitability efficiency (since sales is an output that is opposite to total expenditure), and marketability efficiency (since the market value of shareholders' interest and dividends as outputs are opposite to the input of the book value of shareholders' interest).

Note that the management of a firm does not have equal control with regard to the efficiency to reach the outputs, e.g. the management of a firm has much more control with regard to the operating and profitability efficiency than the marketability efficiency. But, this is not the point! This study is more concerned with how a firm's and not management's technical efficiencies are related to the other variables in this study.

4.2. Altman's revised Z''(EM) model

Altman (1968) developed the Z-score model, which includes five ratios, each multiplied by a constant factor, where 66 companies (that either failed or were safe) were included in analysing the data from 1946 to 1965. He found that this model was accurate at a rate of 95%. The financial distress of a firm is estimated – if a company has a Z-score that is less than the lower level set by the model, failure is predicted, if the Z-score is between two levels, the outcome of the company is uncertain and if it is above the upper level, the company is safe. The revised Altman's Z''(EM) financial distress model, which estimates the degree of financial distress of a firm, was used. Note that the aim of these models is to assess risk, similar to models such as Value to Risk that is used in the banking environment (Matis and Mutu, 2009). The following is the equation, which was successfully applied in emerging economies such as South Africa, (Correia, 2009):

$$Z'' = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Where:

$X_1 = (\text{Current assets} - \text{current liabilities}) / \text{total assets}$

$X_2 = \text{Retained earnings} / \text{total assets}$

$X_3 = \text{Earnings before interest and tax} / \text{total assets}$

$X_4 = \text{Book value of equity} / \text{total liabilities.}$

The Z''-score was adjusted with a constant value of 3.25 to make it suitable for emerging markets. When a score of a firm is less than 1.1, it implies that the firm is in financial distress, between 1.1 and 2.6 implies uncertainty, and a score of above 2.6 implies a firm is safe. Therefore, the higher the Z''(EM)-score, the higher

the financial soundness of a firm is, and the lower the ZTM(EM)-score the higher the financial distress of a firm is.

4.2. Return on equity

Return on equity summarises the structure of the Du Pont analysis. This analysis indicates how the net profit margin and asset turnover (turnover/assets) affect return on assets, and how return on assets and leverage (assets/equity) affect return on equity (Brigham and Ehrhardt, 2005). It is the most comprehensive relative estimate of profitability that summarises the three broad categories of income, investment and capital structure (Correia et al., 2007). The equation is:

$$\text{Return on equity} = \text{earnings after tax} / \text{ordinary equity}.$$

4.3. Price book value

This study used the multiple of price/book value that is an indication of the premium/discount investors are willing to pay for the net assets of a company (Loth, 2009). The share price indicates the investors' assessment of future prospects, while the book value indicates the accountant's representation of historical costs, which then means that the greater the investors' expectations of future prospects are, the higher the price/book value ratio is (Dunis and Reilly, 2004).

It is very important to understand the price/book value ratio in perspective. For example, a high ratio can either tell that the share price is over valued, as a result of factors such as investors' irrationality and speculation, or the market sentiment is good, as a result of factors such as low risk and no structural problems in the companies (Loth, 2009; Beattie, 2009). Nevertheless, the difference between the share price and its book value is the premium (or discount) that investors are willing to pay upon a share's net asset value. The equation is (Brigham and Ehrhardt, 2005):

$$\text{Price/book value} = \text{market price per share} / \text{book value per share}.$$

5. Method and data

Companies use different year-end dates and performances are determined relative to these dates. The market volatility influences the market value of shares; therefore, share prices of companies with different year-end dates cannot be compared at year-end. Inflation may also influence values such as assets and shareholders' interest if the year-end dates are different. Therefore, only companies that use the same year-end dates were grouped together.

Since differences are expected between different sectors, it was decided to only include the following three sectors in the study rather than the whole JSE Limited. The study includes Basic Materials, Industrials and Consumer Goods. The reason for choosing these sectors is that they all have manufacturing of tangible products in common. In total, 22 companies with December and 33 with June as their year-ends were included in the study. Companies with other year-ends than these did not provide large enough samples to be investigated. Data were taken for a six-year period, from 2003 to 2008. Note that no time-series comparison was made over the six-year period, but only between the 55 companies in each year. A six-year period is used to determine whether the results are consistent among the

years. All the data for the DEA model and Altman's Z'(EM) model and other ratios (return on equity and price/book value) were taken from the McGregor database.

The annual technical efficiencies, using DEA, for the companies in the two samples (22 and 33) were calculated relative to the other companies in that sample. The sample size of 22 and 33 observations is sufficient, according to Avkiran (1999), who states that it should be three times as large as the sum of the chosen variables, thus $22 > 3(3 + 3)$ and $33 > 3(3 + 3)$. The software package of Zhu (2004) is purpose-built to solve the DEA problem and has been used in this paper to generate estimates of annual input-orientated technical efficiency for each company over the six-year period. Although all the companies in the sample are involved in manufacturing, the variable return to scale approach was preferred rather than the constant return to scale approach, because of the divergent operations of the companies.

In this study, the following DEA formulae were used for an input-orientated model with a variable return to scale approach. This is where the inputs are minimised, while the outputs are kept at their current levels (Zhu, 2004):

$$\begin{aligned} \min \theta - \varepsilon \left(\sum_{i=1}^m s_i^- + \sum_{r=1}^s s_r^+ \right) \\ \text{subject to} \\ \sum_{j=1}^n \lambda_j X_{ij} + s_i^- = \theta X_{io} \quad i = 1, 2, \dots, m; \\ \sum_{j=1}^n \lambda_j Y_{rj} - s_r^+ = Y_{ro} \quad r = 1, 2, \dots, s; \\ \sum_{j=1}^n \lambda_j = 1 \\ \lambda_j \geq 0 \quad j = 1, 2, \dots, n. \end{aligned}$$

The input-orientated formula calculates input minimisation (where θ indicates the efficiency score). Each observation, DMU_j ($j = 1, \dots, n$), uses m inputs X_{ij} ($i = 1, 2, \dots, m$) to produce s outputs Y_{rj} ($r = 1, 2, \dots, s$), and where DMU_o represents one of the n $DMUs$ under evaluation, and X_{io} and Y_{ro} are the i th input and r th output for DMU_o , respectively. In order to consider any slacks, the presence 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 detailed discussion on the DEA methodology, see Coelli et al. (2005) Ray (2004) and Zhu (2004).]

Although financial models rely heavily on normality of data, Melas and Ruban (2009) proved that financial data are not normally distributed. Since, normality is a prerequisite for linear regression and correlation analysis (Levine et al., 2008), Spearman's rank-order correlation was used to determine the degree in which each of technical efficiency, Altman's Z'(EM)-score, return on equity and price/book value changes if there is a change in the other variables. The rank order

correlation of Spearman may be used to determine whether there is a monotone dependence between each of the four variables. Rank-order correlation is a non-parametric technique for qualifying the relationship between two variables. Non-parametric means that the correlation statistics are not affected by the type of mathematical relationship between variables, unlike the least square regression analysis that requires the relationship to be linear (Vose, 1996). The Spearman rank order correlation coefficient is a more general measure of any kind of monotonic relationship between X and Y. This measure is based on ranks and is therefore not as sensitive for outliers (Millard and Neerchal, 2001). Correlation analysis requires a sample of at least ten observations (Sekaran, 2006). Each sample provides 22 and 33 data-points per year. Finally, the null-hypothesis was tested by using p-values at one, five and ten percent significant levels.

6. Empirical results

Table 1 shows the descriptive statistics of the four variables for both samples. This is an aggregation of the annual descriptive statistics from 2003 to 2008. The input-orientated technical efficiencies (TE) of the companies in the two samples were calculated, which indicate relatively how the inputs (scarce resources) are converted to outputs to create shareholders' wealth. The mean technical efficiency of both samples is 0.92, implying that, on average, the companies could reduce their inputs by eight percent without reducing their outputs. The Z"(EM)-score shows that on average, the mean average scores of the two samples (6.92 and 6.39) are far above the critical point of 2.6 that indicates a company is safe. The minimum scores in the two samples (0.6 and -2.36) imply that there are companies in distress, since these scores are lower than the critical point of 1.1. There is a great difference between the average return on equity (ROE) values of the two samples (12.31 percent and 24.37 percent), which is the result of some outliers, which is also clear from the difference between the minimum and maximum return on equity values. Thus, in the case of return on equity, the medians (19.36 percent and 18.29 percent) are more reliable estimates. The average price/book (P/B) values indicate that that market value of shares cover their book value 2.36 times and 2.30 times for the two samples, respectively.

Table 1: Descriptive statistics of variables: Average 2003-2008

	December year-end companies (n=22)				June year-end companies (n=33)			
	TE	Z"(EM)	ROE	P/B	TE	Z"(EM)	ROE	P/B
Mean	0.92	6.92	12.31	2.36	0.92	6.39	24.37	2.30
Median	0.99	6.54	19.63	1.93	0.96	6.26	18.29	1.85
St. dev.	0.12	3.07	65.75	2.12	0.11	3.16	89.25	2.06
Variance	0.02	9.75	7258	4.95	0.01	10.27	18293	5.09
Kurtosis	2.69	2.03	5.68	5.99	3.77	1.99	15.26	5.87
Skewness	-1.69	0.27	-0.26	1.21	-1.88	-0.27	-1.28	1.18
Minimum	0.59	0.60	-171.7	-1.86	0.54	-2.36	-175.3	-2.27
Maximum	1.00	13.9	129.2	8.27	1.00	13.35	344.8	8.87

Source: Own calculations.

When the descriptive statistics in Table 1 are considered, it is clear that there are in some cases outliers, large variances and also a lack of normality of the data. This is the reason why Spearman's rank order correlation was preferred

above Pearson's correlation. To reach the main objective of the study, data were analysed and in Table 2 the rank order correlation coefficient (r) between the four variables in the first sample (December year-end companies) is presented. To test the null-hypothesis, namely that there is no monotone significant relationship between the four variables, the p-values related to the above-mentioned correlation coefficients were also determined. The null-hypothesis is rejected in some cases at a significance level of one, five and ten percent, where $p < \alpha = 0.01, 0.05$ and 0.10 , respectively (two-tailed).

Table 2: Spearman's rank-order correlation (r) and p-values between technical efficiency, Z"(EM)-score, ROE and P/B for December year-end companies (n=22)

		2008	2007	2006	2005	2004	2003
TE / PB	r	0.18	-0.04	0.27	0.01	0.22	0.12
	p	0.39	0.86	0.21	0.95	0.31	0.57
TE / Z"(EM)	r	0.30	0.17	0.17	0.19	0.17	0.43
	p	0.16	0.43	0.42	0.37	0.42	0.04**
TE / ROE	r	0.49	0.67	0.54	0.60	0.44	0.46
	p	0.02**	0.00***	0.01**	0.01***	0.04**	0.03**
PB / Z"(EM)	r	-0.43	-0.34	-0.22	-0.17	-0.44	-0.20
	p	0.04**	0.11	0.30	0.43	0.04	0.35
PB / ROE	r	0.32	0.30	0.71	0.33	0.00	0.28
	p	0.13	0.17	0.00***	0.13	0.99	0.18
Z"(EM) / ROE	r	0.31	0.18	0.23	0.39	0.58	0.16
	p	0.14	0.40	0.28	0.07**	0.01***	0.45

Source: Own calculations. * = Significant at 10% (two-tailed), ** = Significant at 5% (two-tailed) and *** = Significant at 1% (two-tailed).

Table 2 indicates that only the relationship between technical efficiency and return on equity is significant for all six years under review. The relationship between the Z"(EM)-score and return on equity is significant for two years. The other relationships are only significant once, except for technical efficiency and price/book value where no significant relationship was found.

Table 3 indicates (the results of the second sample, i.e. June year-end companies) some similar results as in Table 2. Only the relationship between technical efficiency and return on equity is significant for all six years. Also worth mentioning is the four significant relationships between the Z"(EM)-score and return on equity. Also, similar to Table 2, only some of the other relationships are significant in one of the six years.

Table 3: Spearman's rank-order correlation (r) and p-values between technical efficiency, Z"(EM)-score, ROE and P/B for June year-end companies (n=33)

		2008	2007	2006	2005	2004	2003
TE / PB	r	0.28	0.38	0.03	0.24	0.32	0.20
	p	0.19	0.07**	0.88	0.27	0.14	0.34
TE / Z"(EM)	r	0.14	0.17	0.25	0.16	0.04	0.01
	p	0.50	0.42	0.24	0.45	0.86	0.97
TE / ROE	r	0.38	0.70	0.69	0.57	0.46	0.57
	p	0.07**	0.00***	0.00***	0.01***	0.03**	0.01***
PB / Z"(EM)	r	0.28	-0.17	-0.13	0.03	0.07	0.02
	p	0.20	0.42	0.55	0.89	0.74	0.91
PB / ROE	r	0.64	0.26	0.32	0.31	0.34	0.25
	p	0.00***	0.22	0.13	0.14	0.12	0.24
Z"(EM) / ROE	r	0.56	0.51	0.35	0.35	0.02	-0.07
	p	0.01***	0.02**	0.10*	0.10*	0.92	0.73

Source: Own calculations. * = Significant at 10% (two-tailed), ** = Significant at 5% (two-tailed) and *** = Significant at 1% (two-tailed).

7. Conclusion

This study investigated the annual performance of two sample groups of 22 and 33 companies listed at the JSE Limited in the Basic Material, Industrial and Consumer Goods sectors from 2003 to 2008. The main objective of the study was to determine the interrelationship between four firms' performance estimates, namely technical efficiency (estimated by DEA), financial distress (estimated by Altman's Z"(EM) score), return on equity as an internal performance estimate and price/book value as an external performance estimate. These four variables were selected because they are all comprehensive performance estimates since they all aggregate a variety of elements. The secondary objective was to create a DEA model to aggregate total firm performance in a single estimate.

The limitation of the study is that a different DEA model may provide different results. A variable such as tangible assets could also be replaced by total assets, which may also give different results. A financial distress model, other than Altman's Z"(EM)-score model may also provide different results.

With regard to the secondary objective, the study concludes that the DEA model used is suitable to indicate in a single measurement the relative efficiency of firms to convert scarce resources (e.g. tangible assets, shareholders' interest and payments for resources such as labour, materials, equipment, transport, etc.) into sales, market value of shareholders' interest and dividends. Since all DEA models require positive data, these selected inputs and outputs are usually positive and will only be negative by exception, e.g. a bankrupt firm with higher liabilities than assets will have a negative book value of shareholders' interest. The results of this model also give an aggregated measure of the operating efficiency, profitability efficiency and marketability efficiency. It was not part of the study, but also important is that inefficient companies can also be identified and investigated

further to detect the reasons for their poor performances. Furthermore, the efficient companies can be used as a benchmark for the inefficient ones.

Regarding the main objective, the study found that only the relationship between technical efficiency and return on equity was significant for all six years under review for both samples. In the first sample, the relationship was significant between the Z²(EM)-score and return on equity in two years, and in the second sample it was significant in four years. Furthermore, in both samples it was found that only some of the other relationships were significant in only one of the six years.

The study concludes that the readily available (and/or easy to calculate) financial ratio of return on equity can easily be used as a substitute for the more complicated estimate of technical efficiency. With less certainty, return on equity may also be used to judge the degree of financial distress of a firm. Furthermore, the study can also conclude that no single performance estimate that was investigated is able to replace all the other performance estimates, i.e. a firm is highly rated by some of these estimates but then also weakly rated by some other estimates. The practical implication of the study is that managers should use different performance estimates for different purposes.

The value of the study is found in the fact that this is the first where the interrelationship between the four performance estimates was empirically tested. However, this study did not investigate the superiority of these estimates relative to each other. Further research should be done to determine which single estimate provides the most sensible and accurate information to managers.

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FACTORS AND CONSTRAINTS AFFECTING LABOUR FORCE PARTICIPATION OF POSTGRADUATE WOMEN: THE CASE OF BHAUDDIN ZAKARIYA UNIVERSITY MULTAN, PAKISTAN

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Abstract. This paper attempts to explore the factors and constraints affecting labour force participation of women having post graduation in Pakistan, using logit model based on primary data. The trend of women's labor force participation is improving over time in Pakistan but it is still very low in comparison with other developing countries. The empirical results for all variables are consistent with the existing hypotheses and are significant. The decision of women to join labour force are not only dependent upon their personal choice and achievement but also on their husband's and father's education, their attitude towards female employment and also on family characteristics which include the profession of respondent's father, mother or husband's profession. There is an ardent need to bring some significant changes in the social values of the family and society's attitudes to enhance women's participation in labour force through quality education. Government should develop policies that become the cause to encourage participation of educated women in the labour force of the country for multidimensional solutions.

JEL Classification: J21, J16, I21, C35

Keywords: Labour force participation; Educated women; Gender bias; Social Values; Pakistan

1. Introduction

Women labour force participation is one of the imperative issues of economic development and is receiving steady escalating prominence and

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recognition in the literature especially since the 1970s. Until the 1970s, development was generally assumed gender-neutral and of equal benefits to both men and women but after that number of studies demonstrated that gender inequality exists in terms of various factors and has varying impacts of development (Boserup 1970; Kabeer 1994; Karl 1995; Rao 1991). A great majority of women is facing discrimination, socio-economic exploitation, participatory exclusions and not only having access to assets and land rights but no decision making even on their own earnings especially in South Asia. They have deprivation of basic existing facilities of social development (Agarwal 2001, 2003; Chaudhry 2007; Mahmood and Nayab 1998; Panda and Agarwal 2005; Siddiqui and Siddiqui (1998); Siddiqui 2001). Nevertheless, they are struggling for social justice, better health care facilities, equal rights and job opportunities in all over the world but especially in developing countries. Females in most of cities and rural areas lag behind due to a lot of obstacles and hurdles from both demand and supply sides in Pakistan. Due to their low social, economic and political status in the society as compared to their male counterparts, Pakistani females have been trapped into the web of dependency, subordination and low access to decision-making. The majority of females suffer from all forms of poverty (Siddiqui 2001). Females are almost half of the population in Pakistan and there is ardent need of their active participation in every field and economic activities.

The promotion of gender equality and women's empowerment is one of the Millennium Development Goals (MDGs) that have been framed by the United Nations in 1999 and agenda will be implemented by the end of 2015. Keeping in view the importance of the issue, women's role in socio-economic development is an indispensable fact and incomplete without their participation and contribution. Gender participation is not only helpful for their own wellbeing and decision-making but also worthwhile for more inclusion and sustained economic growth especially in developing countries like Pakistan. Education plays an important role in human capital formation and it has become one of the defining enterprises of the 21st century with the emergence of globalization and increasing global competition. It raises the productivity and efficiency of individuals and thus produces skilled work force that is capable of leading the economy towards the path of sustainable economic development (Chaudhry, 2007). Since attainment of education is the key factor for better employment opportunities and jobs across the sectors, but investment in the education of women and providing them job facilities are most effective means of raising household's level of earnings and especially promoting sustained economic growth. According to several studies by International Agencies, including the World Bank, UNESCO and the United Nations Development Program, there is positive correlation between improved educational opportunities for females and their labor force participation in developing countries. Nevertheless, question arises that why the women having higher education are not participating actively in the labour force.

While higher educated women are very vital part of labour force of any country, they can play a significant role in the economic development of any country especially in Pakistan. The major objective of this paper is to highlight the factors that affect the participation of higher educated women, using logit model analysis based on primary data. This paper is arranged as follows. Section 2 states the brief theoretical and empirical literature on women labour force participation. In section 3, profile of women labour force participation in Pakistan is stated. Data

and methodological issues discussed in section 4. Section 5 produces the results and discussions. While conclusions and policy implications presented in section 6.

2. Theoretical and empirical literature

The neoclassical paradigm, which focused on male full-time labour in the capitalist manufacturing sectors, paid no attention to women labour but in response to the growing importance of women in the labour market, it has extended analysis to women's problems since the 70s. Substantial literature exists on the rationales worldwide that address the issues of gender labour force participation. The initial descriptions of female labour force participation come from the household economics, an extension of neo-classical economics, initiated by economists such as Jacob Mincer (1962), Garry S. Becker (1965), Glen G. Cain (1976), R. Gronau (1977) and G. Standing (1978). Mincer attempted to answer the question with the focus on the supply characteristics of married women. He argued that the decision whether the wife should enter the paid labour force or not could involve not only the income and substitution effects of market work versus leisure but also the income and substitution effect of market versus unpaid house work. Cain tried to explain the difference in the labour force activity of white and non-white married women based on Mincer's model using various sources of aggregate and disaggregate data. Becker (1965) and Bowen and Finigen (1969) elaborated the basic economic theory of the household. Their theory rests upon the assumption that the household is a consumer as well as decision-making unit. The decision-making process aimed at maximizing the well-being of the household, which is constrained by time and financial constraints. Neoclassical economists considered education to be one of the key determinants of women entering the labor market and women having higher level of education will have greater participation in the labor market.

Empirical studies frequently use a woman's market-wage offer (substitution effect), her husband's earnings and family non-earnings income (income effect), her schooling, work experience, number of children and other family background as variables to explaining female labour supply. Several studies conducted in developed countries have identified the strong influence of household characteristics on the labour force participation of women (Gronau 1978; Heckman 1974, 1980; Lustig et al. 1979; Mason and Palan 1981; McClendon 1976; Presser and Baldwin 1980; Schultz 1980, 1990; Smock 1981; Treiman and Terrel 1975). A detailed survey of theoretical and empirical research is given in Killingsworth (1983) and Heckman and Killingsworth (1986).

Hill (1983) developed a labour participation multinomial logit model to estimate an individual's choice between working in the formal and informal sector and not participating in the Japanese labour market. This study suggests that female labor participation behavior varies between the formal and informal sectors. Tiefenthaler (1994) uses the same methodology to analyze female labour participation on Cebu Island and Philippines. Labour force participation decisions result from choosing between the formal sector, informal sector, contract sector and non-participation. The findings from this study support Hill's (1983) findings. Collier (1994) concluded that gender discrimination against women in the labour market is usually identified with wage differentials in developed countries while it comes into the view from differential access to wage employment in developing countries. The literature concludes that there are many constraints, economic and

non-economic, to women labour force participation. While the social and cultural constraints are prominent among the non-economic restrictions that usually women face, are changing but still women are not as free as men participate in the formal economies of South Asia (Drèze and Sen, 1995; Dunlop and Velkoff, 1999).

The World Bank (2001), in its publication "Engendering Development: Through gender equality in rights, resources, and voice" emphasized on gender equality to be an important part of development strategy that enable people to escape poverty and improvement their standard of living. This book also asserts the role of an institutional environment that provides equal rights and opportunities for both men and women. Evidence from a range of countries suggested that investments in females (education, jobs, and other equal rights) is necessary to empower them and then to achieve gender equality.

Keeping in view the citation of theoretical and empirical literature, we now come to the experience of Pakistan. There are a large number of studies on female labour force participation in Pakistan since the late 1960s. Farooq (1968) examined the labor-force participation in Pakistan for the period of 1901 to 1961. Data for the period 1951 and 1961 were based on the two censuses taken in Pakistan for those dates, and the data for the period 1901 to 1931 were derived from a detailed analysis of the district-by-district reports from the Indian census for the areas now the part of Pakistan. The study favored the expansion of educational opportunities, female employment and urbanization. It suggested that the increased level of female employment might reduce the effective dependency load placed upon the male labor force in Pakistan. Shah (1975) explicates the socio-economic and demographic factors affecting the work participation of married women in Pakistan. Nasra et al. (1976) analyzed the inter-district criteria in overall as well as non-agricultural females labor supply using the data of 1961 census. There was inclusion of many variables and found differentials in the correlations of female labour force participation. Irfan (1983) also analyzed the determinants of female labor force participation. Empirical results of his study indicates that higher level of education significantly influence the female labor force participation, but only if they participate as an employee. Household per capita income is correlated with wage employment but self-employed women appear to be unaffected.

Junaid (1984) pointed out the problems of educated women that they have to face in economic participating activities and the categories of jobs for women. It is also concluded that in Pakistan, women are not permitted to work with men. Traditionally women are economically and socially dependent, so there is immense pressure on qualified women either to limit the scope of their activities or to permit the absorption of their contribution to the family income without acknowledgement. Shah (1986) analyzes the factors affecting change in female's role in Pakistan. Afzal and Nasir (1987) highlight the factors of declining trends of female labour force participation in Pakistan. Ali (1990) analyzed the role and problems of the female labor force in the rural informal sector of Multan District. Kozal and Alderman (1990) studied the factors determining work participation and labor supply decision in the urban area of Pakistan by using OLS regression as well as a Tobit model. Empirical results of this study indicate that labour force participation rate rises with the increase in expected earnings, wages and the level of education. Hamid (1991) analyzed the determinants of female labor supply using micro data. She concluded that household income is a primary determinant of women's entry in the labor market and is inversely related to women's supply in the

labor market. While the effects of educational levels on women's labor force participation rate were different; illiterate women's participation was 44 percent, having Primary and Middle educational level women's participation rate above 30 percent, having matric level education women's participation rate was 60 percent and at F.A. & B.A. level participation rate was 50 percent. Kazi and Raza (1991) studied the changes over time in the level and pattern of women's employment in Pakistan and analyzed these changes in the context of supply and demand factors influencing women's participation in the labor market. Ashraf and Ashraf (1993) analyzed the male-female earning differentials in Pakistan based on Household Income and Expenditure Survey from 1979 to 1985-86. The results indicated that significant decline in the gender-earning gap between this period in every province.

Sultana et al. (1994) analyzed the factors affecting optimum time allocation between market and housework of female in rural Pakistan. The study examined, whether women's decisions not to work outside the home are influenced by social norms (purdah and patriarchy), or by economic constraints such as lack of relevant education and training, non-availability of job opportunities and low wages etc. The study concluded that the labor force participation decision of rural women is mostly influenced by cultural constraints and low job opportunities. Chaudhry and Khan (1996) elucidate the fundamental explanations and policy implications of female labour force participation in rural Pakistan. Mehmood and Nayab (1998) studied the gender dimensions of demographic change in Pakistan. Siddiqui and Siddiqui (1998) decompose the earning differential in terms of differences in personal characteristics and differences in the labor market. The results show that after adjusting for differences in individual characteristics, discrimination accounts for about 20 percent of the earning differential. Ali and Hamid (1999) analyzed the role and contribution of the female labor force in the rural informal sector of Punjab and pointed out the problems of females. Mirza (1999) made a qualitative survey of female office workers in Lahore in 1996-97 and examined the increasing market integration of women. The study showed that women have to face many problems on the gender basis with relations to their colleagues. Female office workers use many strategies, derived from their own life world; to maneuver in the office sector, to appropriate public (male) space, and to accommodate the purdah system to the office environment and in this way they are able to establish themselves in a traditional male field of employment. Ali (2000) presented a case study to identify the impact of Structural Adjustment Policy/Programs (SAPs) on the welfare of urban working women and their household in Pakistan.

Siddiqui (2001) concluded that though female labour force participation rates, literacy rate, and access to credit and health facilities, though rising, but still these are very low. She also concluded that gender discrimination in the labor market did not change significantly in Pakistan but poverty among male and females increased during 1993/94 and 1996/97. Weiss (2001) made a study on women empowerment and concluded that in this age of globalization, poverty and debt problems can be tackled with the empowerment of women by providing them better education and decent paying jobs. Naqvi and Shahnaz (2002) linked two important aspects of women's decisions regarding their participation in economic activities and how these decisions are made using Probit and Logit models based on the data from "Pakistan Integrated Household survey (PIHS), 1998-99". The study concluded that age, better education, responsibilities, and family style affect the female labor force participation decisions. Hafeez and Ahmad (2002) also

studied various socio-economic and demographic factors, which influence the decision of educated married women about participating in the labor market using Logit and Probit models based on primary data. Chaudhry (2007) investigates the impact of gender inequality in education on economic growth during the period 1970-2005 using econometric analysis. The results suggest that gender inequality in education directly and significantly affects economic growth by lowering the average level of human capital.

It is evident from the empirical literature that there is a positive correlation between education and female labour force participation. Now a days a large enrolment rate in the higher education in Pakistani institutions should lead to increase their participation in the labour market effectively but the results are not encouraging so far. The question arises that why higher educated women are not properly contributing in economic growth of the country. What are the constraints on their participation even having higher education? There is no empirical work on this ground and requires an empirical study especially in the country like Pakistan. Thus, this paper fills the gap in literature to address and analyze the constraints on the participation of university educated women in labour market.

3. Women and the labour market in Pakistan: profile and trends

The issue of gender labour force participation has attained a special consideration in the agenda of development policies in developing countries like Pakistan for the last several years. There is considerable diversity in the status of women across provinces, regions, classes and families. The status of women is not homogenous because of the interaction of gender with other forms of exclusion in the society in Pakistan. There is considerable diversity in the status of women across classes, region and the rural/urban divide due to uneven socioeconomic development and the impact of tribal, feudal and capitalist social formations on women's life. Gender is one of the organizing principles of Pakistani society. Patriarchal values embedded in local traditions and culture predetermines the social value of gender. An artificial divide between production and reproduction, created by the ideology of sexual division of labor, has placed women in reproductive roles as mother and wives in the private arena of home and men in a productive role as breadwinners in the public arena. This has lead to low level of resources, investment in women by the family and the state.

Pakistan's labor market is facing four major challenges like other economies in South Asia. The first challenge indeed, is the creation of work opportunities to a level (labour force demand side) that is at least proportionate with absorbing fresh entrants into the labor market- estimated to be over a million. The generation of employment opportunities indeed would demand an adequate consideration of the creation of conditions for "decent work" thus focusing on the quality of jobs and work opportunities that are being generated in terms of income, productivity, better working conditions and respect for fundamental rights at work. The second challenge relates to tackling the low absorptive capacity of the formal sector and a declining employment elasticity of the economy. This phenomenon is posing a serious challenge to policy makers. Third challenge belongs to reduce the gender bias in employment opportunities. The last and most important challenge is to confiscate of constraints on women's labour force participation for inclusion and improving economic growth. However, still this is not considered as a challenge at

the government level and not a significant effort can be seen in the literature addressing this issue.

We present a brief glance at the current labor market situation and some of the recent developments in terms of trends and profile in Pakistan. The trends in population and labour force participation rates based on the Labour Force Surveys data from 1996-97 to 2005-06 are presented in Table 1. The population, estimated at 155.37 million, is growing at the rate of 1.90 percent annually. Pakistan's population is characterized by high fertility rates and dependency ratio as almost one-third (30 percent) of the population is below 10 years of age and another 12.9 percent is in the age group of 10-14 years.

Table 1. Population, Labor Force and Labor Force Participation (LFP) Rates

Years	Population		Labor Force		LFP Rate
	Total (Million)	Growth Rate (Percent)	Total (Million)	Increase (Million)	(Percent)
1996-97	126.72	2.61	36.30	1.57	28.6
1997-98	129.97	2.41	38.20	1.90	29.3
1999-00	136.01	2.23	39.4	1.20	29.4
2001-02	145.80	2.06	42.39	2.99	29.6
2003-04	148.72	1.90	45.23	2.84	30.4
2005-06	155.37	1.90	50.05	4.82	32.2

Source: Labor Force Survey, various issues

The labor force of Pakistan is estimated at 50.05 million with participation rate of 32.2 percent during 2005-06. It increased from 45.23 million to the current level by adding 4.82 million men and women in two years. The current situation, nevertheless, informs about a high dependency ratio. It is important to point out that the labour force participation rates, though low, are gradually increasing over the years. The rural- urban participation rates for the last ten years also show a gradual rise for both men and women as reported in table 2. An increase of 3 percent in the urban areas is dominated by males (4.4 percent for males as compared to 2 percent for females) while females dominate (5.5 percent of females as compared to 2.7 percent of males), almost 4 percent increase in rural areas. The higher increase in the participation rates in the rural areas, especially for females, and of males in urban areas are largely attributed to a positive outlook of the economy. A large proportion of the current labor force does not possess skills measurable in higher education terms. Literacy level is low, 52 percent, given in table 3. The educational distribution of literates shows that 35 percent are below matric, 10 percent are matriculates and 4.1 percent have higher secondary certificate. The degree holders account for only a small (3.8 percent) proportion. Educational attainment of females is lower than males in all categories.

Table 2. Crude Labor Force Participation Rates by Region and Gender (Percent)

Year	Total			Urban			Rural		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
1996-97	28.7	47.0	9.0	27.2	46.6	5.9	29.4	47.2	10.5
1997-98	29.4	48.0	9.4	27.0	47.1	5.3	30.6	48.4	11.5
1999-00	29.0	47.6	9.3	27.1	46.5	6.3	29.8	48.2	10.7
2001-02	29.6	48.0	9.9	29.1	48.9	7.3	29.9	47.6	11.1
2003-04	30.4	48.7	11.2	29.2	49.8	7.0	31.0	48.2	13.2
2005-06	32.2	50.3	13.3	30.2	51.0	7.9	33.2	49.9	16.0

Source: Labor Force Survey, various issues

Table 3. Education and Literacy by Gender of Working Age Population (Percent)

Education and literacy	2003-2004			2005-2006		
	Total	Male	Female	Total	Male	Female
No formal education	0.6	0.7	0.5	0.3	0.3	0.2
Below Matric	33.7	41.1	26.0	35.0	42.6	27.0
Matric but less than intermediate	9.7	12.3	7.0	10.0	12.4	7.5
Intermediate but less than degree	3.9	4.7	3.1	4.1	4.9	3.2
Degree and above	3.8	4.9	2.6	3.8	4.8	2.7
Literate	51.6	63.7	39.2	53.1	65.0	40.6
Illiterate	48.4	36.3	60.8	46.9	35.0	59.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Labor Force Survey 2005-2006

4. Data and Methodological Issues

According to economic theory, an individual's occupational attainment is a function of employers' willingness to hire that person (labour demand) and the individual's desire to work in a particular occupation (labour supply). Labour demand is determined by the individual's human capital, and the labour supply is expressed as a utility function, which includes at least three components: income of occupations, taste for the work involved and family size (Brown et al. 1980). The problem of labor supply is multidimensional. They involve firstly the decision of individuals (or families) whether to seek work or not, and how long to work. Secondly, individuals must decide what sort of work to do, determining the supply of labor to specific occupation. Thirdly, they must decide for whom to work, determining the supply of labor to particular firm or organization. Notwithstanding these issues, there are also some other constraints, socio-economic and demographic, on the women labour force participation. Keeping in view these observations, we explain data and methodological issues.

4.1. Data Sources and Sampling Procedure

This paper is based on the primary source of data collected from the postgraduate females passed out from Bahauddin Zakariya University, Multan.

This university was established in 1975 and is located in the centre of Pakistan and in South of Punjab Province. Postgraduates in the following subjects are included for the sample survey: Chemistry, Economics, Education, English, History, Mathematics, Physics, Statistics, Urdu and Zoology from six faculties in the university. These faculties are Arts and Social Sciences; Pharmacy; Islamic Studies and Languages; Commerce, Law and Business Administration; Sciences and Agriculture; and Engineering. By using simple random sampling technique, we selected three faculties and out of them ten subjects (mentioned earlier) are selected and then sample is drawn using systematic random sampling technique. The preliminary information concerning names and addresses of the passed out candidates was collected from controller examinations office of the university. Based on their whereabouts, detailed information was collected by sending questionnaire by registered post mail. Due to some constraints such as the respondent's availability on the given address, time and economic restrictions, the total 194 filled questionnaires are received that make the sample size for empirical analysis. The data collection procedure was completed in 2006.

4.2. Determinants of Woman Labour Participation

There are number of factors that determine the females' labour force participation.

Education

Education in every sense is one of the fundamental factors of labour force participation and development. Education raises people's productivity and creativity and promotes entrepreneurship and technological advances. In addition, it plays a very crucial role in securing economic and social progress and improving income distribution. It increases the overall productivity and intellectual flexibility of the labor force. Women having higher education are very important part of work force and can play very significant role in economic development. However these females are facing some constraints to participate properly in the labour force. The education of mother, father and husband (in the case of married respondents) has positive as well as negative effects. Positive in the sense that high education makes them more liberal towards job and negative in the sense that when parents/husband have high education and think they can earn more income then why their daughter/wife participates in the labor force.

Family Income

Similarly, family income has also hypothetically both positive and negative effects on woman's labor force participation. If family income is significant, then it affects negatively the female labor force participation and positive in the sense that when family income is low, it leads to more participation.

Occupations

Occupation of father and husband (in the case of being married) also affects women participation. Occupation reflects the level of income as well as social status. Different social status and thinking have different impacts on the decisions of the females to participate in the labor force or not. If mother is also participating in labor force, it may have positive or negative effects on females' labor force participation. Positive in the sense if mother is satisfied with her job/business and

negative if mother have bitter experience in job/business due to lack of facilities and social problems.

Number of children

Number of children is very important factor that constraints women participation. Although it may seem obsolete to someone but the culture in our society remains that women are more likely to take time off from participation in the labor force, especially when they begin to have children (Jacobsen 1998). Nevertheless, the presence of small or more children significantly reduces the probability of labor force participation for females. It increases the opportunity cost of females' labor force participation. In the presence of small or more children, the family structure also affects the female labor force participation. Indeed in the presence of home childcare in the form of extended family members or other adults negates the impacts.

Number of male adults at home

Number of male adults at home and their contribution to family's total income may affect female time allocation for family income. In developing countries like Pakistan male-dominated cultures have had a long, ingrained influence on all aspects of life. As correctly pointed out by Gunderson (1994):

“Discrimination in the developing countries tends to be more overt, with all parties (employers, males and even females) often adhering to traditional attitudes about what jobs are 'suitable and proper' for women, and what pay is 'appropriate' given perceptions about who is the 'breadwinner'”

Income from other sources

Income from other sources also affects the women participation in the labour. It reduces labor force participation when the income from other sources is significantly high.

Job facilities

Job facilities provided by government or other sectors and better transport facility in the case of more distance between home and job place is very important factor for women labour force participation. According to qualification, job scale and pay counts for higher women labour force participation. Credit facility also affects the women participation in case of business initiatives.

Social factors

Social factors have also contribution in the decision of females about participation in the labor force, e.g., the structure of the family either they are in a joint or nuclear family system, either they are purdah observing or not and the attitude of family towards females labour force participation.

4.3. Diagnostic Methodology

Since this paper is based on the primary source of data, Logit model, one of the binary choice or qualitative response models, with the outcome, being assigned a value of 1 if the event occurs and 0 otherwise is employed for empirical analysis. In the logit model, it is hypothesized that probability of the occurrence of the event is determined by the (cumulative) logistic distribution function.

$$p_i = f(z_i) = \frac{1}{1 + e^{-z_i}} \quad (1)$$

Where,

$$z_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k = \beta_0 + \beta_i x_i$$

or alternatively,

$$p_i = \frac{e^{z_i}}{1 + e^{z_i}} \quad (2)$$

Where, p_i is the probability that a higher educated woman participates in the labour force, e is the exponential value and X_i is the set of explanatory variables and β_i is the corresponding set of regression parameters. Since, the probability of supplying labor is not directly observable; a dichotomous (0-1) variable is constructed, taking the value 1, if higher educated woman is participating in labour force and 0 otherwise.

If p_i , the probability of participating labour force, as given by (2), then $(1-p_i)$, the probability of not participating, is :

$$1 - p_i = \frac{1}{1 + e^{z_i}} \quad (3)$$

Therefore, we can write :

$$\frac{p_i}{1 - p_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \quad (4)$$

Now equation (4) is simply the *odds ratios* in favour of participation and for estimation purpose, we take natural log that yields the name, Logit Model. Therefore, labor force participation of higher educated (postgraduate) women is considered, as a dependent variable with binary choice characteristics and its constraints or determinants are considered as a set of several explanatory variables in the logit model for empirical econometric analysis.

4.4. Selection of Variables

Since there are many determinants/ constraints of women labour force participation, we list in some significant variables for the estimation of logit model. The list and explanation of the variables is stated in table 4.

Table 4. List of variables used in empirical analysis

Variables	Detail of Variables	Explanation of variables
<i>Explained variable</i>		
WLFP	Women labour force participation	If higher educated females participate = 1, otherwise = 0
<i>Explanatory variables</i>		
AGE	Age of the respondent	Age in years
MST	Marital status of the respondent	If married =1, otherwise = 0
NCHD	Number of children	In numbers
EDUF1	Father's education in terms of below 10 years of schooling	If father's education is below matric = 1, otherwise = 0
EDUF2	Father's education in terms of 10 years of schooling	If father's education is matric = 1, otherwise = 0
EDUF3	Father's education in terms of 12 years of schooling/college	If father's education is intermediate or equivalent = 1, otherwise = 0
EDUF4	Father's education in terms of graduation or more	If father's education is graduation or more = 1, otherwise = 0
MEDU	Mother's education	If mother is literate or has more education =1, otherwise = 0
MPRF	Mother's profession	If mother participates in the labor force =1, otherwise = 0
EDUH1	Husband's education up to matric (in the case of married females)	If husband's education is matric or below =1, otherwise = 0
EDUH2	Husband's education equal to intermediate	= If husband's education is intermediate =1, otherwise = 0
EDUH3	Husband's education equal to graduation	If husband's education is graduation or equivalent =1, otherwise = 0
EDUH4	Husband's education equal to masters and more	If husband's education is masters or more =1, otherwise = 0
HINC	Husband's income	Monthly in Rupees
HHSZ	Household size	All members of a household in numbers
NMAD	Number of male adults at home	In numbers
FAMS	Family Livelihood system	If live in a joint family system = 1, otherwise = 0
PMAL	Permission to move alone	If woman is allowed to move alone then = 1, otherwise = 0
GBIS	Gender bias	If the gender bias practice is made at home in terms of son preference then = 1, otherwise = 0
JOBM	Job before marriage	If woman gets job before marriage then = 1, otherwise = 0
PACC	Participation affects childcare	If participation affects childcare then = 1, otherwise = 0
PCIN	Per capita income of a household	Per capita income per month in rupees

5. Empirical results and discussion

Since this paper attempts to examine the constraints that affect women labor force participation, a logit model is employed based on the primary source of data but first we present the preliminary estimates of the women participation. Table 5 shows the decomposition of educated women labour force participation computed into two groups consisting five years each with percentages for both periods. The results show that women education has increased with the passage of time in ten years, almost more than the double. The working females are found 121 (62.40 percent) out of 194 while women who are not participating in the labour market are 73 (37.60 percent). The decomposed results show that women labour force participation has increased in the second period as compared to the first five years period. Consequently, it shows the increasing trend of educated women labor force participation in Pakistan but still about 38 percent educated females are not participating.

Table 5. Results of Preliminary Data Analysis

Academic Sessions	Total Respondents	Educated Women Who Participate	Educated Women Who do not Participate
1991-95	58 (29.90)	27 (46.60)	31 (53.40)
1996-00	136 (70.10)	94 (69.10)	42(30.90)
Total	194 (100.00)	121 (62.40)	73 (37.60)

Source: Computed by authors based on the primary data

Note: Figures given in the parentheses are the corresponding percentages

In order to find out the factors that affect the educated women labour force participation (WLFP), we present the results of logit model estimates in depth based on different variable's categories from the primary data. First, we consider the total sample for all-important variables. Secondly, data is divided according to family system (joint and nuclear) and the effects of variables under these family systems are analyzed separately. As the trend is changing with the passage of time, the trend of educated WLFP may change. Then data are sorted out into categories of married and unmarried women and are analyzed under both statuses.

The results of using logit model based on primary data consisting total sample of 194 respondents are reported in table 6. All variables have the correct signs according hypothetical relations. The variable Age has negative effect on the labor force participation of higher educated women. It shows that if higher educated women are willing and have more chance to participate in labor force they will do it just after completion of their study and as time passed the ratio of their participation will fall. Age of woman restricts her participation in the labour market. Marital status (MST) has positive effect on educated women labor force participation. The proportion of married females in labor force is more as compared to unmarried females. Number of children (NCHD) has a negative and significant effect on the women participation. As the number of children increases the participation rate decreases. Mothers' labor force participation (MPRF) has a positive effect on the woman labour participation. The reason may be that the respondents whose mothers are participating in labor force have more chance to

participate in labor force. The families where already females (mothers) are working are more in favor of females' labor force participation.

Table 6. Estimates of logistic regression analysis based on total sample

Variables	Coefficients	Z test	Odds Ratio
Constant	0.63	2.85	-
Age	-0.06	-0.80	0.95
MST	0.30	0.39	1.35
NCHD	-0.64*	-2.82	0.53
MPRF	0.80**	1.73	2.23
EDUF1	-2.14*	-2.02	0.12
EDUF2	-0.39	-0.57	0.67
EDUF3	0.32	0.61	1.37
EDUF4	0.57	1.09	1.78
HINC	-0.0005*	-2.15	1.00
HHSZ	0.22*	3.33	1.24
NMAD	-0.75**	-2.94	0.47
PMAL	0.59**	1.47	1.81
JOBM	2.17*	4.32	8.80

Number of observations = 194, Log-Likelihood = -89.23, Joint significance = 78.47

*Note: *, **, *** significant at 1 percent, 5 percent and 10 percent respectively*

Level of father's education has a very significant effect on participation. According to empirical results, the low level of father's education has a negative effect on women participation and as the level of father's education is increasing, the rate of women participation is increasing. When father's education is below matric (EDUF1), the effect on WLFP is negative and when it is matric (EDUF2) then it has also negative effect but it is low as compared to previous. When father's education is more than the matric, it has positive effect on WLFP. As the level of father's education is increasing the level of WLFP is also increasing. The level of husband's income (HINC) has a negative effect on WLFP. The reason of WLFP may be the financial needs, as when husband's income is low, more females will participating in the labor force and as the level of husband's income is increasing; the rate of WLFP will also decrease.

Household size (HHSZ) has a positive and significant effect on WLFP. The reason may be that if the family size is large and the number of females is more at home, the household responsibilities will be divided and educated women have more time to participate in labor force. Number of male adults at home (NMAD) has a negative and significant effect on WLFP. It may be due to the male adults at home and due to more working and earning by them, the size of family income increases and they thinking unnecessary to participate the woman in labour.

Permission to move alone (PMAL) is a very important factor for WLFP in the South Asian countries like Pakistan. It has positive and significant effect on WLFP. The females who are permitted to move alone are more participating in the labor force, women who are not permitted to move alone are more dependent on their male counterparts, and although they are highly qualified but their

participation rate is very low. Job before marriage (JOBM) has a positive and significant effect on WLFP. The females who participate in labor force before marriage, after marriage although their responsibilities increased but mostly females continue it due to matching their financial needs and enjoy the benefits of jobs or may be they are habitual of it.

Family system has a significant impact on WLFP, especially in developing countries like Pakistan. In a joint family system, responsibilities have been divided to some extent but it has negative effect on independence. There are also some other variables, which have significant effect on WLFP in joint family system. Now we present the results based on both joint family system and nuclear family system and are reported in table 7 and 8 respectively. The results show that all variables have correct signs accordingly. Similar to the results of total sample data, in joint family system age also has negative effect on WLFP. It shows that with the passage of time, the trend of WLFP has increased and higher educated females are joining labor force as compared to past. The reason of this changing attitude may be the increasing level of education, awareness, needs and the availability of jobs. The number of children (NCHD) has negative and significant effect on WLFP rate because due to more children, the females' household responsibilities increase and as the number of children increases, mother has less time to participate in labor force. Household size (HHSZ) has a positive effect and significant at 1 percent level on WLFP because due to more persons (females) at home the household responsibilities have divided and females have more chance to participate in labor force.

Table 7. Estimates of Logistic regression analysis based on joint family system

Variables	Coefficients	Z test	Odds Ratio
Constant	0.68	2.43	-
Age	-0.10	-0.81	0.90
NCHD	-0.51**	-1.81	0.60
HHSZ	0.17*	2.20	1.19
HINC	-2.76	-0.77	1.00
JOBM	2.77*	3.74	5.98
NMAD	-0.39	-1.05	0.67
MPRF	0.35***	1.49	1.42
EDUF1	-1.74	-1.14	0.17
EDUF2	0.90	0.75	2.47
EDUF3	1.21***	1.64	3.37
EDUF4	1.92***	1.68	3.64
PMAL	0.67	1.20	1.95

Number of observations = 88, Log-Likelihood = -39.00, Joint significance = 36.13*

Note: *, **, *** significant at 1 percent, 5 percent and 10 percent respectively

The level of husband's income (HINC) has a negative effect on WLFP but not significant. The results state that as the level of husband's income increases the level of wife's labour force participation decreases. It also shows that most of the female's participation in the labor force is due to their financial needs and when there is no financial problem due to their husbands' more earning their participation rate decrease. Job before marriage (JOBM) also has positive and significant effect

on WLFP. It clears that the females who are working before marriage, continue it after marriage too. Number of male adults at home (NMAD) has negative effect on WLFP. Mother's labor force participation (MPRF) has a positive and significant effect on the respondent's labor force participation. The reason may be that due to mother's working daughter has more chance and guidance to participate in labor force and it may also caused the positive family view about WLFP. According to results, as the level of father's education increases, the rate of WLFP is also increases. Increasing level of father's education has a positive effect on WLFP. Here some results on father's education are contradicting in relation to the results of a total sample. In total sample data, EDUF1 and EDUF2 both have negative effect and EDUF3 and EDUF4 have positive effect on WLFP but this analysis shows that just EDUF1 has negative effect and EDUF2, EDUF3 and EDUF4 all have positive effect on WLFP. So it clears that in joint family system with the effect of other variables, father's attitude towards WLFP is also positive when his education is matric. Permission to move alone (PMAL) shows the less dependency of females on males and it has positive effect but not significant on the rate of WLFP.

All variables have the correct signs. Similar to the analysis of joint family system age has also negative effect on WLFP for highly qualified females. The reason may be the changing trend about WLFP and the more availability of females' jobs. The number of children (NCHD) has negative and significant effect on WLFP. As the data is based on the nuclear system, so with more children women have less time to participate in the labor force due to increasing responsibilities. The household size (HHSZ) has positive significant effect on WLFP. This may be due to increasing financial needs and due to more persons at home, cause to decreasing household responsibilities. The level of husband's income (HINC) has negative effect on WLFP but job before marriage (JOBM) has positive and significant effect on WLFP. Numbers of male adults at home have negative effect on WLFP. If mother is participating in labor force, it has positive effect on daughter's LFP. Low level of father's education has negative effect on WLFP but as the level of father's education increases, it has positive effect on WLFP. If females are permitted to go out alone, it shows their independency to some extent has positive effect on WLFP.

We present higher educated WLFP rate and variables that affect their participation by dividing the data into married and unmarried respondents and are given in table 9 and 10 respectively. The main purpose of this analysis is to analyze the effects of married and unmarried life of women on WLFP. Out of total 194 respondents, 130 are married and out of them 75 are in labor force. All variables have the correct signs accordingly. The result shows that AGE has inverse and significant impact on the WLFP. The number of children (NCHD) has a negative effect on the rate and level of WLFP. Although 57.7 percent married female are participating in labor force but their participation level is low and as the number of children increases, the level and rate of WLFP also decreases. Household size (HHSZ) has positive and significant effect on WLFP. This may be due to dividing responsibilities, as there are more female members at home, so females have more time to participate in labor force. HINC has the negative and significant effect on WLFP. It shows that with the high level of husband's earning, the rate of wife's labor force participation decreases. If females are permitted to move, alone they have more chance to seek suitable job and employment. PMAL

has positive and significant effect on WLFP while gender bias (GBIS) has negative effect on WLFP. Distinction on sex base in every field is very common especially in developing countries like Pakistan. According to many other studies, the rate of GBIS is high and according to our results GBIS has, a negative effect on WLFP but the effect is not too much high. The reason may be that being highly educated these females are able to take their own decision to some but still they are deprived. They face hurdles in different forms and have no proper chance to utilize their knowledge and skill properly.

Table 8. Estimates of Logistic regression analysis based on nuclear family system

Variables	Coefficients	Z test	Odds Ratio
Constant	1.32	4.38	-
Age	-0.02	-0.15	0.92
NCHD	-1.18*	-3.15	0.31
HHSZ	0.51*	2.35	1.68
HINC	-0.005**	-1.63	0.99
JOBM	1.74*	2.25	5.71
NMAD	-1.93*	-3.10	0.15
MPRF	1.18**	1.59	3.27
EDUF1	-3.43***	-1.34	0.03
EDUF2	-2.17**	-1.81	0.11
EDUF3	0.035	0.05	1.04
EDUF4	0.42	0.51	1.52
PMAL	0.91***	1.46	2.49

Number of observations = 106, Log-Likelihood = -42.53, Joint significance = 57.28*

Note: *, **, *** significant at 1 percent, 5 percent and 10 percent respectively

Table 9. Estimates of Logistic regression analysis based on married females

Variables	Coefficients	Z test	Odds Ratio
Constant	0.38	2.19	-
Age	-0.14***	-1.61	0.87
NCHD	-0.41**	-1.72	0.66
HHSZ	0.19*	2.24	1.21
HINC	-0.006*	-2.59	0.98
PMAL	0.72***	1.67	2.05
GBIS	-0.17	-0.34	0.84
NMAD	-0.69*	-2.08	0.50
PACC	-2.23*	-3.04	0.11
EDUH1	-1.39	-0.66	0.25
EDUH2	0.02	0.02	1.20
EDUH3	0.83	0.48	2.30
EDUH4	0.81	0.47	2.25

Number of observations = 130, Log-Likelihood = -58.17, Joint significance = 60.78*

Note: *, **, *** significant at 1 percent, 5 percent and 10 percent respectively

NMAD has significant and negative effect on higher educated married females' LFP. The mostly married females avoid participating in labor force because they think that their labor force participation will have negative effects on their children's care and health. So according to this analysis mostly married females are in view that the effect of labor force participation on childcare (PACC) is negative. The level of husband education has also very significant effect on wife's LFP. When the level of husband's education is matric (EDUH1), it has negative effect on the wife's labor force participation. Nevertheless, as the level of husband's education increases, the rate of WLFP also increases. Therefore, when husband education is more than matric, the effect on WLFP is positive.

We present the results based on the data of unmarried females. All variables have the correct signs accordingly. The results in table 10 show that AGE has positive effect on higher educated unmarried females. In this case, the result is different to earlier results. The reason may be after the completion of their study they have chance to participate in labor force or not, mostly females get married, but the females who are unmarried mostly remain in search of the chance of better utilization of their knowledge and skill and with the passage of time they keep their self engage in some job. Therefore, it has positive impact on the participation. Being unmarried mostly they have less household responsibilities so they have more time to participate in the labor force. HHSZ has positive effect as due to more females at home, the females' responsibilities may divide and they have more time to work. NMAD has negative effect on WLFP; the reason may be that due to more male adults, the level of family income increases and their male counterparts think why do their females participate in the labor force.

Table 10. Estimates of Logistic regression analysis based on unmarried females

Variables	Coefficients	Z test	Odds Ratio
Constant	0.53	3.71	-
AGE	0.17	1.04	1.19
HHSZ	0.23***	1.78	1.26
NMAD	-0.87***	-1.74	0.42
MPRF	1.59***	1.75	4.89
EDUF1	-1.61	-0.91	0.20
EDUF2	-1.49	-1.20	0.23
EDUF3	2.57**	1.75	3.09
EDUF4	0.06	0.06	1.06
PMAL	0.25	0.34	1.29
PCIN	-0.003**	-1.96	0.99
FAMS	-2.18**	-1.81	0.11

*Number of observations = 64, Log-Likelihood = -27.25, Joint significance = 21.54**

*Note: *, **, *** significant at 1 percent, 5 percent and 10 percent respectively*

MPRF has positive effect on higher educated FLFP. The reason may be that if mother is participating in labor force, the daughter will not have many constraints in LFP and may be she has cooperative attitude by her family members to participate in the labor force. When father education is below matric or matric it has negative effect on WLFP but as the level of father education increases, it has

positive effect on WLFP. PMAL has a positive effect on WLFP as with some independence they have more chance to participate in labor force. If the level of PCIN is high, the fewer females participate in labor force because they have no need of finance. Joint family system (FAMS) has also negative effect on unmarried WLFP.

6. Conclusion and Policy Implications

The participation of higher educated women in the labor force can play an incredibly vital role for more inclusion and sustaining growth in the developing countries like Pakistan but due to some socio-economic and demographic constraints, their participation rates are significantly even low as compared to some developing countries. This paper attempts to address this issue and fills the gap in literature using logit model analysis based on primary data. The main conclusions that emerged from the empirical analysis are as follows:

i. The trend of higher educated females' labor force participation is improving with the passage of time but still it is very low as a significant part of the labour force in the country. Both married and unmarried females are highly dependent on their male counterparts and society's attitude towards their decision about labor force participation. In Pakistan, these females mostly belong to middle status families and they only participate due to their financial constraints and needs. Unmarried females are engaged in jobs when they get cooperative attitude from their family but married females are participating because of both financial problems and family permission issues.

ii. The empirical results state that number of male adults at home, husband's income, number of children, education of husband, participation affects childcare, per capita income of a family, age, family system, gender bias, and education of father and husband up to intermediate are inversely correlated with women's labour force participation. While the variables, higher educated father and husband, household size, permission to move alone, job before marriage and mother's participation and profession have positive relationship with women's participation. The decision of females to join labour force not only depends upon her personal characteristics but also on her husband's and father's education; their attitude towards female job and also on family characteristics which include the profession of respondent's father, mother or husband profession. The mother's qualification and especially mother's LFP of the respondent count more in this matter. When mother is participating in the labour force, it has positive effect on respondent's LFP. The females belonging to educated families, participating more in the labour force because they do not face more constraints in joining labour market as compared to females belonging to low educated or uneducated families.

iii. According to the sample data, women's employment has risen but their concentration is on the few occupations, that are generally lower paid and of lower status. The cultural climate discourages female advancement in trade and industries.

iv. For some females, formal employment outside the home is not a feasible for reasons, which include lack of access to transportation, domestic responsibilities, inadequate job training, and other barriers to entering the workforce. Some higher educated females do not participate in the labor force because of these constraints.

v. Since education is one of the most important factors accounting for increased female labor force participation, other factors that have increased participation of females in the work force include a decline in their spouses' earnings, a drop in fertility rates, the cooperative attitude by family members and largely the education of a whole family.

vi. In joint family system comparatively more proportion of higher educated females is participating in labor force but the difference is not much high. In a joint family system, more females are engaged in service and nuclear family system more females are doing business as compared to joint family system.

vii. Women's dependency level is high as they need permission to move out and mostly they are not allowed to move alone. The empowerment of females in terms of decision-making is mostly linked with WLFP, as working females are more confident. Lack of adequate childcare provides one of the principal barriers to female employment. Like other females, highly educated females also have to face the problem of distinction on sex base at home.

viii. More proportion of married working females is in view that there is no negative effect of job on childcare but non-working females are mostly in view that job has negative effect on childcare.

ix. Higher educated working females are doing job/business for the better utilization of time, capabilities, education or due to financial problem, to improve their status, self confidence, to serve the nation and country. Females are more likely to improve their status and participate in labor force if their males are employed in the public/government sector and if there are other adult females at their homes who would presumably free them from household responsibilities.

Policy Implications

Economic development policies need to be implemented without gender bias that consequently will assist in promoting higher educated females labor force participation and allow them to achieve their full economic potential. There are no guaranteed employment schemes for postgraduates, and no structural adjustment policies by the government that make sure the participation of higher educated women in labour force. If the doors are opened for females to participate in the workplace, faster and sustaining economic growth could be achieved. The future research can be conducted on the same topic by considering time series data on the countries in South Asia.

Therefore, some recommendations based on empirical analysis have been proposed to minimize the constraints to higher educated women's employment in countries like Pakistan.

i. Governments should take measures to reduce the unpaid burden through reducing female household chores and childcare obligations. Because the results indicate that one of the major constraints to working female is not to provide the facility of childcare centre by which they can spare some time for job. Government should recognize and act upon the obligation to provide childcare facilities to working females. Moreover, authorities should make some laws and regulations regarding the transport facilitates to working females between the home and work place.

ii. Government should encourage investment in the labour intensive small scale manufacturing opportunities to promote absorption of the surplus educated female labour supply by providing incentives for public and private investment. The

facility of microfinance to unemployed educated women will also have some positive symptoms for inclusive growth and gender poverty alleviation.

iii. There is an ardent need to bring some significant changes in the social values of the family and society's attitudes within Islamic framework to enhance the pace of more women's participation in labour force through quality education to all and the role of media.

iv. Policymakers should routinely use gender analysis when examining the potential impacts of economic development programs on the state's economy.

v. In order to enhance females' informal work in the urban sector, government needs to modernize and regulate this sector. Credit facilities and business guidance need to be extended to working female for the efficient performance and extension of their trade.

vi. It is observed from the survey data that mostly females are doing their jobs not according to their subjects. They can utilize their abilities and education properly only if they get jobs according to their subjects, cooperative and encouraging environment at home and in working institutions, near to home or with proper transportation facility, and with comfortable timing. In short, media and government policies should be aiming at improving the social thinking and market environment by improving employment condition of females, stabilizing their employment and ensuring the training of females.

vii. Higher Education Commission should introduce a department, who should maintain the record of all postgraduates from all universities in Pakistan for providing the job/business facilities for all without gender bias. The postgraduate females also should be convinced to join the labor force and utilize their knowledge and abilities for more inclusion and economic development.

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EMPIRICAL EVIDENCE ON THE FISCAL THEORY OF PRICE LEVEL : THE CASE STUDY OF ROMANIAN POST-SOCIALIST ECONOMY

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Abstract. This paper investigates the inflationary effect of central government deficit. While the answer from conventional economic theory and monetary authorities emphasizes on the strong connection that characterize these two variables there has been controversial empirical evidence in measuring the strength and significance of the relationship: inflation-government deficit. In particular we investigate the causality between government deficit and inflation in the Romanian post-socialist economy (1997-2007) using a VECM model in which inflation is non-linearly related to fiscal deficit through narrow money and M1. Our purpose is to estimate this relationship as an intrinsically dynamic one using the conceptualization proposed by Terrones and Catao (2005). The focus is on the weak form of the Fiscal Theory of Price (FTP) which is closely related to the quantitative money theory that connects inflation with money. The econometrical results conclude that for the period considered the relationship deficit/GDP-inflation is statistically significant, improvement in the deficit/GDP ratio generating a smaller inflation. This connection suggests future policy implication that can be of success in the process of price stabilization.

JEL Classification: C32, E52, E63

Keywords: Fiscal theory of price level, Monetary policy, Seignorage, Inflation, VECM.

1. Introduction

The necessity of combining monetary policy and fiscal policy for macroeconomic stabilization, and in particular for inflation targeting has been

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rationalized in the context of a new economic paradigm – the Fiscal Theory of Price - as an alternative theory of price level determination. Drawing from the theoretical ground proposed by scholars like Woodford (2001), Leeper and Gordon (2006) and more recently Bajo-Rubio et al.(2009;), the main objective of this study is to explore the relevance of this new theory in Romanian economy by quantifying the effects that the reduction of deficit will have upon the inflation ratio.

This idea is justified by the multitude of experts in this area that plead for a coalization of monetary policy with fiscal policy instruments that mainly refers to a correct dimension of public revenue and expenditure (Dăianu, Vrânceanu 2002;). Regarding the role of national fiscal policies, as automatic stabilizers, within a monetary union Muscatelli's and Tirelli's (2006) study demonstrates the sharp contrast in the assertion of the "Brussels consensus" that is based on the view that the ECB *alone* should stabilize the union-wide economy and national fiscal policies should react to idiosyncratic shocks and to national debt levels. Moreover, regarding specific Romanian economic features, Ansola and Jaeger (2007) emphasize on the important role played by the fiscal policy that directly controls 40% of the expenditure of the whole economy. In this context, if the central bank is let alone in the fight against inflation the emergence of high interest rates will affect the growth perspectives by decreasing the level of investments in GDP.

The limits that monetary authority faces in the permanent control of inflation were elegantly presented in the milestone work of Sargent and Wallace (1981). This article comes as a comment to the affirmation made by Milton Friedman upon which monetary authority cannot permanently influence the level of real output, unemployment or real rates of return on securities. The authors add another element that slips from the permanent control of monetary authority: inflation.

Even if we deal with a monetarist economy that satisfies two main premises: monetary base is strongly correlated with the price level and monetary authority can raise revenue from money creation (seigniorage), in certain situations the control of inflation is limited. This limitation is embedded in the sources governments have for paying their liabilities: government bonds and/or seigniorage. More exactly the demand for government bonds can constrain a monetarist government in two ways: one refers to the upper limit on the real stock of bonds that government can offer relative to the size of the economy, the other is given by fact that the interest rate paid cannot be greater than the economy growth rate. The conclusion of Sargent and Wallace is that sooner or later in a monetarist economy the result is additional inflation.

2. Scenarios: Fiscal Dominance – Monetary Dominance

Let's consider two possible scenarios: one of fiscal dominance and the other of monetary dominance. In the scenario of monetary dominance the monetary authority makes the first step by setting independently its politics, for example announcing growth rates for base money for the current period and all future periods. In practical terms this means that monetary authority determines the amount of revenue it will supply the fiscal authority through seigniorage. The fiscal authority faces then the constraints imposed by the demand for bonds since it must set its budgets in such a manner that any deficits should be financed by a combination of the seigniorage chosen by monetary authority and bond sales to

public. Under this scenario monetary authority can permanently control inflation ratios since it independently chooses a path for base money.

In the scenario of fiscal dominance the fiscal authority makes the first step by setting independently its budgets, announcing all current and future deficits and surpluses thus determining the amount of revenue that must be raised through bond sales and seigniorage. Monetary authority will have to cope with the constraints imposed by the demand for government bonds. For example if the demand for government bond implies an interest rate on bonds greater than the economy growth rate, the unpleasant arithmetic relies in the fact that monetary authority can fight current inflation only by holding down the growth rate of base money and letting the real stock of bonds held by the public to grow. Because the interest rate on bonds is greater than the economy's growth rate, the real stock of bonds will grow faster than the size of the economy. Considering reaching the growth limit that refers to the size of economy, the principal and the interest due on the bonds already sold must be financed at least in part by seigniorage requiring the creation of additional base money. If the fiscal authority runs deficits the monetary authority is unable to control either the growth rate of base money or inflation forever.

3. Econometric modeling of deficit-inflation relation

Having in mind that the most plausible scenario is that of fiscal dominance, we can estimate a link between inflation and deficit starting with the government budget constrain equation:

$$\frac{B_{t-1}^s}{P_t} = \sum_{j=0}^{\infty} \frac{1}{r^j} \times (\tau_{t+j} - g_{t+j} + \frac{M_{t+j}^s - M_{t-1+j}^s}{P_{t+j}}) \quad (1)$$

This equation is actually an equilibrium condition that refers to the fact that the real value of net government liabilities – left side of equation- must equal the present value of expected future primary budget surpluses-(fiscal surplus $\tau_{t+j} - g_{t+j}$ and seigniorage, Woodford, 2001).

We can rewrite the budget constrain as follows:

$$\frac{B_{t-1}^s}{P_t} - \tau_t + g_t = \frac{M_t^s - M_{t-1}^s}{P_t} \quad (2)$$

The left side of this equation is the budget deficit consisting of: fiscal deficit and public debt service, the right part reflects the seigniorage defined by monetary mass evolution and price level:

$$SR = f(\pi_t) \frac{M_t^s}{P_t} \quad (3)$$

Introducing 3 in 2 we obtain:

$$\pi_t = \beta \frac{d_t P_t}{M_t^s} \quad (4)$$

were, $d_t = g_t - \tau_t - b_t^s(t)$

This is the equation used by Terrones and Catao (2005) used to depict the inflation-deficit relationship for 107 economies.

The superiority of this model is argued by the authors with the fact that the deficit will affect inflation in a non-linearity because inflation is proportional to the product of the ratio of gross-of-interest fiscal deficit to GDP by the inverse of the ratio of narrow money to GDP. With the demand for transaction money being negatively related to inflation, the size of the inflation tax base – in this case M_t – will be lower (higher) as inflation is higher (lower). This implies that fiscal consolidation will be a more powerful instrument of price stabilization the higher the inflation rate.

The study of Terrones and Catao analyzed 107 countries for the period 1961-2001 using a country specific ADRL model and tested the long-run relationship between the two variables by implying the “pooled mean group estimator” proposed by Pesaran, Shin and Smith (1999). The authors conclude that fiscal deficits have an inflationary effect, the relationship having a strong intensity especially in the case of developing countries and in the cases where the inflation ratio is in the first quartile of the distribution. Also deficits can be significant in the long run in case of countries with moderate inflation ratio. Nevertheless, in the case of low inflation ratio the relationship fiscal deficit-inflation is statistically insignificant.

The effect of fiscal policy over the price stability has been addressed by recent research emphasizing the importance of this field study:

- Davig and Leeper (2006) speak about active and pasive behaviour of the fiscal authority. Their conclusions show that lump-sum taxes have quantitatively important effects on aggregate demand, output, and inflation and switching to non-ricardian outcomes (fiscal authority will determine the value of future primary surplus independent of the current fiscal deficit, thus generating inflation pressure in the sense that the price level will accomodate to a value that will satisfy the budget constrain for an infinite time period) as long as there is a high probability of future active fiscal policy.
- Using bayesian inference Thams (2007) shows that there is a causal link between prices and public debt. The findings suggest that the FTPL is one relevant factor among others in explaining the differences in inflation rates between Germany and Spain between 1970-1998.
- Using annual data on real debt, real primary surpluses, and real GDP for a panel of ten EMU countries over the period 1970-2006, Daniel and Shiamptanis (2009) conclude that over the sample period, fiscal policy has been sufficiently responsive to increases in debt. According to the authors this provides evidence that the violation of the limits imposed by the Maastricht Treaty and the Stability and Growth Pact have not been serious enough to threaten the ability of the European Central Bank to control the price level.

In this paper we will estimate a particular case referring to the situation in which public debt cannot grow, the deficit is in this sense financed through seignorage. This condition is validated by data offered by the Romanian Ministry of Finance which presents a descending trend for the public debt values until the year 2007. Starting with the year 2008 we have increasing values for the public debt as a reflection of the financial crises that characterize Romanian economy. At a more detailed analysis it can be concluded that during the period considered the principal source of financing government deficit is external borrowing. We have to consider in this sense the unfortunate international context starting with the year 1996 regarding borrowings for developing countries. Also the fact that at the end of 1999 Romania had external liabilities of 2,9 mil USD which generated external high interest (Serban, 2001). In conclusion the most viable solution for Romanian government should have been the growing of internal debt, but the lack of trust for the national currency and the negative value for the real interest rate have generated a low level of savings, hence the volume of internal debt is closely connected with base money.

4. Case study: Romanian post-socialist economy

We estimate the relation inflation-deficit-monetary mass starting with the equation (4). in order to find discrete values for the impact that one variable has over another. For this purpose we used quarterly data for inflation, deficit, M1 aggregate and Money Emission series during the years 1990-2007. Data was found in the monthly NBR bulletins, inflation was calculated starting with IPC publicized by INSSE.

The first step was testing stationarity. Using the ADF test we found that the series are non-stationary – the graphics also describe a random walk evolution – but the series have one unit root. For estimating the β coefficient we will use a Vector Error Correction Model, after depicting a long term equilibrium between the variables. We can find a linear combination for non-stationary series suggesting a long term relationship by testing for cointegration. The Johanson test finds two cointegration equation for the period 1991:2009 which means that we have to eliminate successively one year after another from analysis until we will find only one such equation. Data suggest the existence of such a relationship starting with the year 1998, for the period 1999:2007.

This situation is explained by the fact that this is a period of profound structural economical and societal changes. The role played by the NBR in the economy in the years of transition but also the increasing external debt for the period 1991:1997 are explanatory variables to this inconsistency.

The research of Budina and van Wijnbergen (2000) emphasises on the poor official accounting of deficit values during that period. The first ten years of transition to a market based economy meant for the NBR a constant presence in the market in assuming the bourdon of quasi-fiscal operations. In particular uncompetitive economy sectors were financed by the NBR with borrowings that were never refunded. Furthermore, this form of subsidies had a direct inflationary impact in what they directly contributed to the increase of monetary base. However, the subventions were not appearing on government books because they were not accounted for as government expenditures. In this way the reported primary deficit may have been significantly understated.

Secondly, it is expected to find this long term relationship between inflation on the one hand and deficit/M1, EB on the other, only after the year 1997, because this year marks the ending process of administered prices and of currency market liberalization.

Thirdly, if we analyze the external debt evolution we observe that between years 1990:1997 Romania concentrates the most significant growth in terms of public debt, situation that is in contradiction with the condition imposed by our model.

For the period 1998:2007 the Johanson test indicates the existing of one cointegration relationship, the VECM estimations for the β coefficient is 0.60 if we consider the ratio Deficit/M1, and 0.42 if we consider Deficit/Money Emission ratio. The number of lags was determined by LR test, Schwartz Information Criterion (SCI), Akaike Information Criterion (AIC) all suggesting one lag model.

Using the White test we assure correct specification of the model by testing the homogeneity of variance. The model is homoskedastic and the errors are independent by the regressor so that the linear specification is correct.

Regarding error autocorrelation the principle of a good analysis requires that after model specification the variables taken into account should explain most of the variance of the phenomena so that what remains in terms of error should be "white noise". LM test for residues autocorrelation shows that there is no serial correlation between the residues.

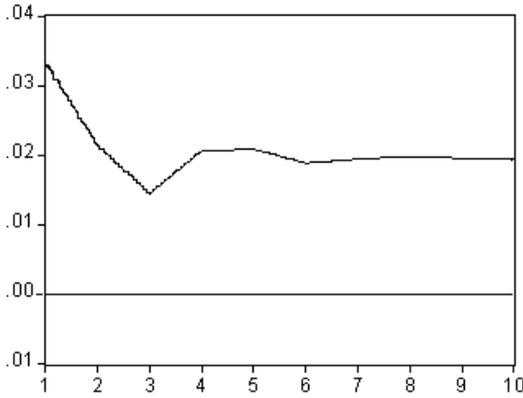
The interpretation of the β coefficient is as follows: since at the ending of the year 2007 M1 was 10% out of GDP, a reduction by one percent of the annual Deficit /DGP ratio will determine a drop in actual value of inflation of 6, 13% - if we use the Deficit/M1 ratio, and 6, 83% for the Deficit/Money Emission ratio. These values were calculated starting with the equation presented at point (4) using a VECM for the Deficit/M1 ratio we have:

$$\Delta\pi_t = -0.11(\pi_{t-1} + 0.60\frac{D_{t-1}}{M1_{t-1}}) + \varepsilon_t \quad (5)$$

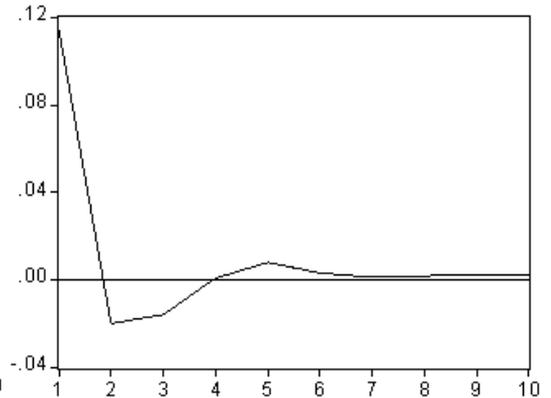
Because we used quarterly values, we supposed that every quarter the Deficit/GBP ratio will drop 0.25%. This will determine a reduction of inflation by 1.5% for every quarter which is equivalent to an actual annual inflation rate of 6, 13%. In other words if we reduce the Deficit/GDP in every quarter by 0.25% situation equivalent with an annual reduction of 1% , the effect will be a drop in terms of inflation rate by 6,13%. Both model offer similar results, the superiority of the Deficit/Money Emission ratio is presented by a smaller standard error.

This effect was calculated in the hypothesis that M1 is constant justified by the fact that monetization and de-monetization are asymmetric phenomena. High inflation can reduce the demand for money rapidly and low inflation will increase the demand for money only gradually. This straight-forwarded intuition is revealed by the fact that when facing high inflation households and enterprises will find ways to conserve on money holdings, having the incentive to discover new "techniques" for operating with low money holdings (Ghosh, 1997). New dimensions for the relationship between the selected variables are revealed by the impulse response function.

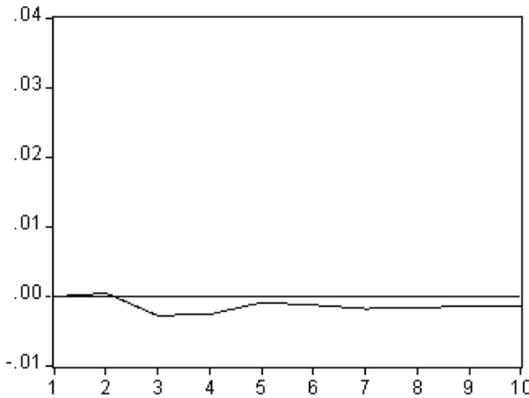
Graphic 1: Response of INFL to DEF/M1



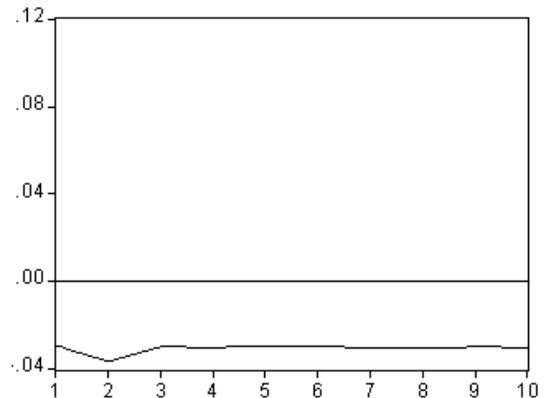
Graphic 2: Response if INFL to INFL



Graphic 3: Response of DEF/M1 to INFL



Graphic 4: Response of DEF/M1 to DEF



DEF

Source: Own calculation using Eviews 5.1
 INFL - quarterly values of inflation, during the period analyzed;
 DEF- quarterly values of deficit variable:
 Def/M1- ratio Deficit/Monetary Aggregate M1, both variables being observed in a quarterly time span;

It can be observed the poor adjustment of inflation to what constitutes a shock in terms of inflation level. Even after the ten periods have past the equilibrium is not reached, one impulse of standard deviation on the inflation level will determine a long term imbalance.

One impulse of standard deviation on the level Deficit/ Monetary Mass will generate an imbalance that is going to have its maximum impact on inflation ratios after three periods have passed. This suggest the fact that the effects of the swifts recorded by the variables Deficit/ Monetary Mass are not to be quantified simultaneously as they happen, as the fully impact of such changes manifests itself only after some time has passed, hence the importance of lags. The oscillations from the equilibrium values are small, the new equilibrium restored is different from the expected one. Regarding the impulse response function using the Deficit/Money Emission ratio the results are very much the same in terms of interpretation.

The monetarist theory postulates that the growth of deficit will determine an increase of supply in economy which will translate into an augmentation of price levels. Since the fiscal shocks are rapidly embedded in the inflation level, any growth of money supply will determine an acceleration of inflation and the possibility for the monetary policy to encourage the economy is low.

Testing Granger causality will disclose more interesting aspects on the relationship between variables. The assertion "X is a Granger cause for Y" does not suggest the common causality that is generally understood. First we have to se how much of the variable Y is explained by Y, and if we add the variable X do we enrich the explanation of phenomena Y. We say that X is a Granger cause for Y, if X helps in the prediction of Y. Furthermore, if the existence of Granger causality between two variables is proven, this does not imply the fact that one is the effect or the cause for the other.

Table 1: Pairwise Granger Causality Tests (1998-2007)

Null Hypothesis:	F-Stat.	Prob.	Lags
Deficit rate does not Granger Cause Inflation rate	199799	0.10101*	4
Inflation rate does not Granger Cause Deficit rate	116.808	0.16410	4

Source: own calculations using Eviews 5.1

*denotes rejection of the null hypothesis at the 0.10 level

The values indicate that we have to reject the null hypothesis and to accept that only for approximately 90% of cases the Deficit/M1 is a Granger cause for inflation. This refers to the predictive value of Deficit/M1 ratio over inflation in the sense that we can predict the values of inflation even if we don't fully consider the values of Deficit/M1 ratio. The risk of error using this variable is 10.101%. If we consider the Deficit/Money Emission ratio, the risk of failure is of 7,785%, both constructions having an appreciable influence over inflation.

5. Final remarks

The purpose of this research article was the quantification of the effect that one fiscal policy has over inflation rates. We estimated a particular case that refers to the fact that public debt cannot grow; the deficit is thus financed through seignorage. This particular case gives meaning to the weak version of the Fiscal Theory of Price that connects the effects of changes in the monetary mass – imposed by the government budget constrain – with inflation. The weak form of the FTP analyses the bound between monetary and fiscal policy. Both monetary and fiscal policy are determined in the long term by the government budget constrain. The first choice is made by the fiscal authority by announcing the level of fiscal deficit/surplus forcing the monetary authority to generate the necessary seignorage in order to satisfy general solvability. Starting from this point of view we estimated the relationship between inflation and deficit. Taking in consideration certain particularities of the Romanian economy – the transition from the socialist planned economy to a free market – our analysis had to focus on the period 1998-2007. The years 2008 and 2009 are of particular interest since they integrate Romanian economy in the mondial economic crisis. The nature of this new context encloses the generalization of the fiscal theory of price since it implies some extraordinary economical changes.

We estimated the parameters using a VECM model because of the cointegration relationship that characterize the long term equilibrium relationship between inflation and deficit. After the econometric estimation we obtained that for 1% reduction in the deficit/GDP ratio corresponds a decrease in terms of inflation ratio by 6,13% - 6,7% according to the variable monetary mass or money emission.

Regarding Granger causality we can accept that such a relation exists at a low significance level, which from a statistical point of view slightly overcomes the error margin. This results are confirmed by the impulse response function that suggest that one impulse in standard deviation on the inflation level will determine a long term imbalance, the equilibrium restored is different from the initial one.

Even if the R^2 coefficient is just 0.56 suggesting a relation of medium intensity between the explaining variables we have to admit the fiscal theory of price brings an important explanatory effect since inflation is a very complex phenomena hard to explain by parsimonious models.

The theoretical dispute regarding this theme still continues, and the empirical testing methodology is of particular interest since it develops sophisticated statistical instruments submitting this field of research for further inquirements and new practical dimensions for understanding the complex phenomena of inflation and macroeconomic stability.

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APPENDIX

$$(INFL) = - 0.1064034109*(INFL(-1) + 0.6017574124*DEF_M1(-1) + 0.007435737536) - 0.1617909063*D(INFL(-1)) + 0.05602910493*D(DEF_M1(-1)) - 0.003904010306$$

$$D(INFL) = - 0.06172964043*(INFL(-1) + 0.4238215137*DEF_EB(-1) + 0.01513297458) - 0.1916348815*D(INFL(-1)) + 0.02553685486*D(DEF_EB(-1)) - 0.0038780716$$

Table 1. Augumented Dickey-Fuller Test

Variable	ADF Values	Critical McKinnon values for rejecting the null hypotesis
Inflation ratio	-1,71	Critical val. 1% -3.63
Deficit/M1	-1,14	Critical val 5% -2.95
Deficit/Money emission	-1,36	Critical val 10% -2.61

*the test includes one constant and 8 lags

Table 2: Cointegration equations

Sample: 1998Q1 2007Q4 ; Included observations: 40 ; Trend assumption: No deterministic trend (restricted constant) ; Series: INFL DEF_M1; Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.455179	32.62615	20.26184	0.0006
At most 1	0.188082	8.334232	9.164546	0.0717

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table 3 : VECM estimations

Vector Error Correction Estimates ; Sample: 1998Q1 2007Q4 ; Included observations: 40 ; Standard errors in () & t-statistics in []

Cointegrating Eq:	CoIntEq1
INFL(-1)	1.000000
DEF_M1(-1)	0.601757
Std. error	(0.08918)
t-statistic	[6.74787]
C	0.007436

Table 4 : Residual Heteroskedasticity Tests

VEC Residual Heteroskedasticity Tests: Includes Cross Terms ; Sample: 1998Q1 2007Q4 ;
Included observations: 40

Joint test:				
Chi-sq	Df	Prob.		
19.01402	27	0.8695		
Individual components:				
Dependent	R-squared	F(9,30)	Prob.	Chi-sq(9)
res1*res1	0.090860	0.333135	0.9568	3.634395
res2*res2	0.110624	0.414611	0.9171	4.424945
res2*res1	0.213500	0.904855	0.5336	8.540017

Table 5 : VEC Residual Serial Correlation LM Tests

VEC Residual Serial Correlation LM Tests ; H0: no serial correlation at lag order h ;
Sample: 1998Q1 2007Q4 ; Included observations: 40 ; Probs from chi-square with 4 df.

Lags	LM-Stat	Prob
1	5.393618	0.2492
2	7.212802	0.1251
3	3.966804	0.4105
4	23.24526	0.0001
5	4.332556	0.3629
6	5.752824	0.2184
7	7.234769	0.1240
8	3.274616	0.5130
9	11.99995	0.0174
10	0.454676	0.9778
11	3.350809	0.5009
12	1.180131	0.8814

THE QUEST FOR SUSTAINABLE FIRM VALUE

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Abstract. The maximisation of shareholder-value is often perceived as the most important corporate goal by the investment community and corporate managers. A firm's value depends, among other, on its long-term ability to create cash-creating growth and pay dividends to its shareholders. However, investment decisions are often based on short-term earnings, with a focus on shareholder value creation, which may have contributed to the recent corporate failures and current global financial crisis. The question could be asked if a focus on the quality and efficient utilisation of the firm's tangible assets could contribute to the creation of sustainable firm-value. In order to test this question, a study on the concept of accounting value, the role of earnings in value creation and the key principles to create sustainable firm value was conducted, focussing on 15 resource firms' asset turnover, and its corresponding earnings over the period from 1998 to 2008. This information was statistically analysed in order to determine whether there are possible relationships between asset turnover and earnings. Based on this analysis no statistical relationships between asset turnover and earnings could be found. In order to create sustainable firm-value, a firm should therefore not only manage its short-term earnings or its tangible asset-base, but manage knowledge-based strategies that effectively utilize the intangible and human assets.

JEL Classification: M10, M14, M41

Keywords: Du Pont analysis, human capital, firm value, shareholder-value, sustainable development, triple bottom line.

1. Introduction

The creation of a sustainable future requires governments, societies and individuals to rethink their resource utilisations, individual objectives as well as their

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interactions with each other (Buys, Du Plessis & Bosman, 2010). Economic growth is probably the most important factor to ensure sustainable development and both households and individual firms could contribute to such sustainable economic growth. The most important household decisions affecting economic growth are to reproduce, to save and to transfer knowledge and assets to the next generation (Guriev & Salehi-Isfahani, 2003). Firms use the factors supplied by households to deliver on the production requirements and then also make the investment decisions (Guriev & Salehi-Isfahani, 2003). However, inadequate corporate governance policies with limited investor and owner protection could have a negative impact on the broader economic growth of a region (Guriev & Salehi-Isfahani, 2003).

Any sense that the economies of the world could learn from the robust, market-based corporate governance systems of the Anglo-American model was rudely dispelled by the spectacular sequence of corporate crises commencing in 2001. The USA was rocked with corporate failures such as Enron, WorldCom, Tyco International, Adelphia Communications and Global Crossings (Clarke, 2005). Europe was impacted with the collapse of Parmalat and in South Africa it was Saambou Bank, Leisurenent and Fidentia Asset Management (Buys, 2008; Van Romburgh, 2008). In 2008, the global economy was impacted by the international financial crisis where firms like Northern Rock, AIG, Bank of America, Fannie Mae, Freddie Mac, General Motors and Chrysler needed government assistance to survive (Johnson, 2009). Other major firms, such as Lehman Brothers, Bear Sterns and Merrill Lynch were either bankrupted or were taken over and ceased to exist (Johnson, 2009). This resulted in a global recession where millions of people lost their jobs and/or their life savings, while shareholder-value amounting to hundreds of billions of US Dollars was also destroyed globally (Collins, 2009).

In August 2000, with a share price of US\$90, Enron was the seventh largest firm in the USA, based on market capitalisation. Fortune Magazine also hailed it as the most innovative firm for five years running. However, during December 2001, Enron filed for Chapter 11 bankruptcy protection (Bratton, 2002). A key reason for its collapse was the quest for non-sustainable short-term profits, which resulted in fraudulent activities as a means to achieve these profits and thus satisfy the market expectations (McLean & Elkind, 2003; Swartz & Watkins, 2003; Deakin & Konzelmann, 2004). Sadly, Enron was not the exception. Between January 1997 and June 2002, approximately 10% of all listed firms in the USA announced at least one financial statement restatement (Coffee, 2003). Share prices of these companies declined 10% on average, with losses exceeding US\$100 billion in market capitalisation (Coffee, 2003). According to Baily, Litan and Johnson (2008) the current global financial crisis' roots could be found in the pursuit of short-term profits. All this happened against the backdrop of a generally accepted principle that a firm's primary objective should be to create and maximise *shareholder-value* (Oberholzer & van der Merwe, 2004).

The ideology of shareholder-value has emerged in the investment community as being perceived as the most important corporate goal (Tangpong & Pesek, 2007). Even though a firm's value depends, among other, on its long term ability to generate cash to fund value-creating growth and pay dividends to its shareholders, investment managers often base their share selections on short-term earnings and portfolio tracking error. Corporate managers point to the investment community to rationalise their own obsession with earnings (Rappaport,

2005). However, it is this fixation on (short-term) quarterly earnings and the so-called shareholder-value objective that played a key role in destroying hundreds of billions of US Dollars of shareholder value and life savings as well as the loss of hundreds of thousands of work opportunities in recent times.

2. Problem statement

Many business enterprises, business people as well as business scholars are struggling with the question about value, including how to create value and for whom should the value be created. There are various arguments as to how value can be created. According to Stern (1994) value can be created by enhancing operating-efficiency, undertaking value-enhancing investments and withdrawing capital from unrewarding activities, while De Wet and Dhanraj (2007) state that value could also be unlocked by moving closer to the optimal capital structure. Furthermore, Andrews and Black (2002) argue that fundamentally, value is derived from the sustainable productivity of a firm's asset-base, while according to Raynor (2009) and Jensen (2001) the focus should be on the creation of firm-value, rather than shareholder-value, in order to ensure sustainability. Due to these diverse perspectives, it was decided to undertake an exploratory study to gauge the possible effect of asset management and utilisation on the firm's earnings. Based hereupon, the primary research question for this article could therefore be formulated as follows:

P: Is a principal focus on a firm's tangible asset base, and such assets' efficient utilisation, sufficient to create sustainable firm-value in the long run?

The working hypothesis for this study is thus formulated as follows:

H: A principal focus on the quality of a firm's tangible asset-base, as reflected in its balance sheet and the efficient utilisation of these assets, is sufficient to create sustainable firm-value in the long run.

3. Research aim and objectives

The primary objective of this study is to determine whether a focus on the quality of a firm's asset-base and its efficient utilisation could potentially result in the creation of sustainable firm-value. In order to achieve this objective, the following detailed objectives are set:

- The consideration of the concept of accounting value;
- The consideration of the role of earnings in value creation, with a specific reference to the creation and maximisation of shareholder-value;
- An evaluation of the concept of sustainable firm value, focussing especially on the key principles of firm-value creation; and
- The use of the Du Pont model as a measure to determine whether a firm's asset base forms the basis for sustainable firm-value creation.

4. The concept of accounting value

4.1. Value measurement bases

A key purpose of a firm's financial statements is to translate its operational data into financial information and to communicate such information to its

stakeholders (Buys, 2009; Sundem, 2007; Damant, 2006). Accounting information should be believable and plausible in the specific circumstances, as well as having common futures to permit the possibility of comparison. However, in the reality of the business world with its many rules and objectives, there is no clear-cut way of knowing whose (or what) financial values are reliable or what these values actually present (Buys, 2009). The term **value** is often used when referring to something tangible in terms of some monetary value. Value is defined as the worth of something in money or other goods for which it can be exchanged (Oxford Advanced Learner's Dictionary, 2008). Blackburny (1994) states that to acknowledge value is to acknowledge some feature of things to take into account in decision-making.

Accounting theory is confronted with the phenomenon of relative values (Mattessich, 2003) and even the obvious cost-value concept can become debatable. When capitalising the price of a purchased object, the simple historical fact is that an amount of money has been spent for the acquisition such an object. It does not mean the acquired object is worth that amount. However, asset values are key quantitative anchors upon which capitalism is based, and the way it is valued can become a key parameter in socio-economic relations (Buys, 2008). In the accounting literature, there are two broad viewpoints regarding the determination of value, namely fair-value accounting and historic-cost accounting:

- **Fair-value accounting:** The fair value accounting (FVA) approach values certain assets and liabilities at their current market value (Campbell, Owens-Jackson & Robinson, 2008). While the proponents thereof believe it provides more relevant and timely information despite its increased use of estimates and subjective judgements (Ryan, 2008), while opponents believe it provides unreliable information (Krumwiede, 2008). Reis and Stocken (2007) argue that even though FVA may have better predictive value, there are many subjective assessments in the preparations of FVA statements. Furthermore, the periodic relativity of values aggravates this value predicament (Christensen & Frimor, 2007; Reis & Stocken, 2007). This predicament becomes even more important within the context of the balance sheet approach, under which financial performances are judged based on the asset values, as opposed to the cashflow (Van Cauwenberg & De Beelde, 2007; Perry & Nölke, 2006). A concern with this approach is a constant re-measurement of assets that may lead to increased profit volatility and the possibility of the manipulation of accounting numbers (Buys, 2009). As such FVA reporting could also partially be blamed for the sub-prime meltdown, bank failures, credit crunch, economic recessions and global corporate failures (King, 2009; Boyles, 2008; Krumwiede, 2008; Ryan, 2008).
- **Historical cost accounting:** The measurement basis most commonly adopted by entities in preparing their financial statements is historical cost. This could also be combined with other measurement bases. Assets are recorded at the amount of cash or cash equivalents paid or the fair value of the consideration given to acquire them at the time of their acquisition. Liabilities are recorded at the amount processed, or received in exchange of a specific obligation (SAICA, 2010). However, historical cost accounting assumes either i) a stable monetary unit, or ii) immaterial value changes in the monetary unit (Riahi-Belkaoui, 2000). Both these assumptions may be challenged in the current market conditions, and over time the historical cost values may become less

relevant for decision-making (Buys, 2009; Schroeder, Clark & Cathey, 2005; Scott, 2003).

A key difference between historical cost and fair-value accounting is the timing of recognition of value changes. The FVA approach is a balance sheet approach to accounting, which means that value changes are measured and recognised as they occur by discounting future cashflows and capitalising it on the balance sheet. The earnings amount in effect becomes the change in the periodic present value (Buys, 2009). However, earnings are still considered to be the single most important item in the financial reports of public firms. In the medium to long run, returns to shares appear to be explained overwhelmingly by the firm's cumulative earnings during the period. This is also applicable to short-term share returns (DeGeorge, Patel & Zeckhanser, 1999). On the other hand, historical cost accounting is an income statement approach, in which the unrealised changes are not recognised in the balance sheet. The recognition of value changes is only recognised in the income statement once an actual transaction or cashflow occurs. The income statement therefore provides information on the current instalment of value created by the firm (Buys, 2009).

Considering the above acceptable, but diverse, valuation concepts in accounting's approach to report values that are disclosed in the financial reports, there could be a concern about the comparability and relevancy of the data (such as the earnings numbers) that is typically used in the valuations of firms.

5. The role of earnings in value creation

5.1. Purpose of the firm

There are two distinct theories regarding the purpose of the firm, namely *shareholder*-value theory and *stakeholder*-value theory (Buys, Van Rooyen & Bosman, 2009). The shareholder-value theory argued that shareholders are the legal owners, bear the most risk, and therefore maximising their value becomes in effect a legal requirement (Buys *et al.*, 2009). Furthermore, maximising shareholder value could also set a clear corporate goal (Raynor, 2009). On the other hand, the core of the stakeholder-value theory states that economic value is created by people who voluntarily come together and cooperate with each other in order to improve everyone's circumstances (Freeman, Wicks & Parmar, 2004). Even though shareholders are an important constituent and profits are a critical feature of this activity, profits are the *result* rather than the *driver* in the process of value-creation (Freeman, *et al.*, 2004). Notwithstanding the argument in support of stakeholder value creation, shareholder-value creation is *still* the most dominant theory (Stockhammer, 2008; Lazonick & O'Sullivan, 2000).

An excessive fixation on shareholder-value and share prices could increase excessive risk-taking (Cassidy, 2002). This was evident in the actions of the Enron executives, where they fraudulently manipulated financial results to boost share prices, which resulted in the collapse of Enron (Fuller & Jensen, 2001). A focus on short-term profit margins through excessive risk taking was also one of the main contributors of the current financial crisis (Baily *et al.*, 2008). The artificially high earnings numbers resulted in excessively high share valuations that released a set of damaging organisational forces that led to a massive destruction of corporate and social value (Jensen, 2005).

5.2. Effect of earnings on the share price

Analysts, investors, senior executives and the board of directors often consider earnings as the single most important item in the financial reports of public firms, because share prices are closely correlated to cumulative earnings (DeGeorge *et al.*, 1999), whereas other possible explanations for returns, such as dividends, cashflow, or capital investments, have marginal correlations close to zero (Easton, Harris & Ohlson, 1992, Kothari & Sloane, 1992). Therefore, the reward for a firm's senior executives depends both implicitly and explicitly on the earnings achieved (DeGeorge *et al.*, 1999). They know that capital markets will punish or reward a firm's share price if the earnings are in line with analysts' expectations or not (Jensen, 2005; Skinner & Sloane, 2002).

Because firms can in many cases not produce the performances necessary to justify the overvalued share price, they could start to take actions that could destroy long-term value for short-term market expected performance (Roychowdhury, 2006; Bergstresser & Phillippon, 2004). However, none of these actions truly improve performance, but destroy part or all of the firm's core value (Jensen, 2005).

Based on the recent corporate history it may seem that the focus on shareholder-value as primary objective did not achieve its goal of creating and maximising sustainable shareholder-value. It could therefore be argued that the primary objective should rather be the creation of sustainable firm-value.

6. The creation of sustainable firm-value

6.1. Defining sustainability

A firm should be sustainable, not only to meet the expectations of its shareholders, but of all its stakeholders. Business sustainability could be defined as adopting business strategies and activities that meet the needs of the firm and its stakeholders today, while protecting, sustaining and enhancing the human and natural resources that will be needed in the future (Labuschagne, Brent & Van Erck, 2005). The debate of shareholder-value versus stakeholder-value belongs to the discussion of the purpose and goals of the firm.

The necessary condition for the existence of a firm and the main purpose for which firms come into being is the production of *products*, not necessarily the production of profits or shareholder-value (Koslowski, 2000). This main purpose may only be realised if sufficient returns on investments are realised, and in this sense, the realisation of shareholder-value becomes a condition for this realisation of the main purpose. It is still, however, not the first condition. The main purpose of the firm (i.e. the production and delivery of products), implies that the firm must be productive and efficient. Productivity is an obligation of the firm independent of market efficiency (Koslowski, 2000).

There are several constituents within a firm that could have an impact on its success and sustainability. Each of the constituents has their own financial and/or non-financial objectives and claims (Mitchell, Agle & Wood, 1997). However, it is not possible for managers to attend to each constituent's claims and to single out one constituent above the other. Therefore, it could be argued that the primary purpose of the firm should be the success of sustainability of the firm itself, and not the success of certain of the stakeholders (Raynor, 2009; Jensen, 2001).

6.2. Firm-value above shareholder-value

Firm managers often have to make difficult choices, such as allocating limited resources among competing objectives (Raynor, 2009). The choice between short-term profit targets or long-term sustainability is more prevalent in the current economic downturn. Many corporate investors view maximising shareholder-value as the primary firm objective, but, as seen in the current corporate failures, should the ultimate purpose of the firm not be the survival of the firm itself? A widely held belief is that the maximisation of shareholder-value is the best metric for corporate strategy. However, shareholders' risks are limited to their investment in the firm. They could therefore be considered only as suppliers of financial capital, just as the staff-complement is providers of intellectual capital. Without financial capital a firm cannot exist, but a firm also needs human capital, manufactured capital, environmental capital and social capital to exist (Raynor, 2009).

According to both Raynor (2009) and Jensen (2001) it could therefore be argued that the primary objective of a firm should be the firm itself and its own survival. To survive, a firm should compete to secure many different inputs, such as financial capital, human capital, revenues and permission from society in order to exist. Securing these inputs, the firm must pay fees as determined by the market (Raynor, 2009). Wise leaders attend to the legitimate needs of employees, investors, suppliers, customers and the community, but avoid trying to satisfy any of them to the maximum extent possible.

6.3. The triple bottom line: building firm-value

In recent years, a growing number of firms have come to recognise that sustainable corporate profits do not result from a single-minded pursuit of financial gain. Rather, sustainable growth and firm-value are best achieved by working through a broad framework of economic, social and environmental values, as well as shared objectives that involve constant interaction between the firm and its various stakeholders. This framework is better known as the triple bottom line (Roselle, 2005). Several scholars, such as Jennings (2004), Nelson and Wilson, (2003) and Doanne and MacGillivray (2001) describe economic sustainability as the interpretation of how firms could stay in business without damaging the social fabric of the community or harming the environment. Firms that can effectively manage their environmental and social issues may make themselves more economically sustainable (Buys, *et al.*, 2009). Firstly, the *environmental bottom line* focuses on the relationship between a firm and the natural environment and is all about the impact of a firm's operations on the environment (Buys, *et al.*, 2009; Jennings, 2004). Secondly, the *social bottom line* is linked to human capital, both within and outside a firm. A firm also does not operate in isolation, but forms part of the local community with many stakeholders (Buys, *et al.*, 2009; Jennings, 2004), while the *economic bottom line* reflects the investment in human and natural resources, which impacts society at large (Buys, *et al.*, 2009; Jennings, 2004) and is therefore integrally linked with decisions that go well beyond the traditional understanding of the financial bottom line (Buys, *et al.*, 2009). A focus on profits is often presented as a short-term perspective and one that is either necessary or immoral, depending upon the point of view. However, the concept of sustainable profitability rests on the twin ideas that:

- Profits can be maximised if the best possible social and environmental performances are produced; and
- Profit maximisation over the longer term does not necessarily require (and may even be undermined by) short-term profit maximisation.

Considering all the above, it may be argued that the environmental and social sustainability could be immensely strengthened if this longer-term approach is combined with an appreciation of the interaction of social and environmental with economic performances.

7. Measuring firm-value

7.1. Background

According to Andrews and Black (2002) it could be argued that value is derived fundamentally from the sustainable productivity of a firm's asset-base, and not the productivity of its people. This statement could be specifically true for firms operating in the resource sector, where the quality of their asset-base could determine the quality of their earnings. This is reflected in the value statements (as per their websites) of some of South Africa's most prominent resource firms, for example Anglo American, BHP Billiton, AngloGold Ashanti, Goldfields and Harmony Gold. However, these firms also acknowledge that other non-financial issues, such as safety, respect and integrity, stakeholder engagement and environmental management are crucial in their long-term strategies to achieve long-term sustainable earnings growth.

As discussed earlier, there is still some controversy regarding the measurement of value. Not only is it about how to measure value, but also about identifying and measuring the internal drivers of performance that have the greatest impact on value (De Wet & Du Toit, 2007:59). Over the years, a number of performance measures have been used on the assumption of having some correlation with value. Financial managers, analysts and researchers, most of the time, use traditional accounting performance measures like earnings per share, return on assets, dividends per share and net asset value per share to determine value (De Wet & Du Toit, 2007). The structured financial ratio analysis combines both the balance sheet and income statement in determining value.

7.2. Structured financial ratio analysis

Background

Return on equity (ROE) along with return on assets (ROA) could be considered as the most widely used measures of corporate financial performance (De Wet & du Toit, 2007). ROE can be broken down into other commonly-used financial accounting ratios that cover the categories of profitability, asset management and financial structure (De Wet & du Toit, 2007). Instead of regarding ROE as the point of departure, one could also view it as the final result of structured financial ratio analysis. This approach is also known as the Du Pont analysis model (Correia, Flynn, Uliana & Wormald, 2007; Milbourn & Haight, 2005). The Du Pont analysis provides information on a firm's liquidity, profitability, efficiency and leverage status, thus analysing how well a firm is operating as a result of changes in one or more of these factors. It is therefore a very powerful tool to trace the financial impact of decisions and to understand the

interrelationship between the income statement, balance sheet and firm profitability (Milbourn & Haight, 2005).

Elements of the Du Pont analysis

The calculation of ROE can be broken up in three separate ratios, as follows:

$$\begin{aligned}
 \text{ROE} &= \frac{\text{Earnings}}{\text{Total assets}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}} \quad (1) \\
 &= \underbrace{\underbrace{\text{Profit margin}}_{\text{NP\%}} \times \text{Asset turnover}}_{\text{ROA}} \times \text{Financial leverage} \\
 &\hspace{15em} \underbrace{\hspace{15em}}_{\text{ROE}}
 \end{aligned}$$

Source: Correia *et al* (2007)

Return on equity (ROE): ROE measures the rate of return on ordinary shareholders' equity and consists of return of assets and the financial leverage multiplier (Buys *et al.*, 2009; Correia *et al.*, 2007).

Return on assets (ROA): ROA indicates the firm's profitability in relation to the assets employed (Buys *et al.*, 2009). It consists of the profit margin and asset turnover.

Profit margin (PM): PM is often derived from pricing power, such as product innovation, product positioning, brand name recognition, first mover advantage and market riches (Soliman, 2008).

Asset turnover (ATO): ATO measures asset utilisation and efficiency, which generally comes from the efficient use of property, plant and equipment, efficient inventory processes and other forms of working capital management (Soliman, 2008).

Financial leverage (FL): FL measures a firm's choice of capital structure, yet changes in a firm's capital structure may not be value relevant (Soliman, 2008). Modigliani and Miller (1958) assert that it is the value of the operations that matters and not the financing of those assets. Penman (2004) shows that, despite the fact that ROE can be mechanically increased through leverage (assuming positive spread), the increase in the discount rate results in no change in equity value.

The three components can be described, in sequence, as profitability, asset turnover and financial leverage. ROE can therefore be improved by improving profitability, by using assets more efficiently and by increasing financial leverage (Correia, *et al.*, 2007:5-20). However, financial leverage may not be value relevant and will not be included in further discussions.

There are reasons to expect competitive forces to affect the two sources of profitability, namely PM and ATO, differently. Large profit margins often draw new entrants into the market place or quick imitation of new ideas from existing rivals. This could cause high profit margins to revert to normal levels, suggesting more transitory benefits (Soliman, 2008). However, unlike profit margins, it may be a bigger challenge for rivals to compete against an efficient deployment of assets. It is more difficult to imitate another firm's efficient production processes, because such imitation often involves large and costly overhauls of current factories and operations (Soliman, 2008). Work by Penman and Zhang (2002), Fairfield and Yohn (2001) and Nissim and Penman (2001) shows that ATO is more persistent than profit margin and that changes in ATO are predictive of future changes in ROA after controlling for ROA.

Additionally, there are simple accounting reasons to expect ATO to be different in nature than PM. ATO is calculated as sales (a flow variable) divided by assets (a stock variable); both of these line items have relatively low variance. However, PM is calculated dividing earnings by sales (two flow variables), and earnings simply have higher volatility than assets or sales. This could also lead to differing persistence (Soliman, 2008). Thus, the very construction of these ratios and the accounting behind them also leads to expecting different time-series properties, i.e. that PM will be less persistent and more volatile than ATO. Accordingly, any shift in ATO is more likely to be a result of an economic occurrence rather than changes due to simple variation in the accounting numbers.

Using the Du Pont analysis for analysing profitability of resource firms

It is common practice to compare a firm's financial ratios with those of an industry peer group. Although the use of industry benchmarks is widespread in practice, the majority of academic research on the mean revision of profitability measures implicitly assumes an economy-wide benchmark by pooling over the entire cross-sections of firms (Soliman, 2004).

Although total profitability measures such as ROA may revert to economy-wide benchmarks, there is good reason to believe that the various components of ROA will not revert to economy-wide levels. Industries have unique operating structures that cause ratios to cluster by industry membership. It would be futile to compare the sales/assets ratio of a retailer with a consulting firm because of the different ways these two industries generate sales. Nissim and Penman (2001), for example, show that industry medians of PM and ATO tend to have a strong negative correlation, implying that while most industries may achieve similar levels of ROA, they do so with different combinations of PM and ATO. Therefore, even though ROA may revert to economy-wide levels, PM and ATO are more likely to revert to industry levels (Soliman, 2004). Since external market forces primarily determine the commodities prices, resource firms are normally price takers and therefore the only real way to influence its PM is through proper cost management. Resource firms need to focus on the quality of its assets and the efficient management thereof (ATO) to create value.

8. Research method

The primary objective of this exploratory study is to determine whether there is a positive relationship between the asset-base of a firm and its earnings, which could contribute to the creation of sustainable firm-value. Before considering the empirical results, it is necessary to clarify the research field and techniques used in this article.

A good deal of the world's natural resources could be found in countries with medium or low human development indexes. According to Stern (1995) many developing countries with substantial mining sectors had some difficulty in converting *mineral wealth* into *economic development*, with the mining sector even being blamed for the underdevelopment or slow growth of the local economies. There could be two possible reasons why the presence of natural resources might exert negative effects on growth and development. Firstly, weak institutions could create circumstances through which interest groups attempt to capture the economic rents from natural resources. The allocation of talent in such an economy may be warped, resulting in the resources being diverted to fruitless activities (Bravo-Ortega & De Gregorio, 2005). Secondly, the allocation of resources among the various activities has different spill-over effects on cumulative growth for example when the presence of abundant natural resources cause capital to be diverted to its extraction, thereby diminishing the capital resources available for other growth-enhancing activities (Bravo-Ortega & De Gregorio, 2005). Since South Africa is considered a developing economy with abundant natural resources, it was decided to focus this exploratory study on those firms that are classified as resources companies.

The primary research objective is firstly addressed by means of a theoretical literature-based consideration of accounting value and the potential role thereof in firm value creation, and secondly by means of a statistical analysis of the potential relationship between organisational earnings and asset utilisation. This exploratory study's population field was limited to resources companies listed on the JSE Securities Exchange / JSE Ltd (JSE) companies. A sample of 15 companies has been selected from the publicly listed resources companies on the JSE. These firms under review are AngloGold Ashanti (ANG), Anglo American (AGL), Anglo Platinum (AMS), African Rainbow Minerals (ARI), BHP Billiton (BIL), DRD Gold (DRD), Exxaro (EXX), Goldfields (GFI), Harmony Gold (HAR), Impala Platinum (IMP), Lonmin (LON), Merafe (MRF), Metorex (MTX), Northam Platinum (NHM) and Sasol (SOL). The financial data, from 1998 to 2008, was obtained from the BFA McGregor database of the North-West University, Potchefstroom Campus. The empirical analysis of the paper is based on the Du Pont analysis as a structured financial ratio analysis technique, in determining possible correlations between earnings of firm and the quality and efficient management of its assets, as expressed as asset turnover for South African resource firms listed on the JSE.

9. Statistical analysis

In order to determine whether any significant long-term relationship exists between the two time-series of ATO and earnings, co-integration techniques are used. Based on the overall working hypothesis defined earlier, the empirical phase of the study investigates the following zero hypotheses:

$$H_0: \text{Earnings} = f(\text{ATO}) \quad (2)$$

against the alternative hypotheses

$$H_f: \text{Earnings} \neq f(\text{ATO}) \quad (3)$$

According to Agung (2009), these techniques can be used if the two time-series are either i) stationary or ii) non-stationary of the same order. Unit root tests are calculated for each set of the two series spanning the 15 firms for which there were more than six data points for each variable. The EViews 7 Unit Root Test summary (EViews, 2009) is used and includes values for the Augmented Dickey Fuller Test and Phillips Peron Test. The test is conducted at the one percent significance level and the results of the tests are included in Table 1. Once it is established that the two series are stationary of the same order they are regressed in a Vector Auto Regression (VAR) in order to test the residual for co-integration.

The VAR specification is as follows:

$$\text{Earnings}_t = a_{11}\text{Earnings}_{t-1} + a_{12}\text{ATO}_{t-1} + b_{11}\text{Earnings}_{t-2} + b_{12}\text{ATO}_{t-2} + c_1 + e_1 \quad (4)$$

$$\text{ATO}_t = a_{21}\text{Earnings}_{t-1} + a_{22}\text{ATO}_{t-1} + b_{21}\text{Earnings}_{t-2} + b_{22}\text{ATO}_{t-2} + c_2 + e_2 \quad (5)$$

If the residual of the estimation ($e_{(1/2)}$) shows co-integration then there is a long-term relationship between the two variables (Agung, 2009). A Johansen Co-integration test (EViews, 2009) is used at the one percent significance level. The Johansen test re-writes the VAR as follows:

$$\Delta \text{Earnings}_t = \Pi \text{Earnings}_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta \text{Earnings}_{t-i} + \beta \text{ATO}x_t + \varepsilon_t \quad (6)$$

Where:

$$\Pi = \sum_{i=1}^p A_i - I \quad \Gamma_i = - \sum_{j=i+1}^p A_j \quad (7)$$

and the assumptions of the rank in Π are tested to determine whether co-integration exists or not.

This indicates that for all firms, except for three, both series are non-stationary of the same order and therefore co-integration techniques can be used.

Table 1: Co-integration test results

Company	Unit root, same level	Co-integration	Reason	Result
ARI	Yes	No	Insignificant Result	No Relationship
AGL	Yes	No	Insignificant Result	No Relationship
AMS	No	Not Applicable	Not Applicable	No Relationship
ANG	Yes	No	Unstable VAR	No Relationship
BIL	Yes	Yes/No	Not enough data	Not enough data
DRD	Yes	No	Unstable VAR	No Relationship
EXX	Not enough data	Not enough data	Not enough data	Not enough data
GFI	Yes	Yes	Significant Result	Relationship*
HAR	Yes	No	Insignificant Result	No Relationship
IMP	Yes	No	Unstable VAR	No Relationship
LON	Yes	No	Insignificant Result	No Relationship
MRF	No	Not Applicable	Not Applicable	No Relationship
MTX	Yes	No	Unstable VAR	No Relationship
NHM	Yes	No	Insignificant Result	No Relationship
SOL	Yes	No	Unstable VAR	No Relationship
*GFI	specified as VEC indicates that causality flows from ATO to Earnings			

Source: Own calculations using Du Pont data

The results of the co-integration tests are included in Table 1. These results indicate that for all firms, except GFI, there is no co-integration in the residual and therefore no long-term relationship. Five of these firms resulted in an unstable VAR. This implies that it is impossible to test for co-integration in the respective cases and that no long-term relationship can be established. All other firms, with the exception of EXX, for which there was not enough data (less than six data points for each variable), have no co-integration.

In the case of GFI, where a long-term relationship exists, the causality runs from ATO to earnings. Such a relationship can be modelled with a Vector Error Correction Model (VEC) (Agung, 2009), but falls outside the scope of this study. Based on the results of the empirical study, as per Table 1, the statistical analysis' stated zero hypothesis is *rejected* and the alternative hypothesis is *accepted*. Therefore, it is concluded that a principal focus on the quality of a firm's tangible asset-base is not sufficient to create sustainable firm-value in the long run.

10. Concluding discussion and recommendations

In answering stated research question of whether a focus on a firm's tangible assets and the efficient utilisation thereof is sufficient to create long-term sustainable firm value, this exploratory study found that there was no real evidence of positive relationships between the utilisation of such assets (as determined by the Du Pont analysis) and the firms earnings.

A firm should be sustainable, not only to meet the expectations of its shareholders, but of all its stakeholders. Yet, the argument in support of shareholder-value creation is still the most dominant theory regarding the objective of the firm. The impact of short-term financial performance on the share price leads to a fixation on quarterly earnings and excessive risk taking. The corporate crisis and scandals of the last decade destroyed billions of US Dollars worth of shareholder-value. The focus on shareholder-value as primary objective therefore did not achieve its goal of creating and maximising sustainable *shareholder-value*. The primary objective should rather be to create and maximise sustainable *firm-value*, and firms should have a longer-term perspective in order to produce sustainable financial results. However, a singular focus on the sustainable productivity of a firm's asset-base could also not result in sustainable profits. Based on the empirical tests conducted above, no long-term relationship between ATO and earnings, as reported in the firms' annual financial statements for the periods under review, could be established. Furthermore, studies also estimated that the net asset value accounted for only 10 to 15 percent of firms' market values (Mouritsen, Larson & Bukh, 2005; Kaplan & Norton, 2001). This is confirmed by comparing the average net asset value per share with the average price per share of South African resource firms' from 1998 to 2009, as obtained from the BFA McGregor database of the North-West University, Potchefstroom Campus, as indicated in the graph below, which indicates no significant relationship between the firm's share price and the net asset value.

Clearly, opportunities for creating value must shift from only managing tangible assets to include managing knowledge-based strategies that deploy a firm's intangible assets. In order to be sustainable, firms should therefore focus on their economic, environmental and social bottom lines, and not only on their financial bottom line (Buys, *et al.*, 2009).

Limitations of the study

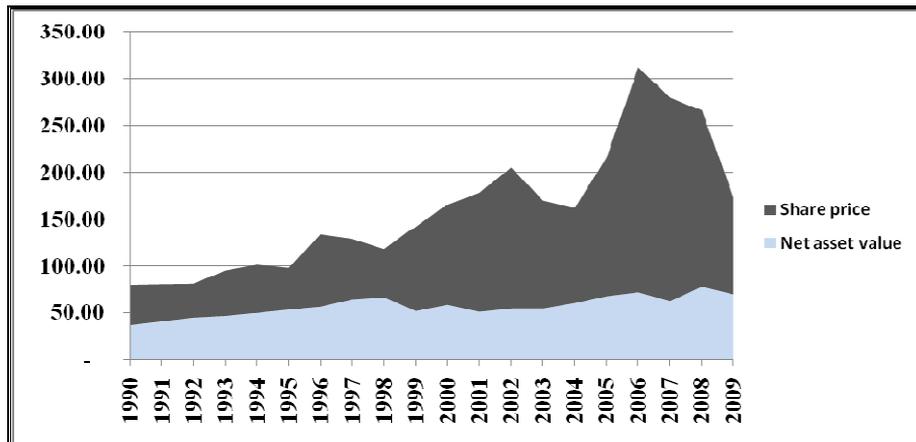
Due to some limitations inherent to the exploratory nature of this research project, the reader should take cognisance of the fact that the findings are subject to certain limitations, including the following:

- The inherent weaknesses of accounting-based performance measurement models includes i) uncertainties in the appropriateness of a accounting technique, ii) possible differences in accounting policies that impact on the

disclosed values, and iii) the effect of non-cash flow expenses and the write-off of expenses such as research and development costs;

- Each individual firm's unique environmental and social environments are constantly changing, which will make it difficult to measure and compare all the relevant variables that might influence the firm's performances;
- The evaluation was based purely on a comparison of the reported financial performance data without consideration of *softer* aspects around the company's social involvement and management experience; and
- The financial data was not adjusted in recognition of different accounting policies.

Figure 1: Comparison of net asset value per share with price per share



Source: Own calculations

Considerations for future research

As stated, this article aimed to explore potential links between earnings and the effective utilisation of tangible assets as a way to create sustainable firm value. However, the study did not find a positive correlation between a firm's earnings and the quality of its tangible asset-base and the efficient utilisation thereof, which could indicate that, in order for firms to create sustainable long-term value, they should also manage their intangible assets. These intangible assets would include the people in the employ of the firm. In line with these findings, further research into the following aspects of sustainability and social responsibility in a South African context, have been identified. Building on this research, future projects could develop a *sustainability framework*, which would take cognisance of intangible aspects such as the employees and in-house human capital development to assist firms in their quest for long-term sustainability. Such a framework might include the consideration of:

- Human capital development on the creation of a sustainable firm value;
- Human capital development on the firm's financial performance; and
- Different cultural backgrounds in behavioural accounting and corporate value creation.

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CHANGING SPATIAL ECONOMIC STRUCTURE IN EAST CENTRAL EUROPE

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Abstract. The economic development of East Central Europe within the last one and a half century can be simply divided into different sessions. Each session has had its own social, political system, which has essentially determined the spatial distribution of economy and the degree of regional disparities in terms of level of economic development. In this paper the five sessions of economic history of East Central Europe are analyzed and compared. The sessions are as follows: 1) Pre-industrial interval before the mid-nineteenth century; 2) The age of modernisation and industrialisation before the First World War; 3) The age of integration and disintegration during the inter-war period; 4) The age of emergence and decay of state socialism in the second half of twentieth century; 5) The age of transition with reorientation and reintegration after the early 1990es.

JEL Classification: N30

Keywords: economic history, East Central Europe, spatial structure of the economy

1. Introduction and theoretical background

The unequal distribution of economic resources and activities in geographical terms cannot be disputed. Territorial inequalities are inseparable from spatial changes. It is impossible to abolish them completely. Nevertheless, understanding the time and spatial changes in differences and disparities has inspired researchers in geography and economics for decades, and even centuries.

The examination of the spatial distribution of economic activities by means of the various location theories can look back on a long time. The first calculations

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of this type were done by Fermat in the early 17th century. He attempted to determine the optimum location of a site by the Euclidean method, taking into consideration the locations of obtaining the raw materials and selling the finished products (Ottaviano & Thisse, 2004).

Later, in the 19th century, J. H. von Thünen made a model highlighting the regularity of the spatial location of agricultural activities. In spite of the fact that J. H. von Thünen formulated his theory not long after the industrial revolution, he did so with surprising completeness and originality. It is remarkable how – as the last one among his theses – he formulated the phenomenon of technological spill-over in the modern sense and the importance of the relations between the industries (Edwards, 2007).

Further relations of locations were treated by A. Weber, who concentrated on finding the optimum location of industrial plants, considering the locations of the consumer market and the raw and basic materials. Later based on Weber's findings, E.M. Hoover made the standard classification of agglomeration advantages, which is in harmony with Marshall's externalia system. Later again A. Lösch improved the theories on locations by thinking not in terms of one entity, but in a complete spatial structure and by considering prices and market conditions not to be externally determined, but to be endogen factors (McCann & Oort, 2009).

Despite the fact that researchers of geography and economics have been analysing the income differences between countries and regions for a considerable time, there is no clear, coherent theoretical background or model at our disposal. There are a number of hypotheses, often contradictory, aimed at exploring the mechanisms of spatial development and inequalities. The grounds and justification of these hypotheses greatly depend on the population, period, amount and quality of data examined.

The neo-classical school is based on the heritage of the Ricardo-Mill-Smith classical economics, according to which a perfect mobility and flow of the production factors takes place based on economic reasonability and market mechanisms towards regions offering greater returns. Enterprises tend to move towards locations promising more profits, and labour moves towards locations with higher wages. At the same time there is an adjustment mechanism at work in the economy through the decreasing marginal profits of the factors, which results in the long-term levelling of territorial disparities in terms of per capita income. According to R. M. Solow, territorial differences will simply disappear parallel with growth due to the decreasing marginal profits of the capital and labour factors. The neo-classical theory has attracted several criticisms because of its fundamental assumptions. Nevertheless, the school has exerted a considerable influence on the investigations of regional development and regional policy (Pike et al., 2008).

Dissatisfaction with the use of production factors as exogenous capacities led to rethinking the neo-classical theories. The endogen growth theories aiming at incorporating the earlier exogenous, independent elements also have regional convergence and divergence in their focal points. The greatest attention is paid to integrating innovation and technology as production factors into the model. In connection with endogen growth models, Fenyővári-Lukovics (2008) remark that the territorial differences developing as a result of the different developments of the regions continue to exist steadily. According to the endogen model, the accumulation of knowledge results in increasing returns to scale, which do not carry any mechanisms to reduce territorial inequalities (Baro, 2005).

The theoretical school formulating contradictory notions about spatial inequalities is described by the name and work of J. M. Keynes. The Keynesian school concentrates on the under-utilisation of the factors, the dissatisfaction of the demand side, and on determining the economic role of the state. Despite J. M. Keynes's work being primarily concerned with countries, a great number of his thoughts were transplanted into regional economics. Building on the criticism of the neo-classical theory, the Keynesian approach endeavours to understand regional divergence and to offer its explanation. According to G. K. Myrdal and other post-Keynesian thinkers, regional development increases territorial differences (Kocziszky, 2006).

Newer and newer models have been developed with time. The new growth theory did not apply the supposition of decreasing/disappearing marginal profits, particularly concerning human, knowledge and public resources. The new geographical theory not only omitted the condition of decreasing marginal profits, but introduced the factor of transportation costs into the system. Geographical economics deals with the prosperity of the national economy, trade, and the effects and relations of these two factors on unequal local and regional development. Building on the imperfect competition of Keynes and Káldor, the increasing returns and external savings, and combining them with the idea of trade within the industries and enterprises, fundamentally questions the neo-classical theory (Meyer & Dietmar-Lackenbauer, 2006).

P. Krugman's works were published in the early 1990s under the name New Economic Geography (NEG); he was practically the first to put spatial determination in the focus for economic processes, and thus encouraged not only a renewal of regional science, but opening economics towards territorial relations as well (Varga, 2009). Next to P. Krugman, M. Fujita and A. Venables (2001) played decisive roles in elaborating the conception. The new economic geography, or agglomeration economics, took the observation as its starting point that economic activities are spatially concentrated.

The explanation of the actual regional differences of East Central Europe in terms of economic development cannot be entire without the knowledge of the historical preliminaries. The aim of this paper is to provide a comparative historical investigation of East Central Europe and an overview and models of the changing spatial inequalities. I wish to identify and present those factors which influenced the spatial distribution of economy from period to period.

The examination of the periodic nature of economic development inspired several researchers in the previous decades. W. W. Rostow identified and described a 5-stage growth theory in his book published in 1960. Later in the 1970s J. R. Friedmann (1973) and H. Richardson (1973) developed further the Rostow-theory. The former assigned a major role to industry in the process of resource arrangements and in the formation of sites, while the latter author adapted the identified mechanisms to developing countries (Lengyel & Rechnitzer, 2004).

It was J. G. Williamson (1965) who -following the footsteps of S. Kuznets- started to study the relationship between economic development and spatial development inequalities. According to his view, the degree of disparity varies in the various stages of economic development. The change of disparities over time can be displayed by a reversed U-shaped function. Even today, this Williamsonian view can be considered to be the theoretical basis, despite the fact that the

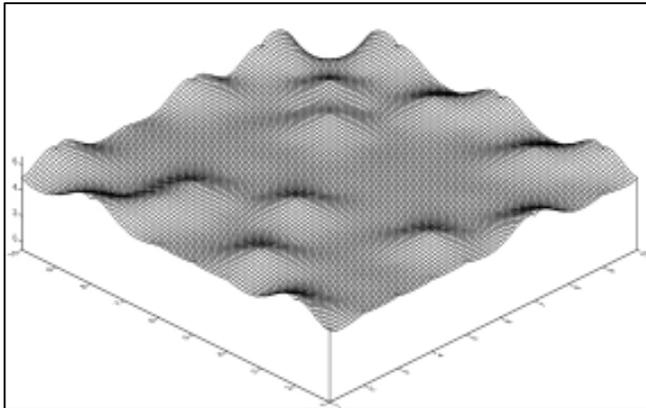
adaptation of the model to emerging and transitional economies remains somewhat contentious (Nemes, 1987).

In the economic development of East Central Europe from the mid 19th century until today, the Friedmannian and Williamsonian periods can be clearly identified. The only discrepancy is the appearance of the Soviet socialist power and ideology after the Second World War. In compliance with this, the three main milestones which separate the various periods in my study are the following: the first, the Second World War and the economic and political changes at the turn of the 1980s and 1990s. The article is divided accordingly.

2. The age of modernisation

The middle of the 19th century, as the starting point of the study is justified by the fact that the industrial revolution started at this time in East Central Europe. Prior to this date in the pre-industrial age, rural societies and predominantly agrarian economies existed in this area. When describing the era before the industrialisation, it is important to point out that the spatial appearance of the population and that of the economic activities showed only limited differences, i.e.: it was balanced and unconcentrated. The disparities were mostly caused by the differences in the natural environment such as the climate, the weather, the soil conditions, the features of the terrain, water courses and vegetation.

Graph 1 : The model of spatial structure in the pre-industrial age



Source: Author's compilation.

Yet, over time, starting from the 1870s-1880s until the First World War, the industrialisation progressed at an ever-increasing pace, which -from the point of view of the spatial structure- was accompanied by two important phenomena namely urbanisation and the development of traffic infrastructure especially that of the railway network. It is important to note from a political and economic point of view that the central part of Europe was divided among the three powers of the Holy Alliance, namely the Habsburg Empire (later to be called as the Austro-Hungarian Monarchy), the Kingdom of Prussia (later referred to as the German Empire) and the Russian Empire. Its importance was that -apart from the difficulties arising from the political and cultural oppression- East Central Europe gained

access to large and populous markets where it could sell its agricultural produce and industrial products.

In the age of modernisation, the geographical situation and concentration of the societies and as a corollary the economies of East Central Europe changed. Three factors influenced the localisation of the population, the work-force and the economic activities. The first and most important one is the natural increase of the birth-rate, which was the highest in the Polish-Russian territories (76% increase between 1887 and 1910), lower in the Prussian-Polish parts (46%) and the lowest in the Austro-Hungarian Monarchy (35%) (Magocsi, 2002). The second one is the phenomenon of urbanisation which -thanks to the increased number of jobs and the ability to cater for the needs of an increased number of people- gave a boost to the number of urban population. First and foremost Budapest, Warsaw and Prague became a metropolis on a European scale, but Łódź, Krakow and Szczecin also exhibited rapid growth rates.

Table 1 : The most populous cities in East Central Europe (thousand inhabitants)

<i>Name of the city</i>	<i>1870</i>	<i>1910</i>
Budapest	320	880
Warsaw	308	771
Prague	252	640
Wroclaw	239	512
Łódź	39	352
Szczecin	81	236
Gdansk	98	170
Poznań	66	157
Krakow	50	150
Brno	73	126
Szeged	70	103

Source: Author's compilation by Magocsi (2002).

The third factor was the mass emigration to the New World which predominantly reduced the population of rural areas. As a result of the economic development more and more people had achieved a middle-class status, nevertheless besides the process of gentrification until the First World War approximately 3.5 million people had emigrated from the Monarchy, most of them to the United States of America. During the same period, from the Polish territories about 4 million people emigrated to the USA, France or other parts of Western Europe.

Parallel to the disparities in population, significant income inequalities emerged. The Austrian Hereditary Lands and Bohemia-Moravia had income levels well above the national average, while other parts of the state lagged behind substantially (Illes, 2007). Hence, this medium-level development concealed substantial territorial inequalities.

Table 2 : Regional differences in the Austro-Hungarian Monarchy (GNP per capita)

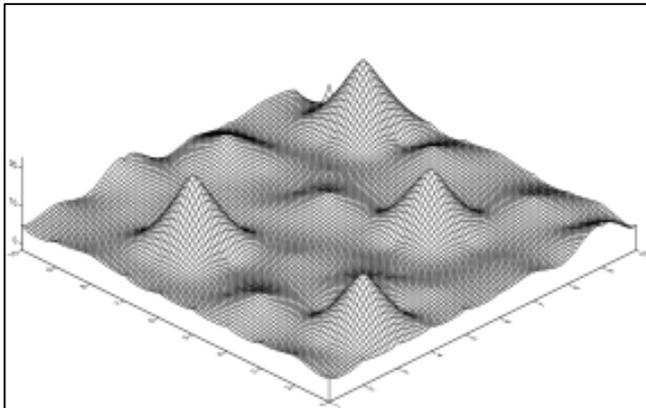
<i>Name</i>	<i>Crown (1913)</i>
Austrian lands	790
Bohemia and Moravia	630
Hungary	327
Dalmatic and Slovenia	300
Bukovina	300
Galicia	250
TOTAL	438

Source: Author's compilation by Horváth (1999).

Poland showed similar disparities as the Monarchy. The industry was far developed in the Russian parts, while the German parts were dominated by agriculture.

During the period of modernisation East Central Europe was characterised by the first wave of urbanisation and industrialisation, by the migration and growth of population and -as a result of the development in infrastructure- by an unbalanced territorial structure. During this period the spatial socio-economic inequalities increased a great deal which was accompanied by the increasing concentration of economic activities. The largest agglomerations in East Central Europe by the end of this period were Budapest, Warsaw and Prague, while Łódź Krakow and Szczecin exhibited the fastest growth rates.

Graph 2 : The model of spatial structure in the age of modernisation



Source: Author's compilation.

3. The age of integration, disintegration and isolation

By the early 1920s the map of East Central Europe had been transformed a great deal. The new borders drawn up by the peace treaties concluding the First World War initiated the process of integration in the north and disintegration in the south. After more than one century an independent Poland reappeared again on the northern part of East Central Europe; moreover as one of the largest states of Europe. In the south, new states emerged following the disintegration of the Monarchy. The borders which had been altered and multiplied, now offered new political-administrative circumstances. This statement was especially valid for the territories of the former Austro-Hungarian Empire and the newly-born Poland (Berend & Ranki, 1978).

The total new political map of East Central Europe drawn by the peace treaties did not create a stabile status, which can be traced back to many reasons. Rothschild (1977) named ten among the most important features:

- economic underdevelopment;
- weakly mechanized agro sector;
- overpopulated rural areas;
- significant, poor peasantry;
- insufficient infrastructure;
- weak or missing social middle classes;
- insufficient educated bureaucrats;
- lack of comprehensive literacy;
- limited experience in the field of parliamentary democracy;
- lack of capital investment.

To the above mentioned Rothschildian list at least one point can be added. The borders -especially in the case of the territory of the former Monarchy-separated the resources and the capacities of the processing industry. That is the reason why the successor states should have realised substantial trade in order to maintain or to increase efficiency. Instead, isolation, mutual mistrust dominated the international relations. The reason: the new states were only a little less ethnically heterogeneous than the former ones. The winner states integrated a substantial amount of minorities into their respective countries which implicitly implied a demand for revenge and revision from their part. Unfortunately this led to isolation and competition among the countries of the region which is underpinned by the increasing customs duties presented in the following table.

Table 3 : Average extent of custom on manufactured goods by countries

<i>Country</i>	<i>Manufactured goods (%)</i>	
	<i>1913</i>	<i>1925</i>
Austria	18	16
Czechoslovakia	18	27
Poland	13-18	27
Hungary	18	32

Source: Author's compilation by WTO (2007).

The Great Depression in 1929 had an extremely negative impact on the region of East Central Europe, since it reduced dramatically the already rather meagre amount of capital investment flowing into the region. It is important to note

that up to the Great Depression in 1929, the regional disparities in development had not changed fundamentally. Only the economy of Hungary started to decline as a direct result of the substantial loss in the territory of the country and the policy led by the Little Entente aiming to isolate Hungary.

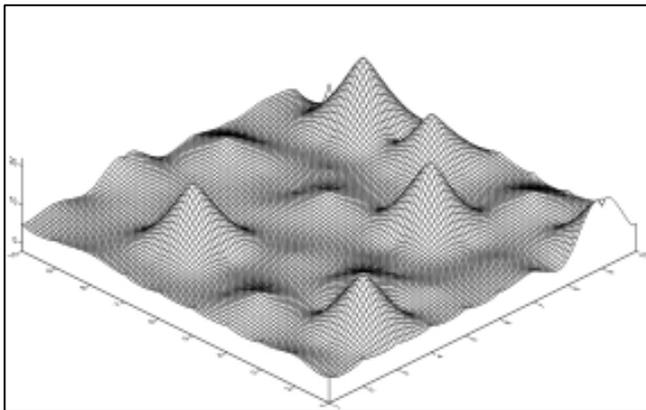
Table 4 : Absolute and relative position of East Central European countries by level of development

Country	GDPpc (int. \$ on 1990 prices)				GDPPC (Austria=100%)			
	1870	1890	1910	1929	1870	1890	1910	1929
Czechoslovakia	1 509	1 912	2 495	3 046	79.8	83.5	82.7	81.8
Poland	946	1 284	1 690	2 120	50.0	56.1	56.0	57.0
Hungary	1 179	1 572	2 192	2 473	62.3	68.7	72.7	66.4
Austria	1 892	2289	3 017	3 722	100.0	100.0	100.0	100.0

Source: Author's compilation by Maddison (2001).

Prior to the Second World War, East Central Europe had increasingly got into the sphere of interest of the Nazi Germany both from a political and economic point of view. The Western powers did not and could not prevent this increase in influence. Hence the several decade-long peaceful development of East Central Europe came to a halt again. These countries drifted again into a new global war, which brought them the squandering of war economies and their subsequent collapse.

Graph 3 : The model of spatial structure in interwar period



Source: Author's compilation.

Only minor territorial changes took place during the period between the two World Wars due to the limited time-span. Predominantly the modified borders and the protectionist economic policy influenced the changes in the territorial structure. In the case of Poland the integration of the previously unevenly developed regions took place, while in the territory of the erstwhile Monarchy the process of disintegration started to emerge. In all the states the economic importance of the new capitals and regional seats increased, while the role of peripheric and

borderline settlements seemed to diminish. The main reasons for the change in territorial disparities are the substantially modified dimension of the countries, the Great Depression and the preparation for the war. The most important economic centre which emerged during this period was Gdynia in Poland and the central industrial region.

4. The age of the emergence and decay of state socialism

The peace treaties concluding the Second World War more or less restored the „status quo ante bellum” in the western and central parts of Europe. Nonetheless, it was a fundamental change compared to the previous situation that the Soviet Union acquired the possibility of organising the economy and politics of the eastern countries. The Russians dominated the region for nearly half a century until the end of the 1980s. By this time the economic reserves of the „Eastern bloc” had been completely depleted which was accompanied by the collapse of the Soviet Union.

Following the often violent and illegal acquisition of the control over the political systems of East Central Europe, the Communist economic system was established in these countries. In compliance with the political-economic ideology, the transformation of the state into an industrial-agricultural economy was encouraged with a special focus on heavy-industry. Industrial development and military economy was enforced in the 1950s. As a result of this, in every country the share of the industry increased in the national income and in the workforce. Regions already having industrial capacity, industrial traditions and the necessary resources (coal, ores etc.) were at an advantage.

Enyedi Gy. (1978) focuses on the characteristics and inequalities of the East Central European socialist economy in the 1970s in a detailed study. According to his work the disparities within the countries and among the countries were substantial. The eight East Central European states fell into three categories as far as the levels of development and inequality were concerned. The first category included the German Democratic Republic and Czechoslovakia with the highest level of development and the most equal territorial structure. The second, intermediary category included Poland and Hungary, while the Balkan countries were the least developed countries with the least equal territorial structure. Enyedi Gy. (1978) pointed out that there was a strong relationship between economic development and spatial-economic levelling, moreover the economic structure was strongly linked to the level of the economy and the structure of the sector. The lack of microeconomic balance was also expressed in the lack of spatial balance. He pointed out that the rapid and intensive industrialisation characteristic of the era could cause imbalances, since industrial activities were forced to be located in several traditionally agricultural areas, which upset the structure of the settlement and the work-force. Nevertheless spatial imbalances will be mitigated over time, due to the fact that the created production unit will be more and more imbedded in the local economy, will use its resources and will foster the settlement of the service sector in parallel. Yet -according to the author- one should not overestimate these mechanisms. Enyedi Gy. reiterated that in the socialist countries -compared to the capitalist countries- greater efforts were made towards the achievement of a balanced territorial structure, despite the fact that the developed countries also contributed substantial financial resources for this objective. In the case of Czechoslovakia the most important regional disparity

existed between the two allied states (i.e.: Slovakia and the Czech Republic) which, unfortunately overshadowed other existing disparities and their solutions (e.g.: disparities between Czechoslovakia and Moravia or within Slovakia). It is true that by the development of the Slovakian parts, predominantly by the settlement of industries, substantial efforts were made towards the mitigation of differences on a national level, which in turn alleviated the inequalities within Slovakia. In an international comparison Czechoslovakia (besides the GDR) had the most balanced economic spatial structure in the region. In contrast, Poland was characterised by a strongly polarised economic structure, despite the fact that the achievement of a balanced spatial structure was a clear priority of the Polish territorial policy. The reason for this: after the Second World War, the newly attached parts of the country had to be integrated. In the 1960s Poland managed to achieve that the six most developed voivodships' (Katowice, Krakow, Łódź, Poznań, Warsaw, Wrocław) share in the GNP decreased.

In the case of Hungary the issue of regional imbalances can be narrowed down to the relationship between Budapest and the country (Enyedi, 1978). Efforts after the Second World War managed to reduce the disparity between these two spatial units, but could not eliminate it completely. Budapest's share in the industrial production dwindled, since many production sites were transferred to other parts of the country. The countryside also benefited from the rapid agricultural development which increased the average income. At this time inequalities were not reflected by the different income levels but rather by the different life conditions.

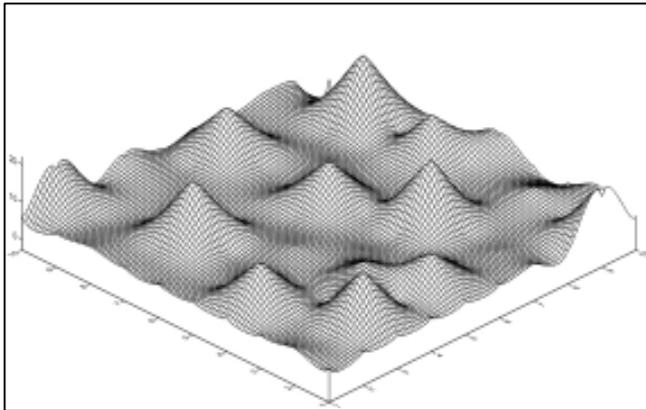
Dusek's (2004) statement is closely related to this issue. According to him during the 1960s and 1970s, the degree of spatial inequality was less in the states of East Central Europe than in the similarly developed market economies, i.e.: the socialist countries seemingly had a more balanced regional spatial structure. Therefore it is not surprising that after the change of the political system a large-scale differentiation took place, these countries adapted to the international trend of the previously described Williamson curve. The diminishing income levels arising from the crisis were coupled with significantly higher disparities.

The Soviet-type location of industry which emerged together with the political and economic influence of the Soviet Union brought about significant changes in the social and economic spatial structure. The most important characteristics of the Soviet-type location of industry were: the state regulated production and economic relations, the strengthening urbanisation, the decreasing role of the western areas coupled with the increasing role of the eastern areas, raw materials as the most important location factor of the industry as opposed to the market. Therefore the main reason for the changing disparities was the change of the traditional geographic orientation of the economy and the Soviet-type location factors. New industrial centres appeared such as Leninváros and Sztálinváros in Hungary; Litvinov and Krompachy in Czechoslovakia and Nowa Huta in Poland (Rado, 1967).

The socialist economic structure described above was characteristic of East Central Europe at the turn of the 1960s-1970s. Two important factors modified this structure in the coming years and decades: the spill over effect of the 1973 and 1979 oil crises and an intensifying political resistance in the socialist bloc (especially in Poland in 1968, in 1970, in 1976 and in 1981).

The large-scale, multi-step hike in the price of oil had several negative effects for the East Central European countries poorly endowed with hydrocarbons. First and foremost it increased the import price of energy resources, hence disturbing the relative balance of foreign trade and the state budget. In most cases the socialist countries financed these imbalances by external credits (main lenders: IMF, West-Germany). Especially the indebtedness of Hungary and Poland increased a great deal. At the same time the crises contributed to the contraction of external markets. As a result of the diminishing revenues due to recession, the Western European countries reduced their import from the countries of the Eastern bloc, which in turn meant a further drop in their revenues. It is important to note that while in the Western countries the significant increase in the price of oil in the medium and long term led to savings, the formation of reserves and a more efficient use of resources, in the COMECON countries this increase in intensity did not take place. (due to the slower, more gradual increase of the Soviet oil prices). The socialist industry's hunger for energy and raw materials and its inefficiency remained, yet the financial and market pressure brought about by the crises strengthened a demand for the reforms.

Graph 4 : The model of spatial structure in the age of emergence of state socialism



Source: Author's compilation.

Table 5 : The annual average GDP growth by countries before and after of the Oil Crisis

Country	1950-1973	1974-1990
Czechoslovakia	3.08%	1.12%
Poland	3.60%	0.85%
Hungary	3.45%	-0.35%
East Central European average	3.79%	0.51%

Source: Author's compilation by Maddison (2001).

Yet the lack of reforms and their inefficiency led to the ageing of production technologies and infrastructure, to the lack and inefficiency of the service sector,

thus to a diminishing competitiveness and indebtedness (except for Czechoslovakia as far as indebtedness is concerned). As a consequence, between the Eastern and Western parts of Europe disparities in economic performance and the standard of living further widened.

Table 6 : Absolute and relative position of East Central European countries by development

Country	GDPpc (int. \$ on 1990 prices)			GDPpc (West Europe=100%)		
	1950	1973	1990	1950	1973	1990
Czechoslovakia	3 501	7 041	8 517	69.84	57.91	50.48
Poland	2 447	5 340	5 115	48.81	43.92	30.32
Hungary	2 480	5 596	6 471	49.47	46.02	38.35
East European average	2 120	4 985	5 437	42.29	41.00	32.22
West European average	5 013	12 159	16 872	100.00	100.00	100.00

Source: Author's compilation by Maddison (2001).

Illés I. (2007) based on the dynamics of the national and regional economy divided the "short" twentieth century into two completely different parts. The first part lasts for 40 years from the early 1920s until the early 1960s, in which period one can observe the closing-up of Central and South-Eastern European states, which was in many cases accompanied by an increase in regional differences. From the second half of the 1960s, the economy of these countries starts to fall behind accompanied by the mitigation of regional differences. Nemes (1987) - following the footsteps of Enyedi Gy.- used data from a later period; he examined figures from Central Europe (East Central Europe) from the late 1970s and early 1980s. His work focused on the following group of socialist countries: Albania, Bulgaria, Czechoslovakia, Yugoslavia, Poland, Hungary, the GDR and Romania.

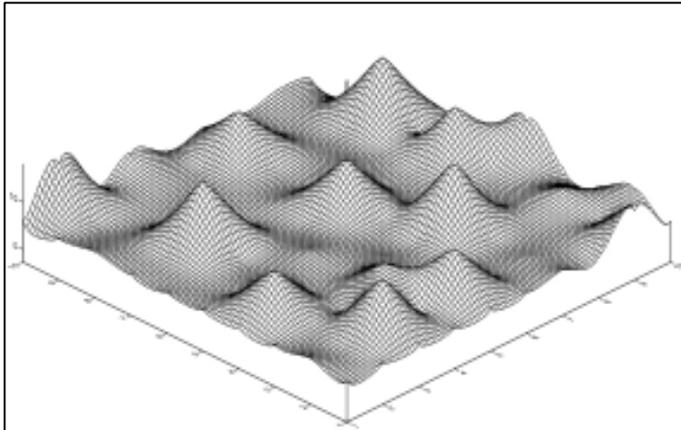
After calculating an average for these countries, he divided the countries into ten categories. Based on the development level of the 236 "counties", the distribution of the region's population of 130 million showed an asymmetric, lognormal shape. Two-fifths of the population lived in a highly developed area (25% above the average), one-third of the population lived in an area with average development, while the rest, approx. one quarter of the population lived in backward areas (25% lower than the average).

By examining the territorial structure of the region the author explored some fundamental relationships. The economic development decreased on a Northwest-Southeast axis. The author concluded that national borders did not alter fundamentally the above described logic in territorial structure. Based on their level of development, he identified some groups of counties. E.g.: a North-eastern Polish "cluster" with low development figures and the geographically dispersed yet clearly identifiable group of highly-developed big cities. These zones existed like islands in an underdeveloped environment.

Nemes Nagy J. also focused on the changes of the 1980s and he concluded that the regional rankings did not change except for some Polish regions which fell back as a result of the social and economic crisis in Poland.

The decline of state socialism was brought about by the depleting resources of the political and economic order, which was partly the result of an unfavourable international and national political climate. This period's impact on spatial structure was the alleviation of development inequalities. The reasons behind this levelling were the following: attenuation in the impact of state mechanisms, stagnating urbanisation, reforms with low intensity. As a consequence new centres and concentrations did not emerge.

Graph 5 : The model of spatial structure in the age of the decay of state socialism



Source: Author's compilation.

5. The age of transition and reorientation

The collapse of the political and economic system of the “Eastern bloc” was unexpected both in its speed and in its scale. By the mid 1990s the slow economic decline of the East Central European countries had accelerated to a dramatic level. These economic depressions can be compared to the biggest ones of the 20th century. Despite the large-scale economic downturn -thanks to the collapse of the political systems in parallel- the reorientation of the East Central European region to the west began.

The changes started in 1989, the modification of the geopolitical situation, the process of democratisation, the change in the property system and the structural change in the economy did not leave the spatial structure of these countries unchanged. The earlier neglected Western regions which had been labelled previously as “uncertain” were rehabilitated by virtue of the proximity of German and Austrian markets. As a result, the significant westward shift of economic centres could be observed. At the same time the eastern parts favoured during socialism seemed to be losing their role. In the following period the prospects of capital regions were the brightest in the entire zone thanks to their favourable geographic situation, economic potential, ability to attract capital and their cultural heritage. The diminishing role of agriculture in the labour market and in the national economy is a threat to the inner peripheric and eastern (southern) regions (Illner et al., 2005).

Thus, the more industrialised, more urbanised regions endowed with better infrastructure could put up with the challenges caused by the new circumstances

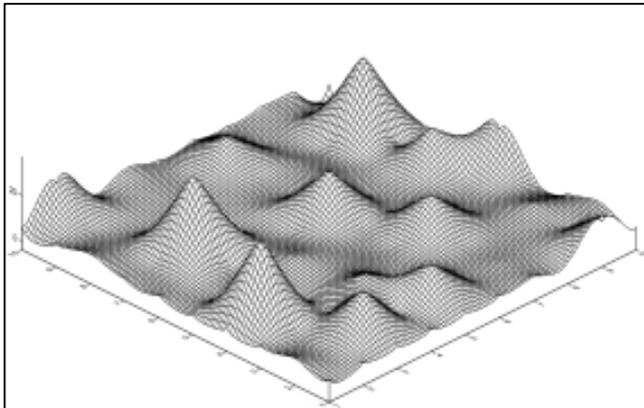
more easily. The adaptability of the regions was fundamentally determined by the diversity of the economy, the degree of socioeconomic development and capital and innovation endowment (Gorzalak & Jalowiecki, 2005).

The central regions, the Western regions and some Polish industrial centres and ports were able to react more rapidly to the changes in circumstances thanks to their more diversified workforce and industry. Regions with a more concentrated, monostructural manufacturing and employment structure suffered the greatest shock at the beginning of transition. In the Czech Republic and in Slovakia the decline of the highly specialised industry was the most severe problem. According to the above-mentioned phenomena the following regional classification can be drawn up:

- the leaders of transition (capital regions and other centres);
- newly arrived (returning) regions (western regions);
- losers (old industrial regions);
- undeveloped peripheries (Eastern agricultural regions).

The period of transition was accompanied by substantially increasing spatial imbalances which can be explained by the withdrawal of the state from the economy, the strong appearance of market regulators, the strengthening of disurbanisation processes and political-economic reorientation. These processes reinforced the role of Western and central regions, while resulted in a declining geopolitical situation for the Eastern ones. The main reason for the intensification of disparities is the rapidly and dramatically altered political-economic situation.

Graph 6 : The model of spatial structure in the age of transition and reorientation



Source: Author's compilation.

6. Conclusions

The Friedmannian and Williamsonian periods have been clearly identifiable during the last one and a half century of the East Central European economic development. A number of internal and external incidents however significantly have influenced or rather deformed the lengths and effects of the intervals.

The capitalist development and the industrialisation, which began in the second half of the 19th century, lasted fundamentally till the end of the Second World War. Although the peace treaties concluding the First World War modified

the economic, politic conditions to the greatest extent in the centre of Europe. The multiplication of borders, the increase of their dividing function, as well as the nationalism and protectionism pursued by the governments during the interwar period disrupted the former, traditional economic relations and spatial structure.

The Soviet expansion after Second World War made an even larger impression on the spatial distribution of economic activities. The Soviet economic policy, which deviates from the capitalist in many respects, brought new characteristics and east orientation to the East Central European states. Since the 1960s the effects of this policy continuously weakened till the 1980s, when it ended.

Thereafter the reintegration and globalisation of East Central Europe began under the conditions of capitalism, market and competition. The transition has had twofold effect and resulted rising extent of inequalities. Some regions have performed well, i.e. showed rapid economic growth and convergence; others have stagnated or lagged behind.

With the comparison I intended to set the effects of transition of the last two decades into historical perspective. Accordingly I consider the transition period unique due to its rapidity and dimension. Just the ages of modernisation and the emergence of state socialism have resulted such significant changes in spatial structure of economy of East Central Europe as the transition in the last decades.

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GDP PER CAPITA GROWTH PERFORMANCE AND ITS SOURCES. POLISH REGIONAL-MACROECONOMIC DIMENSIONS 2000-2006

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Abstract. Poland's voivodships can be divided into three separate income groups when measured in terms of GDP capita. These divisions, which, to a large extent, were reinforced during economic reform, can be traced back to the years of the partitions and the subsequent period under communist rule. Output per head across these three income group divisions is a direct result of the varying economic structures that have evolved over time and the resulting concentration of industry, whose location in the central, northern, southern and western parts of the country supply abundant labour and sizeable sales markets. As a result, these more industrialised regions (referred to as income groups one and two) are better endowed than their more rural, eastern wall counterparts (income group three) to attract higher levels of foreign investment and thereby stimulate foreign trade and expand output. This paper questions whether a process of catchup can be observed between the eastern voivodships and the remainder of the country.

JEL Classification: E01, F43, J21, N90

Keywords: GDP, labour productivity, employment rate, hours worked per job, demography

Introduction

GDP capita measures both the output and income generated from the goods and services produced per person in a given year. It is used by international institutions to measure and compare output across countries (Cotis, 2004) and continues to be regarded as the best proxy of a country's level of welfare

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(Chamberlin & Yeuh, 2006). GDP capita, however, does not include the value of home production; the quality of the environment and it also does not take into account the state of public health (NEA, 2009). GDP capita at a national level has also been long criticized for its usefulness as an indicator in revealing sufficient information concerning the distribution effects within a country's national boundaries and among its citizens (Cameron & Neal, 2003). Usually, countries with higher levels of GDP capita are considered by international organisations to be more advanced, comparatively better developed and, as a result, should also enjoy higher levels of welfare, income and better standards of living. This is an argument supported by trickle-down theorists. The downside to this approach is that poverty, poor economic conditions and low standards of living also plague regions of countries with high levels of GDP capita. Poland in this regard represents an interesting workshop owing to its ongoing process of convergence in areas of growth and development towards EU levels, but also because of its internal regional economic disparities.

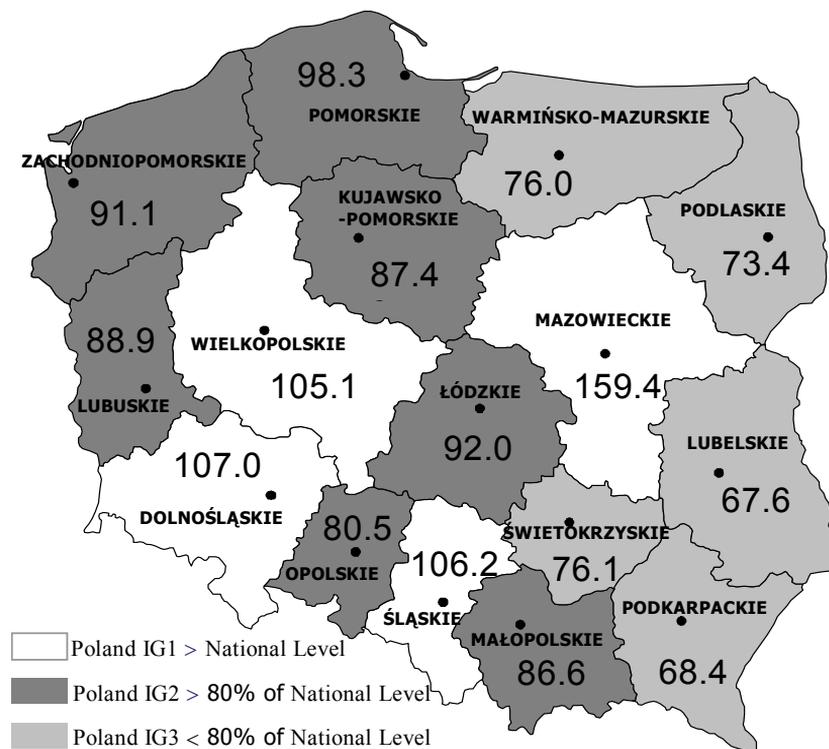
The paper has been structured into two parts. Part one first examines the distribution of income/output (GDP capita) in current zloty terms across Poland's sixteen voivodships/regions with a view to first providing a geographical perspective (Map 1) on the country's economic capacity and to distinguish the relative position of voivodships in terms of the national level (subsection 1.1). This work then examines the nominal and real effects of growth in order to determine what proportion of overall output is due to growth of real GDP capita and what is due to growth in prices. In part two we break down real GDP per capita into its constituent components (labour productivity, work effort, employment rate & demography) in order to reveal the dominant sources of growth across regions as well as their change over the period 2000-2006. This will first involve introduction of the decomposition technique as well as the overall results derived from the model (subsection 2.1) The concluding subsection to this work (2.2) questions the conditions for catchup and whether Eastern wall voivodships are observed to be closing the gap with the remainder of the country. Some of the findings reveal that voivodships belonging to income group one, for example, achieve above national average levels of GDP capita, labour productivity and tend to work fewer hours. These results are accompanied by relatively stable average rates of employment. Group three voivodships, in contrast, whose output structure has focused more traditionally on agriculture, forestry and fishing achieve lower levels of output and tend to work longer hours. Eastern wall voivodships also observe sharper declines in average rates of employment, though this pattern does not hold through out all of them.

1. Nominal GDP/capita performance and its components

Polish regional economic disparities have been the subject of debate in the government and European Union since the early 1990's. These differences can be attributed to the location of input factors, whose origins can be traced back to the divergent development paths pursued by partitioning powers and also to the later management of the country's economic resources up until the beginning of the 1990's under communism. The Socialist system of economic planning, given its reliance on heavy industry, largely reinforced economic structures across regions, resulting in the central, southern and western areas of the country becoming more industrially concentrated, while regions further east remained largely agricultural

and less developed in terms of infrastructure. This two-tier pattern of development originally resulted in east-west regional inequalities, giving rise to the division of the Polish map in socio-economic terms into “Poland A” and “Poland B” (Szot, 1999).

Map 1. Nominal GDP/Capita in Poland’s sixteen voivodships as % of the national level in 2006



The given map shows each voivodships relative level of welfare, measured by GDP capita, as a percentage of the national level. Regions falling into the latter “B” category (income group three) are regarded as the comparatively less developed areas of the country and are shaded in light grey. The results provided are based on sixteen voivodships whose number was reduced in 1999 from forty-nine and which became self-administrative (Hagbart, 2000).

1.1. Regional GDP Capita Distribution

Measured purely in terms of GDP capita, the Polish map can be divided up into three separate income groups. In 2006 nominal GDP capita in Poland was 27,803 Polish Zlotys. Setting this value equal to one hundred percent one can observe the relative position of each voivodship as a percentage of the national level. Voivodships formerly regarded as Poland ‘A’ are shaded in white and dark-grey and are labeled on Map.1 as income groups one and two (IG1 and IG2), respectively. These voivodships achieve levels of GDP capita that are at least

either a minimum 80% of the national level or are above it. Only four out of Poland's sixteen voivodships, however, achieve a level of GDP capita above the national level: Dolnośląskie, Wielkopolskie, Śląskie and Mazowieckie (IG1). These are among the most densely populated regions in the country and contribute higher shares of industry and services in GDP output. The effect of this more developed economic structure is reflected in their combined contribution to total nominal GDP output, which at the end of 2006 stood at 52.0%. Mazowieckie, whose regional boundaries include the capital city of Warsaw, accounted for 21.6% of Poland's total GDP alone (Gus, 2007). Location effects play an important role in the economic performance of these four voivodships. For example, Mazowieckie and Wielkopolskie are linked to the west via the A1 motorway, while Śląskie and Dolnośląskie are connected via the A4. These two motorways link the four voivodships with Germany, the most important trade partner and one of the chief suppliers of foreign direct investment. IG1 voivodships together with the seven voivodships from income group two, which contributed 32.6% of total nominal GDP output in 2006 are the more industrialized regions of the country with relatively well-developed service sectors. Voivodships from Income group one and two, which are geographically located in the central, southern and western parts of the country, have benefited the most from foreign direct investment inflows. This is due to a number of factors, which include their geographical proximity to the west, the new EU states of the south, but is also due to the scale of their sizeable labour and potential sales markets (Clowes & Hallam, 2002). These factors are a result of the existing concentration of industry and associated scale of enterprise numbers, which were offered during the country's mass privatization programme in the mid 1990's (Handelsblatt, 1995). Voivodships with larger numbers of enterprises have benefited the most. By the end of 2006, for example, income group one voivodships accounted for 61.5% of the total foreign direct investment inflows, while those from income group two had received 29.4% (GUS & PAIZ, 2007).

In contrast voivodships from Income group three (shaded in light grey on map 1), have a value for GDP capita that is below 80% of the national level. These regions are more dominantly located in the northeast and down the eastern wall of the country. The downside to this is that while voivodships from income groups one and two benefit from direct foreign trade contact with the west and neighboring countries to the south, eastern wall voivodships border Belarus and Ukraine. These two neighboring countries did not benefit from the technical and financial assistance that characterised Polish-EU co-operation at the start of reform and likewise did not receive an Interim Agreement in the early 1990's governing the co-ordination and expansion of foreign trade operations as well as market access to the west. Growth and restructuring, necessary for the modernisation progress in Belarus and Ukraine has therefore lagged behind the pace of that observed in Poland, directly affecting income levels and welfare creation. As a result, these countries did not regain their 1990 levels of GDP output until after 1999 – four years later than Poland. Opportunities for export expansion between the Eastern wall voivodships of Poland with Ukraine and Belarus has therefore been largely limited to basic necessity goods for the first ten years of transition. GDP output in income group three voivodships is also limited by their economic structures, which has traditionally focused on large-scale agricultural production, forestry and fishing. This pattern of development can be traced back to the partitions of the 18th Century and the period under Russian control. The period under Communist rule in Poland,

given its focus on heavy industrial production and resource extraction, did not address the needs to balance the economic structures of the country's eastern regions, but rather reinforced them. The effects of geographical location as well as the structure of output have therefore influenced volumes of foreign direct investment into these voivodships. In fact, all five voivodships from income group three accounted jointly for just 10% of the total foreign investment injected into the country up until the end of 2006 (PAIZ, 2007).

Poland has remained the most attractive transition country for foreign investors since the start of economic reform, though investment has been sunk primarily into those voivodships possessing abundant supplies of highly qualified, skilled, semi-skilled and unskilled labour and which have the capacity to expand output and stimulate foreign trade (Tiusanen, 2006). These results are supported by research carried out by Domański, who identified that foreign capital is largely concentrated in metropolitan centres (Domański, 2003). However, while past research rightly identifies the exclusion of the eastern voivodships from the bulk of foreign trade and investment opportunities, membership of the EU, linking Poland to investment funds for infrastructure and industrial development is beginning to positively influence rates of growth in GDP capita and labour productivity.

1.2. Components of Nominal Output

Table 1 provides the values for average yearly nominal GDP/Capita growth over the period 2000-2006 for Poland and its sixteen voivodships. The generation of nominal GDP capita growth is due to changes in the price component, referring to growth in consumer prices and also due to changes in the real component. Changes in the latter refer to growth in the output of goods and services produced per head over time (real GDP capita).

Table 1 reveals that voivodships with higher levels of nominal GDP capita growth observe higher growth in prices. Podlaskie from income group three, for example, achieved an average growth in GDP capita of 8.72% and this was accompanied by the highest growth in average prices across all IG3 voivodships. Pomorskie of IG2 was marginally behind Małopolskie in terms of average output per head (7.2%) and recorded an average growth in prices of 2.5%. Mazowieckie of IG1 parallels these performances.

The price component is a useful indicator in reflecting the level of demand and growth of output across voivodships. In this regard one can observe an overall distinct pattern across all three-income groups. Observation of the column containing the price component reveals an overall, upward increasing trend from the more rural voivodships (IG3) through to voivodships containing more advanced economic structures (IG1). The exception to this pattern is Śląskie whose consumer price growth averaged at 1.84%. Śląskie is the most densely populated region in the country and possesses the highest concentration of enterprises. According to National Bank of Poland sources, consumer price inflation stood at 7.4% in January 2001 before falling to less than 1% in May 2003. By May 2004 CPI had risen to 4.5% before falling to less than 1% again in 2006. These sharp fluctuations can be attributed to increased prices in respect of food, beverages and energy, especially during the latter period. In the case of food and alcoholic beverages, prices rose owing to increased excise tax, while increased energy costs were due directly due to the higher prices charged for electricity and heating for households, especially coal (NBP, 2009). The less reliant nature of IG3

voivodships on coal as well as their industrial focus on agriculture, forestry and fishing insulates them to some degree from price increases in these commodities.

Table 1. Components of average yearly nominal GDP/Capita growth in percent (2000-2006)

Region & Income Group (IG)	Nominal GDP Capita Growth 2000-2006 (%)	Price Component 2000-2006 (%)	Real Component 2000-2006 (%)
3 Lubelskie	6.06	1.75	4.31
3 Podkarpackie	6.65	1.43	5.22
3 Podlaskie	8.72	1.88	6.84
3 Świętokrzyskie	6.41	1.78	4.63
3 Warmińsko-Mazurskie	6.35	1.72	4.63
2 Opolskie	5.56	2.09	3.47
2 Małopolskie	7.38	2.12	5.26
2 Kujawsko-Pomorskie	6.06	2.06	4.00
2 Lubuskie	6.86	2.20	4.66
2 Łódzkie	7.20	2.21	4.99
2 Zachodniopomorskie	4.62	2.12	2.50
2 Pomorskie	7.20	2.50	4.70
Poland	9.14	2.62	6.52
1 Dolnośląskie	7.85	2.59	5.26
1 Wielkopolskie	7.04	2.67	4.37
1 Śląskie	6.83	1.84	4.99
1 Mazowieckie	11.26	3.05	8.21

Source: Calculations based on Regional Accounts, Polish Central Statistics Office, (GUS, 2000, 2008).

Low growth in prices is an important factor influencing the catchup process between Eastern wall regions (IG3) and the remainder of the country. However, with the exception of Podlaskie, which achieved an average growth in real GDP capita (6.84%) above the national level (6.52%) and, after Mazowieckie, the second highest growth rate in the country, all other voivodships from income group three achieved similar average real rates of growth to those from income group one and two. A process of catchup can therefore only be argued in the case of Podlaskie. This work will now discuss the modelling technique required to explore real GDP capita in more detail.

2. The decomposition of real GDP/capita

Having ascertained that real growth is more dominant in overall nominal output, we now hold the price structure constant and in this section decompose real GDP per capita into its four constituent components in order to determine whether the source of real output is due to increased labour productivity or improvements in labour market conditions.

2.1. The Decomposition Technique & Initial Results

This can be achieved through the application of the following identity, which was first applied across Canadian provinces (Baldwin et al, 2004) and is given as:

$$\Delta \frac{gdp}{pop} \equiv \Delta \frac{gdp}{hours} + \Delta \frac{hours}{employment} + \Delta \frac{employment}{pop^{15}} + \Delta \frac{pop^{15}}{pop}$$

Where:

GDP/Population = Real GDP Capita

GDP/Hours = Labour Productivity

Hours/Employment = Labour Intensity / Work Effort

Employment/Population¹⁵ = Employment Rate

Population¹⁵/Population = Demographic Factor

The left-hand side of the equation, given as real GDP capita (delta = percent), is equal to or approximate to the sum of the average growth in each of the given components on the right. Central to growth of GDP capita is the demographic factor, which measures the size of the available labour force of working age (15-74) (Głabicka, 2005) as a percentage of the total population. A larger labour force actively engaged in the production of goods and services will lead to a larger volume of GDP output. Oppositely, a greater proportion of the population of non-working age decreases the proportion of the labour force and thus leads to lower output. Demographic shifts, such as the effects of migration and emigration can both positively and negatively impact the size of the labour force and output volume.

The employment rate component represents that percentage of the labour force that is actively employed. The performance of this component depends on macroeconomic management, labour market conditions, the effectiveness of public and private employment services as well as the individuals desire to work. A higher share of actively employed individuals, as a percentage of the total labour force will raise output volume and increase the distribution of goods and services within a country's boundaries.

Dividing hours by employment provides a measure of the number of hours worked per job. This component is referred to as the "work effort" and is also determined by the prevailing conditions in the labour market and the desire for work. It is also determined by decisions exercised by governments and trade unions in respect of the number of work hours permitted per week and the degree of labour market flexibility, such as over time and weekend trading. The sum of both the "employment rate" and the "work effort" can be used to provide a single component that reflects the overall conditions in the labour market (see Baldwin et al.) and its relative strength in driving real GDP Capita.

Labour productivity is the fourth determinant of real GDP capita and refers to the quantity of goods and services produced per hour. The value of output per hour worked depends on the contribution and role played by physical capital in production. It also depends on human capital (education, training and experience) as well as the methodology implemented in respect of the production process.

Both physical and human capital requires injections of investment and resources in order for them to raise productivity. Countries and regions with lower shares of capital in production achieve lower levels of labour productivity and tend to work longer hours (Gylfason, 1999). Table 2 contains the results derived from the decomposition technique. The sum of the first four components is equal or approximate to real GDP capita in the last column on the right.

Table 2. Average yearly percentage growth in Real GDP/Capita & its Components (2000-2006)

Region & Income Group (IG)	Labour Productivity (GDP/Hours)	Labour Intensity (Hours/job)	Employment Rate (Jobs/Pop ¹⁵)	Demography (Pop ¹⁵ /Pop)	Real GDP/Capita (GDP/Pop)
3 Lubelskie	3.96	3.45	-3.85	0.75	4.31 **
3 Podkarpackie	3.47	5.00	-5.16	1.91	5.22 **
3 Podlaskie	8.62	1.87	-2.44	-1.19	6.84 *
3 Świętokrzyskie	3.76	4.87	-3.68	-0.32	4.63 **
3 Warmińsko-Mazurskie	4.25	3.62	-3.83	0.59	4.63 **
2 Opolskie	2.44	4.56	-3.02	-0.50	3.47 ***
2 Małopolskie	5.01	3.47	-3.92	0.71	5.26 **
2 Kujawsko-Pomorskie	3.53	4.23	-2.08	-1.68	4.00 **
2 Lubuskie	5.34	0.55	-3.42	2.19	4.66 **
2 Łódzkie	5.07	2.96	-3.14	0.11	4.99 **
2 Zachodniopomorskie	1.85	3.64	-2.24	-0.74	2.50 ***
2 Pomorskie	5.88	0.27	-0.93	-0.52	4.70 **
Poland	7.95	0.47	-0.45	-0.44	6.52 *
1 Dolnośląskie	5.76	1.53	-2.89	0.86	5.26 **
1 Wielkopolskie	5.03	1.18	-1.01	-0.82	4.37 **
1 Śląskie	6.23	-2.74	-0.90	2.41	4.99 **
1 Mazowieckie	9.20	-1.36	-0.49	0.87	8.21 *

Source: Calculations based on Regional Accounts, Polish Central Statistics Office, (2000-2008).

* = Voivodships with an average real GDP capita above the national level or 6%.

** = Voivodships with an average real GDP capita above 4%.

*** = Voivodships with an average real GDP capita below 4%.

Average growth in real GDP capita ranged from a minimum 2.5% in Zachodniopomorskie to a maximum 8.2% in Mazowieckie. The criteria applied to real GDP capita using the asterisks enables us to categorise voivodships according to performance over time. The results for average growth in real GDP capita reveal that, while Polish voivodships can be subdivided into three separate income groups when measured in GDP capita (see map 1), higher GDP capita and geographical location is not always consistent with higher rates of average output per head. Opolskie and Zachodniopomorskie (marked with three asterisks) from income group two, for example, achieved the lowest growth rates of all voivodships. In both cases, labour productivity was also the lowest in the country, reflecting low or falling rates of investment. Poland achieved an average real GDP capita growth rate of 6.52% over the six-year period, but only two voivodships

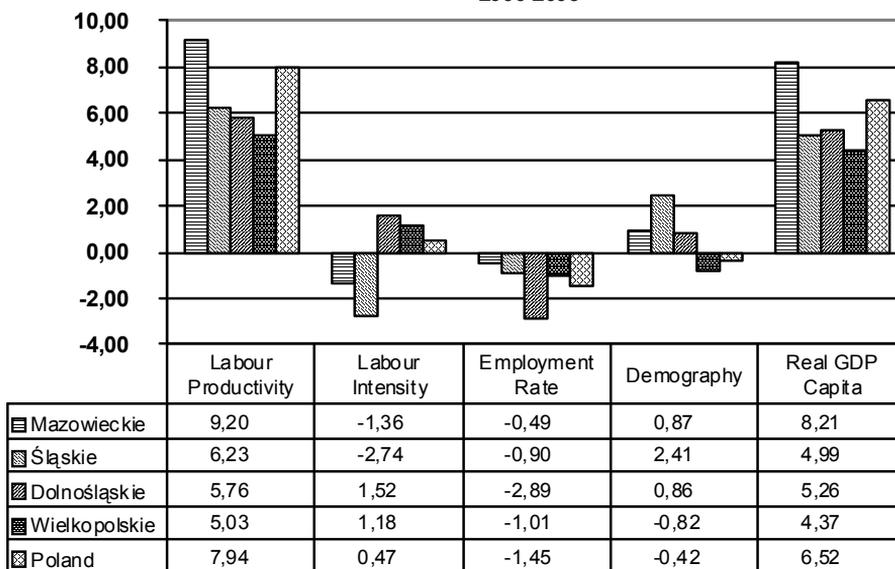
(Mazowieckie (IG1) & Podlaskie (IG3)) achieved average rates of real GDP capita above the national level. These voivodships also recorded the highest average rates of labour productivity in the country. Twelve out of Poland's sixteen voivodships achieved average rates in real GDP capita between 4.0% and 5.3%. All Eastern wall voivodships (IG3) fell into this category, though labour productivity was not the dominant source in all cases but rather increased hours worked per job and comparatively sharper declining average rates of employment.

2.2. Conditions for Catchup

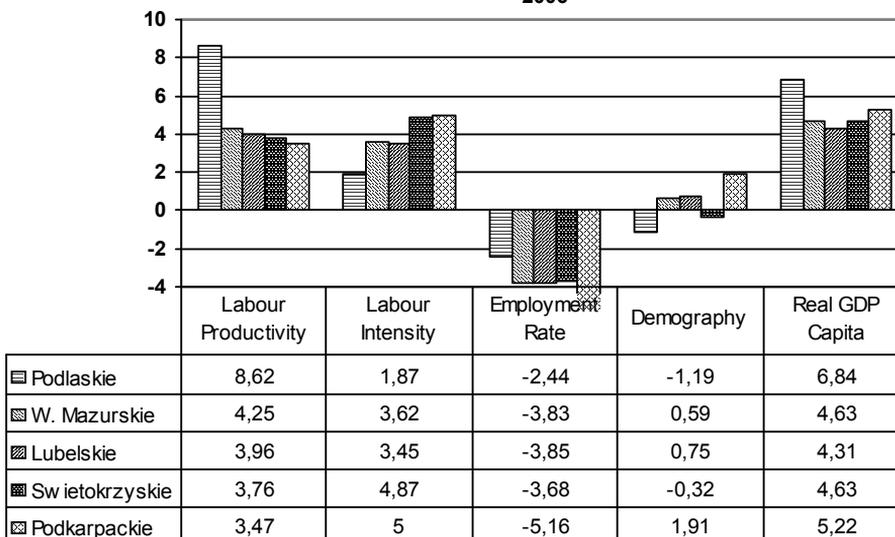
The singular high-growth performance of Podlaskie (IG3) in respect of real GDP capita and labour productivity raises an important issue concerning the conditions for catchup among Eastern wall voivodships. In income group one, for example, labour productivity (see next page) is the dominant source of real GDP capita growth through out all voivodships. However, observation of voivodships from income group three reveals that this pattern only applies in the case of Podlaskie, Warmińsko-Mazurskie and Lubelskie. In the cases of Świętokrzyskie and Podkarpackie increased labour intensity, referring to the number of hours worked per job is more dominant in growth than increased labour productivity, though a comparison of both graphs shows that, with the exception of Podlaskie, the number of hours worked per job (labour intensity) grew by more than three percent on average in income group three. In contrast, the highest growth in average labour intensity from income group one was almost half of this value and could be found in Dolnośląskie (1.52%).

A clear observation that does emerge regarding the economic performance of voivodships from income group one is that high growth in labour productivity is the dominant source of real GDP capita growth and this is positively associated with low or falling rates of growth in the number of hours worked and comparatively stable average rates in employment. This supports earlier conclusions in so far that voivodships with higher shares of services and industry in overall output have benefited the most from foreign investment and work fewer hours. Income three voivodships in contrast, with exception of Podlaskie, achieved comparatively lower rates of average growth in labour productivity and this was associated with higher growth in the number of hours worked per job and much sharper falls in average rates of employment. Podlaskie achieved the second highest growth in labour productivity in the country and this is reflected in the voivodship's lower growth in the average number of hours worked, which was half of that (1.87%) of Warmińsko-Mazurskie (3.62%). Podlaskie also experienced the lowest average fall in the rate of employment (-2.44%), though this was partially offset by a fall in the size of the population of working age (Demography (-1.19%)), which eased pressure on the labour market. In contrast, Podkarpackie achieved the lowest average growth in labour productivity (3.47%) from income group three and this was associated with the highest growth in average labour intensity and the sharpest fall in average employment (-5.16%). The case of Podkarpackie however shows that the decline in employment was also aggravated by an increase in the size of the population of working age (demography), which increased by 1.19% and reflected the lack of capacity of the labour market to absorb additional individuals of working age into the work force. The case of Śląskie from income group one illustrates this.

**Income Group 1 & Poland, Average Real GDP Capita Decomposed
2000-2006**



**Income Group 3, Average Real GDP Capita Decomposed
2000-2006**



Source: Own Calculations, based on data obtained from the Polish Governmental Statistical Offices, 2000-2008.

Conclusion

This work has identified that Polish regions when measured in terms of GDP capita can be subdivided into three separate income groups. The objective of this was to determine whether voivodships from income group three, of the Eastern wall, reveal a level of economic performance that would suggest that a process of catchup has been initiated. Voivodships from income group one in this regard provide a useful benchmark in allowing us to accurately identify under what conditions high rates of real GDP capita growth can be achieved. The research finds that high average growth in labour productivity is the most important source real GDP capita across IG1 voivodships. This is accompanied by low or falling rates in the number of hours worked per job and also comparatively average stable employment, reflecting investment and the increased role of technology across industries. This can be attributed to economic structure, market size, location, industrial concentration and the presence of foreign investment.

Income group three, given their economic structure and location, do not yet possess the full range of attributes that characterise IG1 voivodships. Their economic performance in real GDP capita terms however is comparable with that of most voivodships throughout the country and is also higher in some cases. A factor that has contributed to this performance has been the low growth in average prices over time (CPI) and the resulting higher degree of insulation from government policy in respect of price increases in food and energy in particular. This has enabled real growth to play a more dominant role in overall nominal output. In this regard low prices were identified as an important factor in the catchup process, though observation of all component results from the decomposition technique revealed that only Podlaskie was beginning to make some headway in closing the gap on the remainder of the country. Podlaskie ranked second in the country for achieving the second highest average growth rates in real GDP capita and labour productivity. It also recorded the lowest fall in the number of hours worked and performed the best of all IG3 voivodships in terms of average employment. This work did identify however that a proportion of the downward pressure on the labour market had in fact been eased through falling demography and the outflows of workers.

Podkarpackie from IG3 was also one of the strongest performers in the country in terms of real GDP capita (5.22%), though the average number of hours worked (5.0%) was stronger in growth than labour productivity (3.47%). Despite this strong growth however Podkarpackie displayed sharply declining average rates of employment, aggravated by increased demography and low rates of labour market absorption. Podlaskie in this regard experienced a slight fall in the size of the workforce, which eased pressure on the labour market and government resources.

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