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Journal of Applied Economic Sciences

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Monetary Policy Dynamics and the Stock Market Movements:
Empirical Evidence from Nigeria

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Abstract

The contributions of the stock market to economic growth can never be over-emphasized. In this paper, we used the Autoregressive Distributed Lag bound testing estimation techniques to examine the existence of any relationship between monetary policy instruments and the stock market in Nigeria based on the data sourced from 1985 to 2013. From the results obtained, it can be deduced that monetary policy instruments significantly exerts on stock market behaviour in Nigeria. We recommends that policy makers should put in place policies that aimed at adjusting the interest rate upward, reduce or at best keep at constant the money supply growth rate, increase the net credit to the private sector and manipulate the exchange rate regime so as to boost stock market.

Keywords: Stock market, monetary policy, ARDL, interest rate, Nigeria.

JEL Classification: C32, C92, E37, E44, E52, E62, G15. G12.

1. Introduction

The monetary policy rule of the monetary economists provides the framework through which monetary authority influences the behavior of the economy, the stock market inclusive (Bernanke and Gertler (1999), Cecchetti (2008), Goodhart (2001), Hussain (2011), Chortareas and Noikokyris (2014), Janseh and Tsai (2010), Kurov (2010), Fischbacher *et al.* (2013), Laopodis, (2013)). The ability of the monetary authority to influence the behavior of the stock market through its various instruments have been documented in literature for the developed economies (Bernanke and Kuttner (2005), Gurkaynak, Sack and Swanson (2005), Rigobon and Sack (2004), Thorbecke (1997), Bredin *et al.* (2007), Chortareas and Noikokyris (2014)) with very scanty evidence from emerging economies, most especially Nigeria. Given the scanty availability of literature on the relationship between monetary policy instruments and stock market behavior from emerging economies such as Nigeria, this study tends to examine if any relationship exists between the stock market and the fluctuations in monetary policy instruments in Nigeria. In other words, does stock market responds to monetary policy actions in Nigeria? If yes, what policy instrument(s) significantly influences stock market behavior in Nigeria? Answering these questions is important to virtually all the stakeholders in the economy most especially the monetary authority on the one hand, and the market practitioners on the other hand. For the monetary authority, the knowledge of this relationship will help in making policies that will enhance the growth and development of the stock market by identifying the core instruments that most influences the behaviour of stock prices. Market practitioners (both local and foreign investors) on the other hand, will find the result of the relationship useful as it will aid in making hedging strategies against fluctuations in the monetary policy instruments that can negatively exert on stock market prices.

The rest of the paper is structured as follows: Section Two (2) provides both the theoretical and empirical review of the existing literature, Section Three (3) deals with the methodology, Section Four (4) interprets the results while Section Five (5) concludes and makes recommendations for policy implementation.

2. Literature review

2.1. Theoretical framework

The theoretical framework through which the monetary policy influences the behavior of the stock market can be classified into five theoretical stances viz: interest rate channel; credit channel; wealth effect channel;

exchange rate channel; and the Tobin's Q investment hypothesis. (Mishkin 2001, Ioannidis and Kontonikas 2008, Chatziantoniou *et al.* 2013) Each of these channels is briefly explained in this sub-section.

Interest Rate Channel: This channel is also known as the traditional Keynesian hypothesis of the transmission framework of interest rate. It explains that fluctuations in interest rates will impact on firms' corporate cost of capital, thus alter their present value of future net cash flows. This implies that higher interest rates will provoke a fall in the present values of future net cash flows, thereby transmitting into lower stocks prices.

Credit Channel: This represents an indirect monetary policy transmission of interest rate adjustment. This approach identified interest rate alteration as the means through which the monetary authority influences the level of investment and by extension stock market prices in an economy. Under this hypothesis, fluctuation in the level of corporate investment will alter the market value of firms which will in turn influence the present values of its future cash flows. In specific, the credit channel explains that higher corporate investment activity is expected to induce higher future cash flows, thereby increase the firm's market values.

The wealth effect provides another transmission mechanism on how monetary policy exerts on stock market performance. The core of this approach centers on the ability of interest rate to determine the value of stock prices such that an increase in interest rates will lead to a fall in stock prices.

Another link is found in the exchange rate channel which observed that the impact of monetary policy on stock market is influenced by the impact of interest rate on the exchange rate system. It explains that higher interest rate will provoke an appreciation of the domestic exchange rate; this will lead to higher importation accomplished by lower exports. This scenario will negatively affect the economy export industry which could lead to fall in her production base and by extension a lower asset prices.

Finally, the Tobin's Q theory of investment which observed that higher interest rates will lead to lower stock valuation thereby shifting fund from the stock market to the bond market (assume only these two assets exist in the market) thereby forcing stock price to fall.

2.2. Empirical literature

Most of the studies that empirically investigate the relationship between monetary policy instruments as they exert on stock market behavior are from developed economies with very little on developing economics especially Nigeria. Some of these studies are briefly reviewed in this part of the study.

For the US, empirical results on the impact of fluctuations in the monetary policy instruments on stock market returns is to some extent robust. For instance Bjornland and Leitemo (2009) observed that when the monetary policy adjusts the FED funds rate upward, the stock market response with a fall in price. Chen (2007) further observed that the impact of monetary policy changes that results in increasing the FED fund rate upward will have a larger effect on stock market especially when the market is bearish. Davig and Gerlach (2006) observed that the stock market responds negatively when there is an unprecedented change in the monetary policy instruments in the economy. Arguing from implied vitality point of view, Vahamaa and Aijo (2011) observed that the impact of the fluctuations in the stock market as induced by the monetary policy variables have more influenced for both scheduled and unscheduled changes. Farka (2009) and Bjornland and Leitemo (2009) concluded that the response of the stock market to the monetary policy changes is indicated by changes in different policy measures.

For the Irish economy, Bredin *et al.* (2005) observed the existence of asymmetrical volatility in the stock market before and after the monetary authority (FOMC) meetings. For the EU area/zone, Cassola and Morana (2004), Fernandez-Amador *et al.* (2011), Hussain (2011) and Kholodilin *et al.* (2009) observed that changes in monetary policy variables influences the behavior of stock market prices. Bredin *et al.* (2007) documented an inverse relationship between asset prices and monetary policy instruments and that expansionary monetary policy regime will lead to higher market liquidity.

For the OECD countries, Kholodilin *et al.* (2009) observed that monetary policy significant exerts on stock market behavior and volatility. Durham (2001) further advanced literature on the OECD economies as it relates to the relationship between monetary policy and stock market with a wider coverage of about 16 economies, the study concluded that the impact of monetary policy fluctuations on stock market returns in those economies are at best on monthly and quarterly basis.

For a selection of five developed and three emerging economies of the US, Euro area, Japan, UK, Australia, South-Korea, Thailand and Brazil, Belke and Beckman (2014) used the Co-integrated Vector Autoregressive (CVAR) estimation techniques to analysis quarterly data sourced from 1983Q1 to 2013Q1 so as to investigate the existence of both the long run and the short run relationships between stock market and

monetary policy instruments proxied by broad money aggregate, interest rate and net capital flows with the intension of examining the ability of the central banks to influence stock market development in the economies studied. Their findings revealed that stock markets in the emerging economies respond to changes in the monetary policy instruments. In the developed economies, evidence abounds that except for Japan, no significant relationship exist between stock market and monetary policy instruments.

Narayan and Narayan (2012) examined the effect of US macroeconomic conditions as proxied by the exchange rate and short term interest rate on the stock market of seven Asian economies of China, India, Philippines, Malaysia, Singapore using daily data sourced between 2000 and 2010. The study employed the use of Ordinary Least Square (OLS) and Generalized Autoregressive Conditional Heteroskedascity (GARCH) estimation techniques to analyze the data set, and observed that in the short run, the US interest rate has insignificant effect on stock returns for all the countries studied except for the Philippines in the crisis period. The study also observed that the Chinese stock market exhibits a negative but significant relationship with exchange rate fluctuations. When the analysis was subjected to a long run test, the study revealed that financial crisis weakened the connections between stock prices and the monetary policy variables.

For Jordan, Bekhet and Mater (2013) used the ARDL to analysis annual data sourced from 1978 to 2010, to establish an existence of a long run relationship between stock price returns and a number of macroeconomic variables including money supply, interest rate and exchange rate. The study observed that for Jordan's economy, the economy adjusts from short term disequilibrium to long term equilibrium with an approximate of 49.3% speed of adjustment. The study submitted that fluctuations in stock market returns response to changes in the macroeconomic variables.

Tang *et al.* (2013) examined the impact of monetary policy shocks on both the money and stock markets for China by using daily data sourced from 2006/10/8 to 2012/5/11. The results shows that a close relationship exists between the Chinese stock market and money market, and that changes in the Chinese MPC instruments have a significant influence on both the stock market and money market. The results further revealed that an upward shift in the monetary policy instruments leads to larger fluctuations in the SHIBOR market than when the shift is downward. On the impact of a downward shift in monetary policy variables on stock market behavior, the study revealed that market returns will climb up with about a 3 day delay in the stock market given a fall in monetary policy instrument rate. The implication is that a fall in interest rate will lead to increase in investible fund, thus increase in market returns. The impact of delay of about 3days implies that the response of the stock market to fluctuations in interest rate is gradual and usually appropriate.

Kuosamanen and Vataja (2011) documented the ability of interest rate in predicting the behavior of the real economic activity and that the ability of stock market return and volatility in predicting stock return behavior is insignificant for the Finish economy. For South Africa, Chinzara (2011) observed that a significant relationship exist between stock market prices and exchange rate, and between stock market prices and interest rate.

The only relevant studies on this relationship from the Nigeria economy perspective are Osamwonyi and Evbayiro-Osaye (2012) and Okpara (2010). In Osamwonyi and Eubayior-Osaye (2012), annual data from 1975 to 2005 on interest rate, inflation rate, exchange rate, fiscal deficit, GDP and money supply were used as proxies of macroeconomics policies while short market return was proxided by All Share Index. Using the Vector Error Correction Model (VECM), the study observe that a bi-directional relationship exist between All Share Price and the selected macroeconomics variables. The study recommended the use of inflation targeting, adequate supervision of the capital market operation, reduction in money supply, increase national income and export so as to achieve sound economic and stock market growth and development. Okpara (2010) on the other hand, used monthly data sourced from January, 1985 to December, 2006 on the Nigerian economy to examine the impact of monetary policy changes on stock market behavior with focus on Treasury bill as the core policy instrument. Using Augmented Dickey-Fuller unit root test, Vector Error Correction Model and Forecast Error Decomposition Analysis, the study observed that in the long run, Treasury bill significantly influence the behavior of stock returns such that high Treasury bill price will connotes fall in stock market prices.

A major flaws of the two literature from Nigeria is that they used data set that are relatively old, besides Osamwonyi and Eubayiro (2012) used mixed of both fiscal and monetary policies instruments rather than pure monetary policy instrument which negates the Classical economists hypothesis of existence of a crowding out effect from fiscal policy instruments on stock market prices. Thus, there is a need to revisit the relationship between stock market prices and monetary policy instruments (separately from interference from fiscal policy instruments) with more current data especially after the global economic/financial crisis of the 2007/2008.

3. Data and methodology

In this study, we used annual data from 1985 to 2013 sourced from the Central Bank of Nigeria Statistical Bulletin (2013). The variables are the All Share Index (ASHI), a proxy of the stock market behaviour (the dependent variable); the monetary policy instruments (the independent variables) includes Interest rate (INT), exchange rate (EXC), broad money supply (M2) and the Net Credit to the private sector (NDC). Some of the variables i.e. ASHI, M2 and NDC were transformed into natural logarithms (*In*) by using Microsoft Excel, Microfit 4.2 and Eviews 7.2 statistical packages. Following Hsing (2011), we expressed the model as follows

$$ASHI = f(INT, M2, NDC, EXC) \tag{1}$$

3.1. Methodology

This study employed the use of Autoregressive Distributed Lag (ARDL) approach. The ARDL was developed by Pesaran *et al.* (2001) as a surrogate co-integration technique to investigate the relationship at both the long run and short run between two or more variables. The model in preferred to other existing techniques like Engle and Granger (1987), Johansen (1991), Johansen and Juselius (1990) and Gregory and Hansen (1996) for a number of reason: First; it is more appropriate when faced with small sample size (Ozturk and Acaravci (2010); Odhiambo (2010) Lawal *et al.* (2015); second, it is applicable whether or not the underlying regressions are purely *I*(0), purely *I*(I) or mutually co-integrated (Marashdeh (2005)); third, the techniques accommodates different optimal lags unlike other conventional co-integration procedures (Bekhet and Matar (2013)). These advantages motivate the choice of ARDL procedure in investigating the relationship among the variables. The ARDL model specification is as follows:

$$\Delta InSPI_t = \beta_{01} + \sum_{i=1}^{n1} \beta_{11} \Delta InSPI_{i-t} + \sum_{i=0}^{n2} \beta_{12} \Delta InM2_{t-i} + \sum_{i=0}^{n3} \beta_{13} \Delta InINT_{t-t} + \sum_{i=0}^{n4} \beta_{14} \Delta InEX_{t-i} + \sum_{i=0}^{n5} \beta_{15} \Delta InNDC_{t-i} + \phi_{11} InSPI_{t-1} + \phi_{12} InM2_{t-1} + \phi_{13} InINT_{t-1} + \phi_{14} InEX_{t-1} + \phi_{15} InNDC_{t-1} + \varepsilon_{t1} \tag{2}$$

We formulate the H_0 and H_1 hypothesis so as to be able to test the existence of the short and long runs relationship among the stated variables as follows:

H_0: no long-run relationship	H_1: a long-run relationship
$\phi_{11} = \phi_{12} = \phi_{13} = \phi_{14} = \phi_{15} = 0$	$\phi_{11} \neq \phi_{12} \neq \phi_{13} \neq \phi_{14} \neq \phi_{15} \neq 0$
$\phi_{21} = \phi_{22} = \phi_{23} = \phi_{24} = \phi_{25} = 0$	$\phi_{21} \neq \phi_{22} \neq \phi_{23} \neq \phi_{24} \neq \phi_{25} \neq 0$
$\phi_{31} = \phi_{32} = \phi_{33} = \phi_{34} = \phi_{35} = 0$	$\phi_{31} \neq \phi_{32} \neq \phi_{33} \neq \phi_{34} \neq \phi_{35} \neq 0$
$\phi_{41} = \phi_{42} = \phi_{43} = \phi_{44} = \phi_{45} = 0$	$\phi_{41} \neq \phi_{42} \neq \phi_{43} \neq \phi_{44} \neq \phi_{45} \neq 0$
$\phi_{51} = \phi_{52} = \phi_{53} = \phi_{54} = \phi_{55} = 0$	$\phi_{51} \neq \phi_{52} \neq \phi_{53} \neq \phi_{54} \neq \phi_{55} \neq 0$
H_0: no short-run relationship	H_1: a short-run relationship
$\beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = 0$	$\beta_{11} \neq \beta_{12} \neq \beta_{13} \neq \beta_{14} \neq \beta_{15} \neq 0$
$\beta_{21} = \beta_{22} = \beta_{23} = \beta_{24} = \beta_{25} = 0$	$\beta_{21} \neq \beta_{22} \neq \beta_{23} \neq \beta_{24} \neq \beta_{25} \neq 0$
$\beta_{31} = \beta_{32} = \beta_{33} = \beta_{34} = \beta_{35} = 0$	$\beta_{31} \neq \beta_{32} \neq \beta_{33} \neq \beta_{34} \neq \beta_{35} \neq 0$
$\beta_{41} = \beta_{42} = \beta_{43} = \beta_{44} = \beta_{45} = 0$	$\beta_{41} \neq \beta_{42} \neq \beta_{43} \neq \beta_{44} \neq \beta_{45} \neq 0$
$\beta_{51} = \beta_{52} = \beta_{53} = \beta_{54} = \beta_{55} = 0$	$\beta_{51} \neq \beta_{52} \neq \beta_{53} \neq \beta_{54} \neq \beta_{55} \neq 0$

Our decision as to whether to accept or reject H_0 (existence of no-co integration among the variables) is guided by the following procedures (Pesaran *et al.* 2001):

If $F_s >$ upper bound, reject H_0, thus the variables are co-integrated;

If $F_s <$ lower bound, accept H_0, thus the variables are not co-integrated.

However, if $F_s \geq$ lower bound and $\leq$ upper bound, the decision will be inconclusive.

Table 1 - Descriptive statistics of the variables

	ASHI	INT	M2	NDC	EXC
Mean	28.05582	13.67643	17.18929	12.48929	29.28510
Median	35.30478	13.50000	16.55000	11.00000	6.178444
Maximum	130.9388	26.00000	38.00000	36.70000	323.5263
Minimum	-45.76535	6.130000	8.600000	5.900000	-5.774474
Std. Dev.	35.69310	4.114049	6.490811	6.890323	66.23036

	ASHI	INT	M2	NDC	EXC
Skewness	0.342371	0.729633	1.563775	2.056884	3.433094
Kurtosis	4.148475	4.275504	5.812682	7.229195	15.21898
Jarque-Bera	2.085846	4.382432	20.64154	40.61070	229.1893
Probability	0.352423	0.111781	0.000033	0.000000	0.000000
Sum	785.5630	382.9400	481.3000	349.7000	819.9827
Sum Sq. Dev.	34397.92	456.9858	1137.527	1281.867	118434.4
Observations	28	28	28	28	28

Source: Authors (2015) using Eviews 7.2

The descriptive characteristics of the variables used in this paper are presented in the Table 1 above. Of utmost importance to us are the coefficients of the Jarque-Bera (JB), Kurtosis and the Skewness of the variables in determining whether the series follow normal probability distribution. We expect the Skewness (S) and Kurtosis (K) co-efficients to be 0 and 3 respectively for the variables to be normally distributed; otherwise, they are not normally distributed. Thus we can use parametric test to analysis our data.

From the result, it can be deduced that, the coefficients of the Skewness are significant more than zero. In the same direction, the coefficients of the kurtosis for all the variables are significantly greater than 3. This implies that the variables are not normally distributed; hence we can use ARDL estimation techniques.

Table 2 - Result of Correlation Matrix

	ASHI	INT	M2	NDC	EXC
ASHI	1.000000	0.404995	-0.254311	-0.292256	-0.164523
INT	0.404995	1.000000	-0.498345	-0.527950	-0.053823
M2	-0.254311	-0.498345	1.000000	0.943443	-0.176641
NDC	-0.292256	-0.527950	0.943443	1.000000	-0.173369
EXC	-0.164523	-0.053823	-0.176641	-0.173369	1.000000

Source: Authors (2015) using Eviews 7.2

The result of correlation matrix of the variables is presented in Table 2 above. From the table, it can be deduced that an inverse relationship exist between the All Share Index and the selected monetary policy variables except the interest rate. This implies that when any of these instruments is adjusted up, stock return will fall by a certain percentage as shown in the table. From our result it can be deduced that when money supply (M2) is increased by 1%, the All Share Index will fall by 25%, similarly when the policy makers adjust the Net Domestic Credit and the Exchange rate upward by 1%, each of them will have a corresponding effect on the All Share Price by a fall of about 29.2% and 16.45% respectively. A fall in stock price return by 16.45% as induced by increase in exchange rate indicates that foreign investors shy away from the market and sells their interest when there is an upward surge in exchange rate movement. (See Olwenyi and Mondi 2011)

On the other hand, as earlier stated, a positive relationship exists between interest rate and ASHI return such that an increase in the interest rate by 1% will lead to an increase in the ASHI by about 40.45%. The implication of the results is that, in order to boast stock market return, the monetary policy is expected to increase the interest rate and at least keep other variables constant. The result is supported by the theoretical frameworks on the relationship between monetary policy instruments led by interest rate and the stock market returns.

Table 3 - Unit Root Test Result

Variables	ADF Statistics	Critical Values	Probability	Order of Integration
*In*ASHI	-5.439736	-3.724070	0.0002	*I*(1)
INT	-4.848635	-3.699871	0.0006	*I*(1)
InM2	-5.234202	-3.711457	0.0002	*I*(1)
InNDC	-6.064745	-3.711457	0.0000	*I*(1)
EXC	-4.79254	-3.689194	0.0006	*I*(0)

Source: Authors (2015) using Eviews 7.2

In Table 3 above, we present the results of the ADF test of stationarity for all the variables both in levels and first difference forms. From our results, it can be deduced that we cannot reject the null hypothesis of unit roots for all the variables in level form except for exchange rate that is stationary at level *I*(0). However, when the ADF test was applied at first difference for each of the variables, the results show that we can reject the null

hypothesis. This implies that the variables are stationary for the order $I(1)$. Given that all the variables are stationary at least at $I(1)$, we proceed to test whether or not the variables are co-integrated.

4. Results of the long run relationship

In Table 4 below, we presents the result of the long term relationship among the variables, we choose the optimum lag length based on the Schwartz Bayesian Criterion (SBC), a parsimonious model that selects the smallest possible lag length, which is most suitable for annual data (Pesaran *et al.* 1999)

Table 4 - F-Statistics for testing the existence of a Long run relationship among the variables

Model	F-Statistics
F_{InASHI} (*In*ASH1/*In* M2, INT, EXC, *In*NDC)	5.342***
F_{InM2} (*In*M2/In ASHI, INT, EXC, *In*NDC)	4.6116**
F_{INT} (INT/*In*ASHI, InM2, EXC, *In*NDC)	9.487***
F_{EXC} (EXC/In ASHI, INT, *In*M2, *In*NDC)	3.2493
F_{InNDC} (*In*NDC/*In*ASHI, *In*M2, INT, EXC)	2.561

Source: Authors 2015 using Microfit 4.2

From the table, it can be deduced that compelling long run relationship are established among the variables when the regressions are normalized in the *In*ASH1, *In*M2 and INT Models. However, the results of the procedures for INT and *In*NDC models were inconclusive based in the fact that their calculated F-Statistics though higher that the lower-bound critical value were lower than the upper-bound critical value. Given this situation, we followed Kremers *et al.* (1992) by applying the error correction term to establish cointegration.

Table 5 - Estimated long-run coefficients using the ARDL (1, 0, 0, 0, 0, 0) model selected based on SBC
Dependent Variable ASHI

Long run coefficients			Short run coefficients		
Regressors	Coefficients	T-Ratios	Regressors	Coefficients	T-Ratios
α_0	10.094	2.9018**	α_0	1.4029	2.9837
*In*M2	-0.4244	-3.1298**	*In*M2	-2.2204	-0.2232**
INT	0.5270	2.9639**	INT	0.0057	0.2222**
EXC	0.0526	0.2250**	EXC	0.0073	0.5284**
*In*NDC	-0.7309	-1.2334	*In*NDC	0.1016	0.6845
Trend	0.0232	2.9147	Trend	0.0032	4.4219**
DU $_{ASHI}$	-0.0464	-.02786	DU $_{ASHI}$	-0.0064	-0.2897
			ECM_{t-1}	-0.4411	-0.2052***

Source: Authors 2015 using Microfit 4.2

Table 5 above presents the results of both the long run and short run relationship between the All Share Index and the monetary policy instruments. From the result, it can be deduced that in the long run the coefficients of all variables except in Net Credit to the Private sector (NDC) are significant at 5% level of significance. Furthermore, it can be deduced from the result that a negative relationship exist between broad money supply (M_2) and All Share Index, this implies that increase in money supply will shift investment away from the stock market or lower stock market return. For other variables with significant impact, the study found a positive relationship between each of these variables and the stock market. These results are in line with earlier findings such as Bekhet and Matar (2013) who documented the existence of a positive relationship between exchange rate and share price for Jordan, Chinzara (2011) who documented a significant relationship between stock prices and the dual of exchange rate and interest rate for the South African economy but contradicts Laopodis (2013) who concluded that there was no consistent dynamic relationship between monetary policy instruments and stock market for the US economy.

The short run relationship results as shown in Table 5 reveals, that a positive relationship exists between NDC and ASHI though the relationship is insignificant. The research further revealed that a significant and positive relationship exist between the ASHI and EXC rate, and a significant but negative relationship exist between ASHI and M_2 in the short run.

The speed of adjustment from disequilibrium to equilibrium for the model is shown by the coefficient of the Error Correction term (Ect_{t-1}). When the coefficient in significant and negative, it connotes that long term

relationship exist among the variables (see Narayan and Smyth 2005, Marashdeh 2005, Pesaran and Pesaran 2009, Ozturk and Acaravci 2011, Lawal *et al.* 2015). From Table 5, it can be deduced that the Ect_{t-1} co-efficient (-0.4411, 0.000) is negative and significant at 1% level of significant. This implies an existence of a high speed of adjustment of about 44.11% from disequilibrium to equilibrium from the previous years to the current year.

In investigating the stability of the estimated ARDL model of the long run viz-a-viz short run relationship between ASHI and the selected monetary policy instruments, we employed the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Square (CUSUMQ) graphs. The decision rule is that, all the coefficients of the error correction are stable and the null hypothesis cannot be rejected provided that the plots stay within 5% range of the significance level (i.e within the two straight lines), if otherwise we reject the null hypothesis (Bekhet and Matar 2013, Odhibomo 2010, 2009, Bahmani-oskoe and Bohl 2002, Pesaran and Smith 2001). As shown in figures 1a and 1b, both plots lies within the critical boundaries, this implies that the long run coefficients of the ASHI function is stable.

5. Conclusion and recommendations for policy implementation

In this study, we examined the relationship between the All Share Index and some selected monetary policy instruments in Nigeria. The ARDL estimation techniques was employed to test cointegration among the variables using annual data sourced from 1985-2013. From our results, it can be deduced that strong evidence abound against the null hypothesis of unit roots in most series investigated. The ARDL procedure also indicates an existence of a stable long run equilibrium relationship between the All Share Index and the selected monetary policy instruments.

Furthermore, the result of the error correction coefficient Ect_{t-1} has the expected signs and is highly significant at 1% level of significance; this indicates an existence of a speed of adjustment of about 44.11% back to equilibrium in the long term from short term disequilibrium position. We also conducted stability test for the coefficient of the error correction model by applying the CUSUM and CUSUMQ stability tests, the results of these tests show that the plot lies within the range of stability. Finally, from the results, it can be deduced that (as evidence from the long term co-efficient of the monetary policy instruments), monetary policy instruments significantly exerts on stock market behaviour in Nigeria. Our results are in line with earlier findings of Bekhet and Matar (2013) for Jordan, Belke and Beckman (2014) for US and UK, Tang *et al.* (2013) for China.

Based on the results of the findings, which among others shows an inverse relationship between stock market returns and broad money supply (M2); positive relationship between stock prices and each of exchange rate, Net Credit to the Private sector and interest rate, the study recommends that in order to achieve sustained growth in stock market returns, monetary policy makers should adjust interest rate upward, reduce or at best keep at constant the money supply growth rate.

In conclusion, we recommend that further research should investigate the impact other variables such as Required Reserve Ratio (RRR), fiscal policy instruments and the effects of the interactions between fiscal and monetary policy instruments on the All Share Index.

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APPENDIX

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
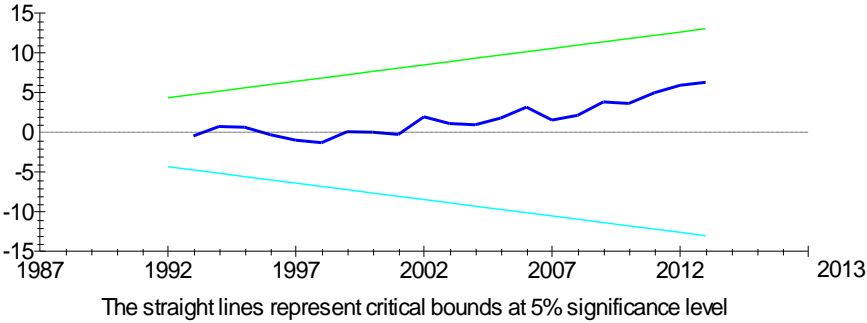
Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
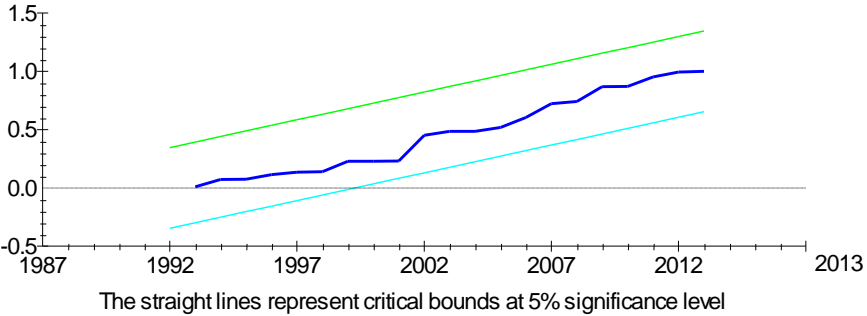
Formation of a Steady Social and Economic Framework of the Region

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Abstract

The purpose of the article consists in justification of theoretical and conceptual basis of formation of a steady and balanced social and economic framework of the region based on the rational use of the capacity of all its territories, both central, and peripheral. In the article the poly-component structure of the stability and equilibrium of the social and economic framework of the region which basic elements are integration, structural and resource ones has been proved. Taking into account the enclosure of the concepts "social and economic framework - rational branch structure - import substitution - national security" the conceptual provisions of the mechanism of regional social and economic strategy trends aimed at the development of links between territories for the implementation of projects of non-raw material import substitution have been formulated. The conclusion is drawn on the need of creating dynamic stable design of a social and economic framework of the region for ensuring rational import substitution in non-raw material sector which is expressed not in the mechanical reduction of a share of raw branches in LRT and the direction of regional resources in ineffective projects of industrial production, but in the formation of rational proportions of development of raw and non-raw sectors in economy and social sphere, forming finished reproduction chains in the region.

Keywords: equilibrium, region, social and economic framework, stability.

JEL Classification: O21, R12.

1. Introduction

The priority of the regional aspect in the formation of a new model of the Russian economy management in the current external economic landscape is defined considerably by the greater mobility of mesolevel systems in practical realization of federal strategic and program solutions. The value of import substitution in non-raw spheres amplified by the influence of external factors attracts scientific interest to the research of formation of social and economic framework of the region providing stability, coordination and equilibrium of regional development in these directions. This fact defines methodological and practical importance of specification of theoretical, methodological and conceptual basis of functioning of the regionally adapted mechanism of support of decision-making, directed on the creation of a steady social and economic framework of the region as a multicomponent structure.

2. Literary review and research tools

Convergence of a number of general methodological and special approaches: systemic, synergetic, standard, target, balanced, institutional and endogenous ones forms the methodological basis of the research, as well as sharing of a number of theories – growth poles, territorial industrial clusters, balanced development, consideration of a region as social, ecological and economic system, and also combination of the following concepts: economic space, basic framework of settling, polycentric development. In foreign and domestic literature the problem of formation of economic framework was considered as "an aggregate of elements - poles

of business activity connected by the resource streams circulating between them" for many years (Baransky 1956, Izard 1966, Lösch 1940). Within the developing theory of growth poles leading branches, as well as certain territories, regional complexes of the enterprises can act as elements of the framework (Lasuén 1969; Pottier 1963, Perroux 1968). Recently the regional framework has been considered as a spatial combination of the territorial industrial skeleton of structure and of the ecological framework of the territory (when the region is considered as a social, ecological and economic system); economic framework of the region is formed round a kernel, i.e. systems of city settlements (Kiselyova and Kiselyov 2007, Sharygin, Nazarov and Subbotina 2005, Shedko 2013). Within the concept of a basic settling framework, it appears in the form of an aggregate of centers and highways connecting which represent economical and geographical mechanism of the integrity of the country (Mayergoz 1986, Lappo 2002, Polyan 2014). Herewith, the results of economic and social development of the region as a system accumulate in the nod elements of the framework.

Being based on the combined use of basic provisions of the listed theories, approaches and concepts, we will note that the methodological basis of this research is formed considerably under the influence of G.B. Kleyner's ideas about the systemic organization of economy (Kleyner 2010, 2011, 2012). According to them, social and economic framework of the region is understood as a set of interconnected regional subsystems functioning of which provides integrity, stability, and also a certain organization (structuring) of a regional economic and social space.

3. Trends of problem solution and analysis of the results

In recent years the problem of formation of social and economic framework is considered within a conceptual outline of the depolarized development of the regions which are characterized by the formation of polycentric structure of their economies. Search for mechanisms of overcoming centripetal tendencies in nodal points of the regional system and involvement of peripheral territories in the structure of the basic framework is a characteristic feature of statement of such problems. This is explained by the fact that efficiency of developing, making and implementing administrative decisions at a mesoeconomic scale, including achievement of balance, is substantially interfaced to completeness of use of tools of system approach for the integration of social and economic capacities of all the territories of the region, and in the course of statement, as well as in the achievement of the objectives of economic systems of various levels of hierarchy, and complex accounting of the factors defining regional development dynamics and assessment of consequences of administrative influences. (Matveeva and Nikitayeva 2007)

Another aspect of the scientific researches connected with the formation of a social and economic framework of the territory is providing not only the equilibrium, but also the stability of this "construction". In this case equilibrium is considered from the position of achievement of such type of economic development which will ensure "ecological safety, reproducibility of limited resources and quality of economic growth" (Tsapiyeva 2010) and has emphasis on the complex development of separate regional subsystems. Such interpretation was introduced into the scientific use by the United Nations General Assembly in 1987 after the publication of the report of the Commission on environment and development and has been dominating so far. This is confirmed by the system of balanced frameworks of the territory developed by the Department of the strategic analysis and development of the "Vnesheconombank" state corporation (Figure 1) within the policy of formation and support of territories of advancing development.

According to the scheme presented in Figure 1, properties of balance of the formed framework (frameworks) of the regional system are shown in the achievement of optimum ratios of development of social, economic, innovative spheres, the infrastructure supporting them, and also "relations of cooperation of a person with the biosphere". (Abalkin 1994)
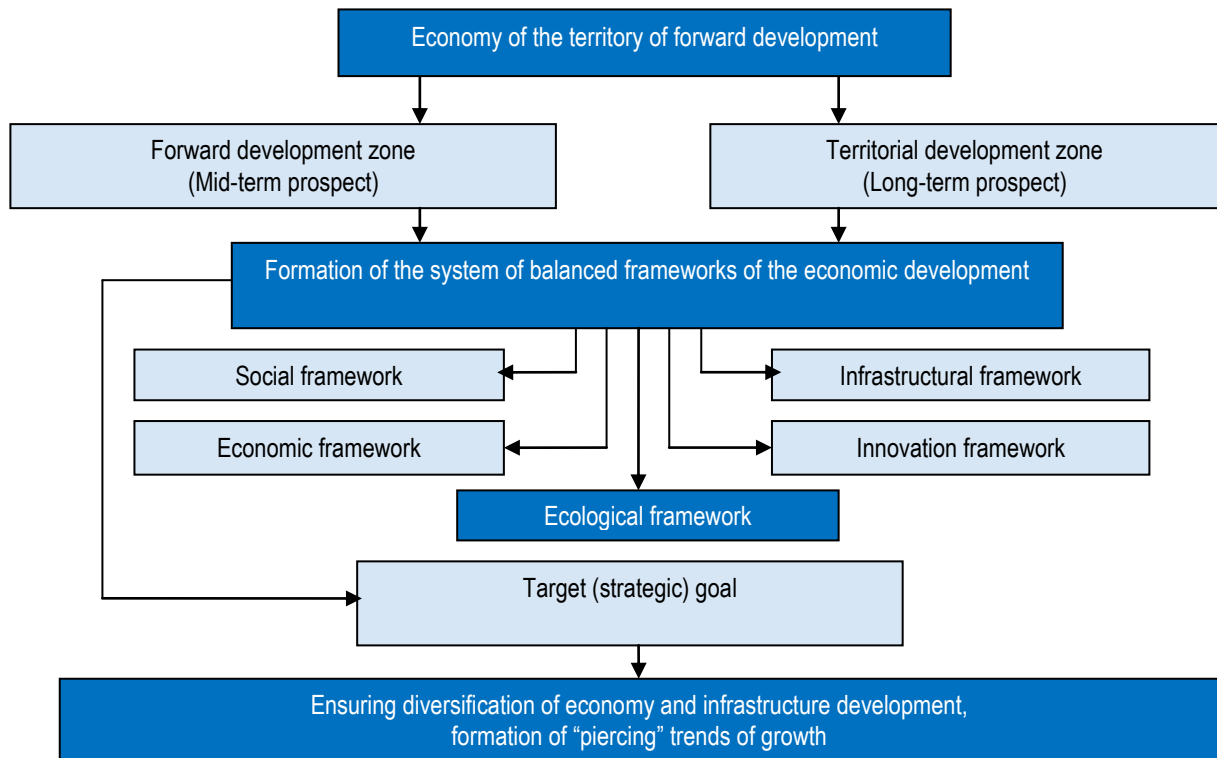
Source: Developed by the authors

Figure 1 - System of balanced frameworks of the region when forming economy of the territory of advancing development

To ensure sustainable social and economic development of the regions it is necessary to adjust economic, market methods of managing with social and ecological aspects of life of the population. In this regard it should be noted that it is not about change of interpretation of the concepts "stability" and "equilibrium of regional development", but about substantial filling and adaptation of these terms in relation to essential characteristics and role functions of the social and economic framework of the region in the conditions of new imperatives of strategic development of the Russian economy. It has not only important methodological value but pragmatic purpose connected with the increase of efficiency of processes of development and introduction of mechanisms and tools of realization of non-raw import substitution strategy.

To form accurate logics of interrelations between structurally functional subsystems of the regional system and to define the role functions of the framework it is important to consider the results of critical studying of the existing conceptual approaches to this problem. According to modern economic literature, social and economic framework, forming the skeleton of economic activity in the region, has to provide realization of the whole range of system and structure-forming functions and possess a set of properties which can be presented by the authors as follows:

▪ to provide strengthening of economic security of the region from the point of view of ability to modernization development in the changing external and internal conditions, including emergence of problems creating threats to strategic interests;
▪ to keep stability of social and economic development in the conditions of uncertainty and risk, possibility of adaptation to the changing external factors;
▪ to provide opportunities for effective interaction of separate regional subsystems in the country context, and also territorial economies within region borders;
▪ to provide possibilities of self-development of the economic subjects of the territories of the region, reproduction of their economic resources (on the basis of existence of the corresponding institutional, infrastructural and other conditions).

Opinions of the economists on the configuration of the social and economic framework of the region are defined also by the ideas of its dominating functions. We will track, from the author's position of the balanced sustainable development of social and economic system of the region, the structure of the framework and its

intrinsic characteristics in separate theories and concepts of regional development. Such focus of research of the conceptual and terminological design of the framework, critical judgment of its social, economic and structurally functional definiteness presented in the works of leading experts, will allow to reveal not only advantages and practical importance of the relevant provisions, but also possible limitation from the point of view of use of their key provisions as a methodological basis of the research (Table 1).

Table 1 - The characteristic of structure of the social and economic framework of the region taking into account its functions

Role functions of the economic framework	Paradigms, theories and concepts of the regional development	Characteristics of the structure of the economic framework	Limitation of application of the theory in the context of a research perspective
To provide possibilities of performance of planned indicators of development on the basis of effective interactions of agents.	Concept of economic space (Baransky 1956, Izard 1966, Lesh 1940).	Nodal points – the poles of business activity connected by the resource streams circulating between them.	The perspective of social and economic development of peripheral territories is ignored. Problems of structuring economic space are limited to consideration of relation streams between growth poles.
To provide processes of innovative development of the territory, diffusion of innovations.	Theory of poles of growth (Peru 1968; Budvill 1968; Lasuen 1969; Potye 1963).	Strengthens the theory of central places (leading branches, certain territories, regional complexes of the enterprises).	Idea of spontaneity of formation of poles of growth and impossibility of their formation purposefully. Mainly technocratic approach and insufficient attention to economic factors of development.
To maintain stability of development from the point of view of balance of development of economic, social and ecological subsystems.	From the position of consideration of the region as a social-ecologic-economic system (Kiselyova 2007, Sharygin and Nazarov 2007).	Spatial combination of the industrial structure skeleton of the territory and ecological framework of the territory. Systems of town settlements are considered as central points of the framework.	The perspective of asymmetry of intra regional social and economic development is ignored.
The rational territorial structure providing formation of uniform economic, cultural and scientific space.	Concept of a basic framework of settling (Lappo 2002, Mayergoyz 1986, Polyan 2014).	Set of the centers and the highways connecting them which represent the economical and geographical mechanism of integrity of the country. In nodal elements of the framework the results of social and economic development accumulate.	Development of the territory is considered mainly through the formation of agglomerations. Insufficient attention to branch factors of development, to the research of the role of nodal elements in generation and distribution of innovations.
Parameters of stability of the economic framework are set by a combination of balance ratios of the regional system.	Balance approach (Kleyner 2010-2012).	The framework of the territory is formed by the development of "knots" (a subject kernel) - binding elements of a network with a bunch of vertical axes "state - region-enterprise".	Considers the construction of the economic framework as initially set factor defining quality of functioning of the business environment and strategy of regional development. The model of the framework isn't focused on dynamics of the economic space.
Formation of polycentric structure of regional economy.	Concept of polycentric development (Mirokhin and Kutovoy 2012, Kushnarenko 2015).	Reference points of the economic framework should be formed on the semi-periphery and with involvement of the periphery potential	The market mechanisms defining an orientation of circulation of resource streams in social and economic spheres of the region are ignored

Source: Developed by the authors

It is obvious that in the context of studying of the contents and role functions of the social and economic framework of the region as a basis of realization of the non-raw import substitution strategy, each of the theories

(approaches) presented in Table 1 have certain restrictions. In particular, the structure of the social and economic framework of the region is represented, as a rule, in one functional aspect and doesn't consider possibility of use of synergetic potentials of subjects of interaction of various levels of hierarchy, various fields of activity. Not enough attention is paid to such binding elements of the social and economic framework as informal interactions of economic actors which along with formal ones define stability of its design.

The balance approach covers the purposes of our research most fully. According to it, the stability of functioning of the economic system of a certain hierarchical level is provided with set of structural balance ratios between components of this system, among which: export – import balance, inter-branch balance, balance of supply and demand and so forth (Kleyner 2015). At the same time the balance model of the economic framework is focused more on the dynamics of the processes (change of level of innovative activity, growth of GRP, an employment rate of the population and so forth) but not on the dynamics of space which is expressed in complication, expansion and deepening of the social, economic, productive and technological relations. Whereas for the creation of the general model characterizing the condition of the region it is necessary to create the system of structural indicators in which socio-economic indexes are adjusted to spatial characteristics". (Khramov 2008)

In this regard, in defining the contents and functional role of the framework in new imperatives of the development of the national economy it is advisable to be based on the convergence of the presented approaches and theories to the research of a perspective of formation of the economic framework of the region as a basis of realization of non-raw strategy of import substitution. Respectively, the main functional role of the social and economic framework of the region consists in the formation of a platform (production and technological, institutional, infrastructural and so forth) on which the model of economic development of the region is based, system of the reproduction relations is created which sets certain parameters of stability and modernization vector of the development of the regional subsystems is created. Important problem of the formation of the framework of the region from the point of view of the concept of the system organization of economy is ensuring stability of the basic construction as the major integrated quality of economic system of any level. In defining the concept of stability it is necessary to focus on the compliance of the functions realized by the economic framework of the region to the imperatives of development of both regional and national economy in general in the conditions of changing external tactical financial and economic parameters. Resistance of the economic framework to the influence of external challenges and threats is defined by the specific variety of regional factors and conditions among which are the following:

- resource potential of the modernization development which is basic for any economic system and considerably determines the structure of the regional economy;
- structural factors, and rationality of the branch structure is provided concerning the scales of activity of the enterprises (large, small and medium business), and the fields of activity that in turn defines the structure of export/import of the region;
- integration factors which represent the superlinear level defining coherence, target directivity and coordination of the regional development.

Thus, the concept "stability of the social and economic framework of the region" is multicomponent and isn't determined by a concrete number of components because of their large number, complexity, interpenetration, combination, and considerable heterogeneity. Herewith, we can't say which component is the most significant for ensuring the stability of the framework of the region in the course of realization of the non-raw import substitution strategy. So, resource level defines all other components of the economy, and its ability to attract external resources depends on the existence of internal resources of the regional system in many respects. Structural level actually represents region economy from the positions of aggregation of its subjects according to the scales and fields of activity. However, successful realization of the resource potential of economic subjects of the region requires its target directivity to providing modernization trajectory of the development of the whole regional system.

Multicomponent representation of the concept "stability of the social and economic framework of the region" is presented in Figure 2.
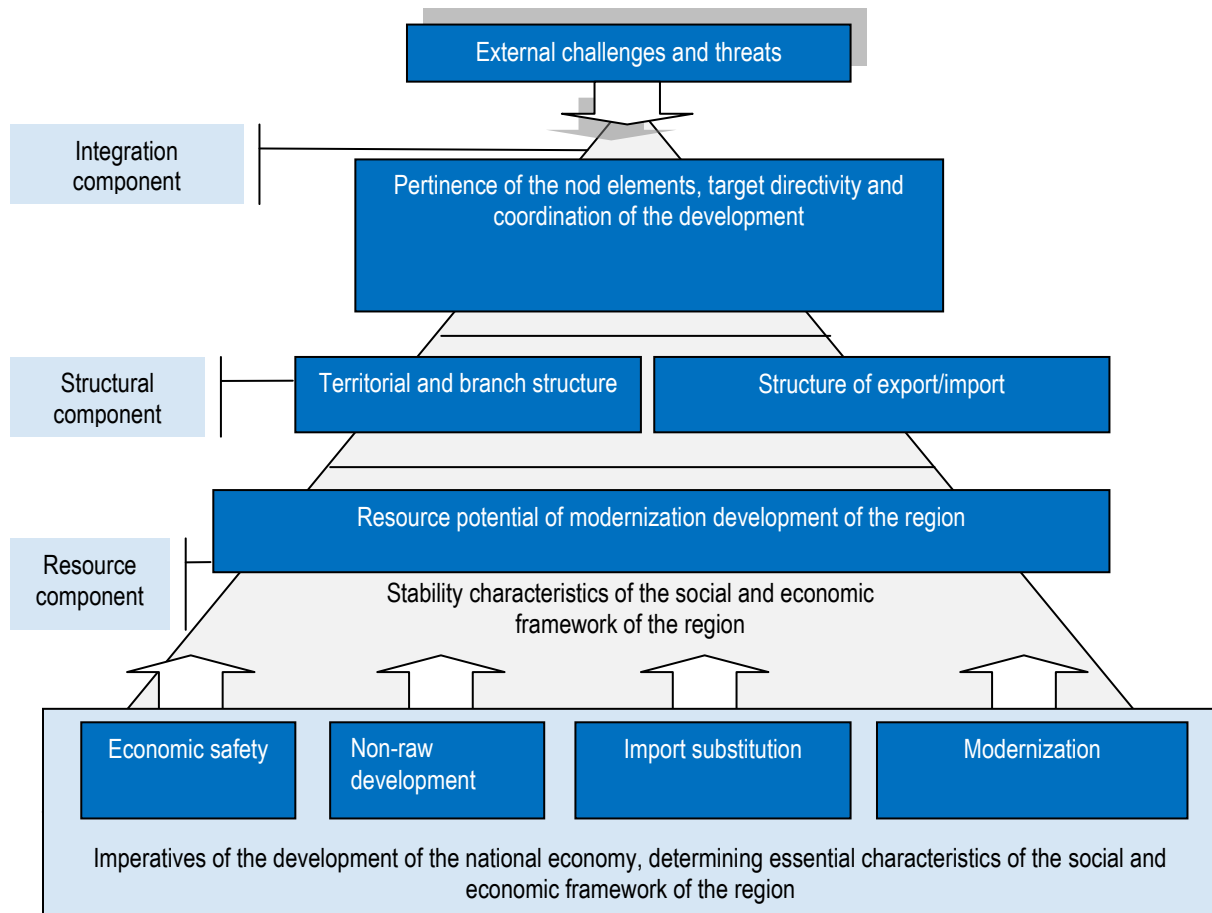
Source: Developed by the authors

Figure 2 - Multicomponent structure of the concept "stability of the economic framework of the region"

According to I.V. Frolova, multicomponent structure of the economic system assumes that management of its development must have multicomponent character, as from the point of view of an orientation on several components of the regional system simultaneously, and from the position of multicomponent character of the activity itself. This property must be remained both at the tactical and strategic levels of the regional economy management as a multicomponent institution. It is mostly important for the top contour of the multicomponent region management as it means ensuring unity of interaction of the interpenetrating components of the system, and also a uni-orientation of their movement to achieve objectives of the regional economy. (Frolova 2014)

In this regard it is necessary to pay attention to the role of the government in the maintenance of the coherence of nodal elements of the framework of the region, ensuring their coordinated development towards the achievement of the objectives of regional economy. So, for instance, A. Pilyasov distinguishes two types of economic behavior of the executive power of the region:

- pro-integration, expressed in the realization of the functions of the economic coordinator providing increase of the integration level of the economic space of the region, equilibrium of the development of the regional system;
- intended exploitation of disagreements and imbalances of the regional system for the purpose of receiving a rent of different kind. (Pilyasov 2003)

Mau V. also emphasizes inseparability of the processes of functioning of the institutes of state power and economic processes (Mau 1999). We can agree that the political component considerably defines the stability of the social and economic framework. Herewith, application of the "dot" approach (as opposed to the integrated approach) to the solution of problems when shortage of resources in one field of activity is blocked by means of their "withdrawal" from other sector that results in irrational change of the structure of regional economy, has, as a rule, negative influence on the indicators of stability of the social and economic framework of the territory.

According to L. Vardomsky, "dot", selective character of the conducted regional policy destroys fractality of the economic space of the country, leads to the hypertrophied strengthening of the heterogeneity property of the

economic space and suppression of the property of self-organization of regional economic systems (Vardomsky, An electronic resource). In this regard, B.G. Kleyner's position should be noted, which says that the economic framework is formed by a bunch of vertical axes "the state - the region-enterprise" (Kleyner 2015). According to the authors of this article, solution of the problems of overcoming monopolism in functional and administrative spheres of interactions is very important for strengthening positive influence of the state power on the ensuring system and structure-forming functions by the social and economic framework of the region.

The multicomponent essence of the concept "stability of the social and economic framework of the region" is expressed in the processes of management of framework structure formation. So, regional system really exists during any considered period and in a sense fully formed, it has its own genesis and specific properties. If these properties aren't considered when making administrative decisions on the formation of separate elements of the framework, the whole construction can appear unstable. Therefore to ensure management efficiency one level of making administrative decisions (branch, regional, federal) is not enough, as in this case some part of synergetic effects can drop out of the management process and affect the indicators of the system development in strategic prospect. (Deruzhinsky 2009)

Variations of the structures of regional social and economic frameworks can differ in features of institutional construction. Thus various structures of the framework can possess different resistance potential to modern economic challenges that leads to the emergence of the interregional competition.

The property of multicomponent structure inherent to the concept "stability of the social and economic framework of the region" should be considered when forming strategy of non-raw import substitution. In this regard it is necessary to pay attention to the enclosed synergism of the concepts "economic framework-rational branch structure-import substitution-national security".

4. Discussion and conclusion

Ensuring integrity and maintenance of national security of the country, creating a strong foundation of its competitiveness for a long-term period are possible only on the condition of realization of import-substituting technologies in real sector of economy, including development of full-cyclic productions of hi-tech production. In this regard cardinal change of branch structure of national and regional economies is necessary. So, for example, according to the results of the research of economies of the developed countries of OECD conducted by A.A. Akayev the optimum branch structure of the modern economy can be presented as follows: 20% – processing industries, 25% – finance sector, 22% – sector of services. In turn, processing industries should consist of hi-tech (20%) and middle-tech (30%) sectors. (Akayev 2013)

Respectively the forming social and economic framework of the region is urged to solve problems of creation of such steady basic platform which will provide formation of a uniform regional space, completeness of the formation of production chains, gradual elimination of disproportions of territorial development. Consequently, we can say that the structure of the social and economic framework of the region as a complex system is defined by the following determining factors:

- target guide posts of the national economy development which, being projected on the level of certain regions, form features caused by specifically territorial factors and conditions;
- territorial features of the region (branch specialization, infrastructural, institutional, socio-economic indices of development and so forth);
- specifics of the accumulated economic (personnel, material, financial, investment, innovative, organizational and institutional, informational, etc.) and social potential in separate branches and fields of activity.

Complicacy and complexity of the formation of the concept "social and economic framework of the region" finds reflection in a certain enclosure of the concepts introducing and transferring qualitative characteristics, forming main system properties of internal structure of the framework (Figure 3). And the enclosed synergism is shown by means of consecutive addition of qualitative properties which allow speaking about system and structure-forming role of the framework.
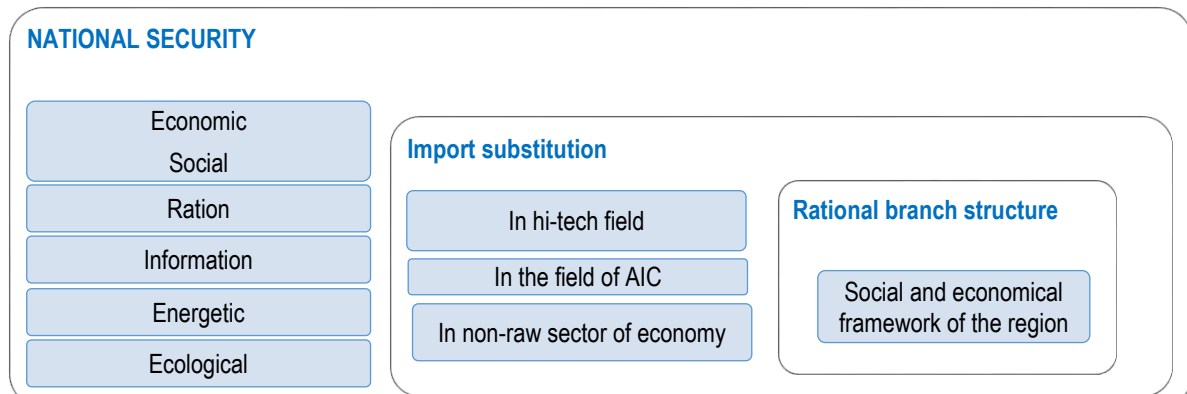
Source: Developed by the authors

Figure 3 - Enclosure of the concepts "social and economic framework-rational branch structure-import substitution-national security"

Thus, the social and economic framework of the region obtained in the course of its development new properties and functional roles caused by qualitative changes in the conditions and imperatives of the organization of the economic activity of the country in the development. Focus of attention in the formation of the basic framework of the regional development is shifted from the economic growth expressed in indicators of increase in LRT volumes to the economic development where innovations are the main driving force. At the present stage of the development of the national economy the major and most essential role of the social and economic framework of the region consists in providing opportunities for its qualitative changes accompanied by the reorganization of the branch structure in favor of modernization development of the non-raw sector on the basis of stimulation of processes of self-development.

At present the current industrial structure of the economy of the Russian regions has considerable distortions towards raw branches, defining their import-oriented development in those sectors of economy which has the strategic importance for ensuring national security. So, according to Polovinkin and Fomichev's estimates, the following branches are the most critical:

- medical industry and pharmaceutics (share of import - 70-80%), heavy engineering (60–80%);
- machine-tool construction (over 90%);
- radio electronics (80–90%);
- light industry (70–90%).

In this context it should be noted that 80-85% of the analytical research equipment are acquired abroad. In agriculture fruit import exceeds 48%, meat – more than 55%, cheeses – more than 55%. The import share in light industry is also high: production of fabrics, knitted products – more than 90%, footwear – more than 75%. Strong dependence on import is observed on chemical fibers and threads – about 50%, polypropylene and polystyrene – more than 30%. (Polovinkin and Fomichev 2014)

Herewith, it is important to provide rational import substitution in non-raw sector of economy which is expressed not in mechanical reduction of the share of raw branches in LRT and allocation of regional resources in ineffective projects by the principle "if only they weren't connected with raw materials" (Friedman 2014), buy in the formation of rational proportions of development of raw and non-raw sectors of economy, forming finished reproduction chains in the region. As Kosenko and Polichkina note, solutions of problems of import substitution have to be the cornerstone of a reason of economic, but not political expediency. Thus, any economy of the world can't deny import completely, especially in short terms (Kosenko and Polichkina 2015). It is even less possible in hi-tech sectors of economy.

5. Restrictions and recommendations

Considering the problem of formation of the social and economic framework of the non-raw development of the region through a prism of its multicomponent structure, it is possible to draw a conclusion that the administrative influences directed on implementation of structural changes in economy and social sphere of the region should affect all the components of system, and development of separate components has to be coordinated and balanced. Otherwise limitation on one of structurally functional components creates obstacles for social and economic development of the region as a system due to general system properties of the regional

economy. Thus, stability of the framework of non-raw development of the region is defined by the balanced development of the following main components: realization of the resource potential of the region; structural changes in the regional social and economic system; administrative influences providing target directivity, coordination of the development of the nod elements, as well as links and relations between them.

The above mentioned aspects define the need for the accounting of the historically developed under the influence of natural and geographical regularities and the principles allocation of productive forces of the framework structure of the region from the point of view of gradual adaptation of its dynamic design to external and intrasystem challenges. At the same time, the existing regional structure developing in the conditions of macroeconomic imperatives of non-raw import substitution model, forms contents, vector and force of managing influences for the realization of these strategies.

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Does Minimum Wage Policy Help Poor Workers? Evidence from Indonesia

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Abstract

The objective of this study is to examine the effects of minimum wage policy on poverty of workers in Indonesia. Using National Labour Force Survey (Sakernas) data of 2011-13, specifically, this study examines how the minimum wage policy affects the probability of worker categorized as poor or non- poor. The finding shows that an increase in the minimum wage generally decreases the probability of workers being categorized as poor. Nevertheless, the significant impact is found specifically on workers living in urban areas only, suggesting that the minimum wage policy is not an effective instrument to improve the standards of living of workers living in the rural areas.

Keywords: minimum wage, poverty, Indonesia, Sakernas, Probit, urban areas.

JEL Classification: J31, I32.

1. Introduction

The minimum wage policy is one of the most important policies relating to the employment in Indonesia. The main objectives of this minimum wage policy basically are: (1) to provide a decent payment to workers (especially for those with low level of earnings), which, in turn, is expected to provide a positive effect on the improvement of business productivity and economic condition in general, and (2) as a mean to determine the lowest earning or the basic wage which is decent based on the need of workers, employers' ability, regional economic condition, and the business location (Widarti 2006). Therefore, the minimum wage is not only used as a basic wage or the lowest earning given to the workers but it is also expected to have implication on the increase of all workers' standard of living.

Some important studies dealing with the effects of minimum wage policy in Indonesia have been conducted such as Rama (2001), Suryahadi *et al.* (2003), and Pratomo (2010 and 2011). Rama (2001), for example, found that an increase in minimum wage in Indonesia decreases the level of employment and reduces investment particularly in the urban areas. Suryahadi *et al.* (2003) showed a comprehensive result where there are several groups who benefit from minimum wage policy and some others of the opposite condition due to this minimum wage increase. They confirmed specifically that an increase in minimum wage will raise the white collar employment, but in contrast, an increase in minimum wage will decrease female employment, youth employment, and workers with low educational background. Female workers, youths, and low educated workers are often considered as a group which is vulnerable to any changes in the minimum wage policy.

In addition, Pratomo (2010), similarly to Gindling and Terrell (2005) in Costa Rica, showed that there is a tendency of workers negatively affected by the minimum wage policy and workers specifically will move from the formal sector employment to the informal sector employment with a lower quality of working environment and lower earnings. Meanwhile, Sugiyarto and Endriga (2008) using the industrial rate data of 2003-2004, showed that the minimum wage policy negatively influenced less educated workers, while the worst impact is experienced by workers in small enterprises.

Unlike the previous studies, the objective of this study is to examine the effects of minimum wage policy on the poverty level of workers in Indonesia. The study conducted by Card and Krueger (1995) in several states in the US is one of the most important studies focusing on the effect of minimum wage policy on poverty. As mentioned by Card and Krueger (1995), the impact of the minimum wage policy on poverty is actually not too significant. The reason is because approximately two-third of workers in productive age at that time of study in the US case does not work in formal sectors which are not affected by the minimum wage policy. In fact, the

minimum wage policy is only binding to the formal sector. However, Card and Krueger (1995) have succeeded in showing that the increase in minimum wage in America between 1989 and 1991 reduced the poverty level especially in the states which have a significant effect on the average wage.

The second important study is the one conducted by Neumark and Wascher (1997) who also did a case study in the United States. By employing panel data method between states in America, Neumark and Wascher (1997) showed that the effect of minimum wage policy is quite varied. On the one side, it is found that an increase in minimum wage has succeeded in helping many poor families to have better life or escape from the poverty, while on the other side the minimum wage increase elevates the probability of non-poor families to live in poverty. Ironically, in fact, the number of families who become poor after the rise of minimum wage is bigger than the number of those who are freed from poverty although the difference is not statistically significant.

For the case of developing countries, there have not been many studies concerning on the effect of minimum wage policy on poverty. One of the most important studies in developing country which is used as a reference for this present study is the one conducted by Gindling and Terrell (2008) who attempt to see the effect of minimum wage increase on poverty in Honduras. They found that the rise of minimum wage reduces the poverty mainly of the workers at large scale private sectors. However, the minimum wage rise does not have an important effect on workers of small and medium enterprises (where many of them are not covered by the minimum wage policy), as well as the public sector. In other words, the finding in Honduras demonstrated that the minimum wage has become an effective instrument to overcome poverty especially in formal sectors and workers in large scale companies.

Looking back on the main purpose of the arrangement of minimum wage policy, it is clear that it aims to improve the living standards of workers especially those who are at the bottom level (at the lowest level) of their wage distribution. Thus, it is indirectly expected that poor workers who are usually at the lowest distribution of earnings can increase their living standards with the rise of their family's income through the increase of minimum wage. However, the problem is not that simple. A continuous raise of minimum wage and being above the market equilibrium's level, the employment is predicted will also decline which eventually impacts on the increasing number of unemployment and the worsening of poverty.

With the segmented condition of Indonesian labor market, *i.e.* consisting of labor market for the formal and informal sector, the effect of the minimum wage policy becomes more complex. In Indonesian case, the minimum wage policy will bring an indirect effect on the informal sector where there are many workers or people categorized as poor. Therefore, it is possible that the minimum wage policy (which is mostly implemented to the formal sector) turns out to be not effective to reduce poverty (since poverty is mostly found in informal sector), although workers at the bottom level usually categorized as poor or vulnerable to poverty.It is even predicted that the minimum wage policy, which, almost certainly, keeps increasing every year will, in fact, elevate poverty especially if employers respond the policy by increasing the price of their products, thereby causing inflation. Based on these phenomena, it is important to examine the effect of minimum wage policy on poverty especially for workers in Indonesia.

According to Gindling and Terrell (2008), if the minimum wage is much above the poverty line, the minimum wage normally does not have significant effect on the decreasing in poverty since the policy will be mainly enjoyed by middle class workers instead of the lowest class. However, it is not very clear what the ideal ratio (based on literatures) between minimum wage and poverty line is, in order to see the minimum wage which can affect the poverty level.

As a comparison, in Guyana for instance, the minimum wage is 6.5 times as much as the poverty line which makes it a country with the highest difference between minimum wage and poverty line. As predicted, the minimum wage in this country does not have any significant effect on decreasing poverty. At the medium level, for example, there is Chile with a minimum wage 3.8 times higher than the poverty line and Honduras with the minimum wage 3.5 times its poverty line. In these two countries, minimum wage significantly decreases poverty level. Meanwhile, in Indonesia, the ratio between the minimum wage and the poverty line is approximately 4.04 (own calculation). This number is in between Chile/Honduras and Guyana; therefore, there is a potential that the minimum wage policy might have a significant effect on the reduction of poverty.

The rest of this paper is as follows. In the second section, the research methodology will be explained. The following section contains the empirical results and discussion. As for the final section, this paper presents the conclusion.

2. Research methodology

To answer the research objectives, this study employs a probit model, which is similar used by Gindling and Terrell (2006 and 2008), to see how the minimum wage policy affects probability of worker to be categorized as poor or not poor. The model is as follows:

$$Poor_{irt} = \alpha\theta + \alpha\theta \ln MW_{rt} + \beta\theta X_{itr} + \varepsilon_{it} \qquad (1)$$

where Poor is equal to one (1) if the worker is categorized as poor, and equal to zero (0) if the worker is not categorized as poor. A worker is categorized as poor if the worker's income is below the poverty line, whereas if their income is above the poverty line, they are not categorized as poor workers. The main focus of respondents is workers, or those categorized as paid employment since these groups are to whom the minimum wage policy is focused.

The independent variable used in this study includes the *MW* (main variable) as the minimum wage which is set based on provincial and city/municipalities levels in Indonesia. Several control variables that used in the model consist of:

- Age of workers,
- Unemployment rate of each region as the proxy from demand side,
- Dummy variable of highest educational level achieved (primary school as the reference),
- Dummy variable for the sector of activity (agriculture sector as the reference),
- Dummy variable for family background, whether the respondent is the head of the family or not,
- Dummy variable for marital status (single as the reference).

The main data used is the National Labour Force Survey (Sakernas) during the period of 2011 to 2013. Sakernas is an annual survey of labour force which has been conducted by BPS since 1986. The prominent purpose of Sakernas is to estimate and monitor the labour force and its characteristics in Indonesia, where each year it surveys approximately 200,000 respondents or about 0.1 percent of the population.

3. Empirical results

Using probit model, Table 1 shows that an increase in minimum wage generally has a negative impact on the probability of workers to be categorized as poor. In other words, minimum wage policy brings a positive effect on the decreasing rate of worker's poverty level. Specifically, it can be stated that a 10% rise in the minimum wage will reduce the probability of workers categorized as poor as much as 3.5%. This is in fact a very positive result from the increase of workers' living standards with the presence of minimum wage policy which can also help to reduce poverty probability of workers.

This finding is in line with some other studies in other developing countries such as Gindling and Terrell (2008) in Honduras, where the effect is even bigger than in Indonesia. In Honduras, Gindling and Terrell (2008) found that the rise of minimum wage results in the decrease in poverty with the elasticity of -0.10 to -0.18. In Honduras, the decline in poverty is particularly seen in big private companies where the minimum wage policy is more strictly binding, while in small enterprises, the effect of minimum wage on the decrease of poverty cannot be significantly observed.

From the control variables which also influence worker's probability to be categorized as poor, most of them show a significant effect. The worker's age variable, for example, has a non-linear impact on the probability of worker's poverty in which the older the worker's age (which is in line with the work experience), the smaller the probability of being categorized as poor. However, the condition is otherwise at certain age. Next, seen from the place of residence, workers who live in the urban areas turn out to have higher probability to be categorized as poor than those who reside in the rural areas. This is possible considering that more workers who are of the latter category are self-employed and family workers rather than listed as employees or paid employment. In fact, poverty in the rural areas is highly dominated by self employed and family worker categories especially from the agriculture sector. By gender, male workers have less probability to be included in poor category compared to those of females. It happens regarding the fact that in Indonesia male workers, on average, earn more than female workers. Concerning the educational background, all levels of education (University, Senior High School, and Junior High School) show a negative coefficient which means that there is a smaller probability to be categorized as poor compared to those with primary school background (where primary school education is the reference). It can be clearly seen, therefore, the important role of education where the higher the education achieved by workers, the smaller the probability of the workers to live in poverty. It is proved by the coefficient of

workers graduating from university (-0.706), which is less than those of high school graduates (-0.433) and junior high school's (-0.279).

Table 1 - The effect of minimum wage on probability of workers being poor

	Coef.	P>z
Log Real Minimum Wage	**-0.352**	**0.000**
Age	-0.052	0.000
Age2	0.001	0.000
Urban Areas	0.091	0.000
Head of Family	-0.249	0.000
Males	-0.337	0.000
Married	-0.112	0.000
University	-0.718	0.000
Senior High School	-0.442	0.000
Junior High School	-0.285	0.000
Industry	-0.148	0.000
Trade	-0.105	0.000
Service	0.528	0.000
Unemployment Rate	-1.231	0.000
Constant	2.216	0.000
No obs	314546	
LR chi2(14)	13017.32	
Prob>chi2	0.000	
Pseudo R2	0.1028	

Looking at the sector of activity, agriculture and service sectors have a positive coefficient, which illustrates a higher tendency or probability to be categorized as poor workers than other sectors. Many of the agriculture sectors in Indonesia in practice is still traditional where in which the biggest poverty exists, whereas many service sectors involve unskilled labour rather than high skilled labor, which in turn influences their income. On the contrary, workers from the trade and industrial sectors have a negative coefficient which means that the probability to be categorized as poor is smaller as this sector has the least workers in the category of poor.

This study is then continued by looking at more specifically at the effect of minimum wage on the probability of workers' poverty based on the place of residence and gender. As seen in Table 2 minimum wage has a negative and significant influence on workers' poverty probability (both men and women) in the urban areas. A 10% rise on the minimum wage will reduce the poverty probability of male workers in urban areas as much as 4.82% and 4.77% for female workers in the urban areas.

Table 2 - The effect of minimum wage on probability of workers being poor
(based on residences and gender)

	Urban Areas				Rural Areas			
	Male		Female		Male		Female	
	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
Log Real MW	**-0.482**	**0.000**	**-0.477**	**0.000**	**-0.090**	**0.076**	**-0.047**	**0.370**
Age	-0.059	0.000	-0.044	0.000	-0.053	0.000	-0.054	0.000
Age squared	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000
Head of Household	-0.249	0.000	-0.050	0.075	-0.197	0.000	-0.213	0.000
Married	-0.239	0.000	0.006	0.740	-0.183	0.000	-0.048	0.067
University	-0.634	0.000	-0.948	0.000	-0.356	0.000	-0.618	0.000

	Urban Areas				Rural Areas			
	Male		Female		Male		Female	
	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
Senior High School	-0.448	0.000	-0.565	0.000	-0.298	0.000	-0.334	0.000
Junior High School	-0.274	0.000	-0.346	0.000	-0.231	0.000	-0.304	0.000
Industry	-0.292	0.000	-0.167	0.000	-0.135	0.000	-0.065	0.076
Trade	-0.078	0.001	-0.127	0.000	-0.127	0.005	-0.396	0.000
Services	0.432	0.000	0.530	0.000	0.485	0.000	0.504	0.000
Unemployment Rate	-2.502	0.000	-1.158	0.000	0.921	0.055	1.322	0.009
Constant	3.155	0.000	3.118	0.000	-0.161	0.640	0.086	0.808
No.obs		131038		74089		75594		33825
LR chi2(12)		3828.73		3669.26		1081.5		853.2
Prob > chi2		0		0		0		0
Pseudo R2		0.0993		0.0837		0.0568		0.0413

However, the minimum wage does not significantly affect poverty in the rural areas. It is understandable remembering that the implementation of minimum wage policy is more focused or more binding for workers on the cities or urban areas than in rural areas even though the policy basically applied to all paid employment. Therefore, it seems that the minimum wage policy not an effective instrument which can assist workers in the rural areas to escape from poverty. Meanwhile, in the urban areas, the minimum wage policy can be an effective tool for workers to leave poverty. The other covariates seem to follow the first estimate.

Conclusion

From the findings, it can be concluded that an increase in the minimum wage generally decreases the probability of workers to be categorized as poor. Nevertheless, the significant impact is specifically found on workers residing in the urban areas. It demonstrates that the minimum wage seems not an effective instrument to improve the standards of living of workers living in the rural areas.

There are several implications of the policy that the government policy in formulating and determining the minimum wage of the concerned region should be carefully conducted, and not a single policy but has to be followed by poverty alleviation policy such as the improvement of human resources, i.e. workers from both formal sectors and informal sectors. It is also necessary to arrange a policy integrated from various lines of agencies in the level of province as well as municipalities which is aimed at increasing the access, most importantly, to such basic services as health, education, and economic activity.

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The Impact of Competition among Suppliers on Procurement Results – Public Procurement is no Exception

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Abstract

Electronic reverse auctions, having the ability to decrease the prices of products, have grown popular in the procurement communities in recent times and this trend is expected to continue. Electronic reverse auctions are very much dependent on the market conditions and the literature emphasizes the importance of the number of bidders participating in the auction for the result of the auction. Within the paper, we provide the evidence on the impact of competition among suppliers taking part within electronic reverse auctions on the efficiency of the tender. We support the existing studies by evidence provided on recent sample of public procurement data using linear regression.

Keywords: procurement, efficiency, competition, electronic reverse auction.

JEL Classification: C33, D44.

1. Electronic reverse auction increasing the efficiency of procurement

The rise of the Internet and various forms of web applications has affected almost all aspects of the business (Swaminathan a Tayur 2008). A lot of organizations are aware of the possibility to improve on the organization of internal processes (Delina 2012, Soltes and Gavurova 2013, Soltes and Gavurova 2015, Ştefănescu *et al.* 2009). In this regard, rising importance of electronic procurement (Lancioni *et al.* 2003) within supply chains can be identified.

Electronic reverse auctions, being one of the most powerful negotiation mechanisms within electronic procurement, have grown popular in the procurement communities in recent times and this trend is expected to continue (Jap 2002, Beall *et al.* 2003, Schoenherr and Mabert 2007). In general, electronic reverse auction is a dynamic environment in which suppliers can compete/bid against each other. Winner is the one who offered the lowest price. In the auction, suppliers are under pressure to react on the competing supplier's bid. This results in a lower final price for the buyer. Since the entire process is online, electronic auctions are understood to increase transparency and speed comparing to the traditional purchase methods. Beal *et al.* (2003) provided the following definition on electronic reverse auctions: In its simplest form, the electronic reverse auction is online, real-time ongoing, dynamic auction between the purchase organization and a group of pre-qualified suppliers who compete against each other in order to obtain a contract for goods or services. These goods and services are clearly specified by criteria such as design, quantity, required quality, delivery conditions and other related terms and conditions.

Electronic reverse auctions provide great number of benefits when comparing to the traditional negotiation. Several authors have mentioned as the main advantage significant reduction of the purchase price (Brunelli 2000, Hannon 2001, Janke and Kubacka 2013). Cost savings per unit of output range from 5-40% (Tully 2000), gross savings are in the range 15-20% (Cohn 2000) - these numbers are all the more significant because manufacturers typically spend up to 55% of sales prices for the purchase of materials (goods and services) needed for production. (Monczka *et al.* 2002)

In addition to direct costs savings, there are also other benefits such as shorter product cycle for both, buyers and suppliers, a larger supplier base for buyers, access to the new markets for suppliers, reduction of geographical barriers, information transparency, visible prices and generally higher competitiveness, productivity and efficiency of the buying process. (Beall *et al.* 2003, Carter *et al.* 2004, Smeltzer and Carr 2002)

2. Determinants of efficient electronic reverse auction

Since there is a constant pressure on further cost reduction, some organizations look for additional opportunities to achieve it. One of the possible ways is to improve on the auction settings. However, if the organization decides on understanding different auction settings and strategies in better detail, they most likely stumble on the lack of relevant literature. This can, not only, prevent from achieving further cost reduction, but in some cases can even negate savings related to the electronic auction adoption.

Procurement negotiation techniques´ (e.g. electronic reverse auctions or sealed bids) and procedures´ efficiency is very much dependent on the market conditions. This statement holds regardless of procured subject - goods, services, construction works, or even innovation which not yet in the market within Pre-Commercial Procurement approaches. If the conditions are positive, also the procurement outcome will be positive. The literature emphasize that number of bidders participating in the auction is a crude indicator of supplier interest. In other words, the higher is the number of suppliers, the better. (Onur *et al.* 2012, Pavel and Sicakova-Beblava, 2013)

Auction literature emphasizes the importance of the number of participants as one of the factors guaranteeing the lower prices in the auction. In case of tenders, where each participant has the option to submit one bid only and does not have information on the number of competing suppliers, this rule is not that important, but in the auction price is dynamically pushed down through the competition of the individual suppliers who outfight their offers. Singer *et al.* (2009) argue that one supplier lead to poor outcomes, with two suppliers only mixed outcomes, and the best savings are attributed to higher number of bidders. The literature can also find examples of successful auctions with only two suppliers, but in such cases there is a high risk of loss of anonymity and the possibility that individual suppliers recognize themselves (Beall *et al.* 2003). This may ultimately lead to collusion among suppliers, in which one of the suppliers decide against rivalry and consequently such suppliers decide to share the whole contract. Most studies argue that at least three to five suppliers is required for successful auctions (Beall *et al.* 2003, Schoenherr and Maber 2007, Major 2007). The auction theory is in line with these statements (Jap 2002, Crane 2008, Yilmaz 2012). Wagner and Schwab (2004) again provide a general statement that the auction should not be carried out with a small number of suppliers.

Auction volume is another crucial factor. Suppliers tend to compensate lower prices and margin by the higher volume in order to maintain or increase the total revenue. On the other hand, buyers benefit from the lower transaction costs and economies of scale (Beall *et al.* 2003, Carter *et al.* 2004). The numerous studies have discussed the procurement volume that must be sufficient enough to provide adequate profits to attract enough suppliers, and provide enough savings to cover their additional costs (Jap 2002, Beall *et al.* 2003).

When discussing the determinants of electronic auction results, we cannot omit the specification of the procured good or service – specification of quality, delivery and service conditions, etc. Through the definition of these parameters, buyer can influence the auction condition in either positive or negative way. Some of the authors argue that electronic auctions are suitable for the price criteria only and for any intangible parameters or non-price factors direct negotiation with suppliers is required (Jap 2002, Beall *et al.* 2003). This is perception is changing recently and more complex software solutions for electronic auctions provide opportunity to bid on almost any logical parameter.

3. Methodology

Research goals

According to findings of previous research we decided support the evidence provision on the impact of competition among suppliers taking part within electronic reverse auctions on the level of contract price resulting from the tender. In other words, the higher is the rate of competition the higher should be difference between Initial and Contract price. In contrast to existing studies, we attempt to provide the evidence on recent sample from 2015 of public procurement data on commonly traded products.

Based on previous research goals, we formulate our working hypothesis to be:

Working hypothesis: Higher competition among suppliers leads to decrease in the product price within electronic reverse auction.

Data used

Research is based on data from Electronic Contracting System (ECS) in Slovakia. The ECS is the state-controlled centralised marketplace used by different public bodies to procure products meeting the specific criteria

and price levels according to Slovak National Act on Public Procurement using electronic reverse auction mechanism for price negotiation.

When describing the data used, we need to point out very important information – on ECS, the "common products" (goods or services) are being procured. By "*common products*", the National Act understands the products, which 1) are not produced or provided on specific "tailor-made" needs, 2) are sold in the form without major modifications of features, 3) are used for satisfaction of operational needs, 4) and have consumable nature. And as the result of this, on ECS, the standardized agreement is used for all procurements. All of these attributes can be seen as very beneficial for the purposes of our research – the commonness of products ensures there should be high enough competition within every tender and procurers do not have many options to hinder it.

To perform planned analysis the indicators presented in Table 1 will be exploited.

Table 1 - Description of variables

Name of variable	Description
ID of procurement case	Each procurement case has specific ID number to enable its identification
Date of contract	Date when the contract between procurer and supplier was made
Number of competitors	Number describing how many competitors gave at least one bid within eRA
Number of bids	Number describing how many bids were received within eRA by all competitors
Initial price	The first bid in eRA in EUR
Contract price	The final price in eRA, so the price which was paid to supplier by procurer in EUR

Source: Authors

Model specification

To fulfil defined research goal, following linear regression model based on panel data will be used:

$$\mathrm{CP_i} = \beta_1 \mathrm{IP_i} + \beta_2 \mathrm{CLS_i} + \beta_3 \mathrm{CLB_i} \tag{1}$$

where:

CP_i is contract price which is the result of eRA performed in EUR

IP_i is the Initial price, so the first offer, within the eRA auction in EUR

CLS_i is the value of Competition level based on number of SUPPLIERS

CLB_i is the value of Competition level based on number of BIDS

Within the model creation, in order to understand the impact of competition level of price movement within eRA, we needed to cope with the fact that database also included the observations of no competition. It contained the records of procurement cases where there was only 1 supplier willing to sell the product. It is obvious such a supplier is not forced to change the price at all, as no competition pressure occurs. On the other hand, we did not want to lose these observations to demonstrate, that no competition has no impact on price movement. To fulfil mentioned requirements, we decided to adjust the variables describing competition level - both number of suppliers and number of bids – by decreasing the original values by 1, which is the value of suppliers/bids, when competition pressure does not occur.

These variables were calculated as:

$$CLS_i = Number\ of\ competitors - 1 \tag{2}$$

$$CLB_i = Number\ of\ bids - 1 \tag{3}$$

Moreover, we decided not to include the Intercept (Constant) – as we assume the Initial price to be the base value for setting the Contract price according to the level of competition present.

Both made adjustments were needed to prevent the misleading interpretations of model results predicting the cases, where no competition occurs. When creating the model, as mentioned in literature review, we should not omit the impact of specification of the procured good or service (quality, delivery and service conditions, etc.). Through the definition of these parameters, buyer can influence the auction condition in either positive or negative way. However, when discussing the possibility to avail this determinant within model, it quite obvious we are not able to create objective indicator. The quality of the procurement object´s specification lies tacitly within the sentences of the documentation (tender details, agreement proposal, technical specification, etc.). Therefore, we must accept the fact the procurement object´s specification will be embedded in its consecutive indicators measuring the level of competition. On the other hand, as we use the data describing the procurements of common goods and all procurements have to use the same contract template, we can omit the impact of this issue.

Expectations

Before the regression analysis we estimate the effect of each independent variable in specified panel regression model. Within the electronic reverse auction, the *Initial price* acts as the base value for setting the Contract price, as the price movement starts at this point. We therefore predict *positive relation*. On the other hand, *negative relation* is expected for *both competition indicators*: Competition level based on number of competing suppliers - CLS_i and Competition level based on number of bids proposes within competition - CLB_i. The higher is the competition the higher should be movement within eRA, what is supported by previous studies devoted to this topic (Beall *et al.* 2003, Schoenherr and Maber 2007, Major 2007, Singer *et al.* 2009).

4. Data description

The regression analysis was based on 8,751 records of procurement cases performed on Electronic Contracting System, called as ECS in Slovakia, in June, July and August 2015. We decided to use the most recent data for relatively short period of time because the Electronic Contracting System was launched in March 2015 and first months of usage might include many irregularities caused by the adoption of new processes.

Basic description statistics is showed in the table below. As we can see in our sample are small as well as big procurement cases from the view of price, while the mean price is 7,193.68. The rate of competition is described by number of competitors and number of bids. The level of competition was in maximum case pretty high, as maximum value is 19 competitors and 543 bids in auction. Overall, the mean level is 3.62 competitors per auction and 25.16 bids per auction what indicates that Electronic Contracting System is already established in Slovakia, recognized not only by procurers, but also by suppliers.

Table 2 - Description of variables

	N	Range	Min	Max	Sum	Mean		Std.Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Competition_level_BIDS	8,751	543	1	544	220,192	25.16	.411	38.469	1479.832
Competition_level_SUPPLIERS	8,751	19	0	19	22,935	2.62	.028	2.617	6.850
Contract_price	8,751	356,377	0	356,377	62,951,878	7,193.68	251.387	23,516.458	5.530E8
Initial_price	8,751	361,375	2	361,377	72,966,511	8,338.08	280.341	26,225.008	6.878E8
Number_bids	8,751	543	1	544	220,192	25.16	.411	38.469	1 479.832
Number_competitors	8,751	19	1	20	31,686	3.62	.028	2.617	6.850
Object_of_contract	8,751	1	1	2	16,454	1.88	.003	.325	.105
Valid N (listwise)	8,751								

Source: Authors

To make a decision about the appropriate statistical method there was need to know if values of variables are normally distributed. For this purpose we made Kolmogorov-Smirnov test of normality. As we can see (table below) our data is not normally distributed.

Table 3 - Kolmogorov-Smirnov test of normality

	Kolmogorov-Smirnov		
	Statistic	Df	Sig.
Object_of_contract	.524	8 751	.000
Number_bids	.265	8 751	.000
Competition_level_BIDS	.265	8 751	.000
Number_competitors	.182	8 751	.000
Competition_level_SUPPLIERS	.182	8 751	.000
Initial_price	.375	8 751	.000
Contract_price	.380	8 751	.000

Source: Authors

Looking at the results of non-parametric Spearman´s correlation coefficient, we can see there is strong correlation between a few pairs of variables (based on Cohen; 1988). E.g. there is naturally strong relation between number of competitors and number of bids. As we can see the competition is statistically significant but its direct impact is not as strong as correlation between contract price and number of competitors is 0.50 and between contract price and number of bids 0.71.

Table 4 - Correlation matrix

		Contract_price	Initial_price	Competition_level _SUPPLIERS	Competition _level_BIDS
Contract_price	Cor. coef.	1.000	.982**	.050**	.071**
	Sig. (2-tailed)	.	.000	.000	.000
	N	8 751	8 751	8 751	8 751
Initial_price	Cor. coef.	.982**	1.000	.132**	.162**
	Sig. (2-tailed)	.000	.	.000	.000
	N	8 751	8 751	8 751	8 751
Competition_level_SUPPLIERS	Cor. coef.	.050**	.132**	1.000	.794**
	Sig. (2-tailed)	.000	.000	.	.000
	N	8 751	8 751	8 751	8 751
Competition_level_BIDS	Cor. coef.	.071**	.162**	.794**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	8 751	8 751	8 751	8 751

Source: Authors

5. Results

In our research, the main method to define the relations between competition and contract price was linear regression using the panel data.

The model equation is:

$$CP_i = 0{,}878IP_i - 153{,}773CLS_i - 9{,}309CLB_i \qquad (4)$$

The dependent variable was contract price and independent variables represented Initial price and factors of competition. The beta coefficient and significance of particular factors are stated in the table below. To summarize the results, we can state, our expectations on the impact of particular attributes were correct:

- Initial price – positive relation (+0.878);
- Competition level based on number of suppliers – negative relation (-153.773);

▪ Competition level based on number of bids – negative relation, coefficient (-9.309).

The effect of competition is also as expected before the analysis, negative. But its value is rather interesting. As we can see in equation 4 each new competitor will cause that contract price will be lower by app. 153 EUR (-176.022,-131.524) and each bid decreases the price by more than app. 9 EUR (-11.079, -7.539). We can say that Initial price is really the base value for setting the Contract price as the beta coefficient is close to 1. This is quite interesting knowledge, as there is small part of the price movement in the electronic reverse auction not related to level of competition, what can be explained by suppliers´ propensity to start the auction competition with inflated prices at the level of app. 12%.

Table 5 - Coefficients of model

Model	Unstandard. Coef.		Stand. Coef.	T	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
Initial_price	.878	.002	.983	392.344	.000	.874	.883	.933	1.072
Competition_level_SUPPLIERS	-153.773	22.249	-.023	-6.911	.000	-197.386	-110.159	.521	1.918
Competition_level_BIDS	-9.309	1.770	-.017	-5.260	.000	-12.778	-5.839	.535	1.869

Source: Authors

Table 6 provides overview of relations between dependent variable – Contract price – and independent variables.

Table 6 - Description of variables

	Findings		The Relation with Contract Price	The Direction of Relation
Initial_price	Coefficient	.878	Significant	Positive
	T statistics value	392.344		
	P probability value	.000		
Competition_level_ SUPPLIERS	Coefficient	-153.773	Significant	Negative
	T statistics value	-6.911		
	P probability value	.000		
Competition_level_ BIDS	Coefficient	-9.309	Significant	Negative
	T statistics value	-5.260		
	P probability value	.000		

Source: Authors

As the Coefficient of determination (R-squared) is at the level of 0.949, it means, that almost 95% of Contract price is based on studied three factors.

Table 7 - Model summary

Model	R	R Square[b]	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.974[a]	.949	.949	5,565.975	.949	54,021.825	3	8,748	.000

Source: Authors

Conclusion

Within the paper, building upon previous studies, we verified the impact of competition among suppliers taking part within electronic reverse auctions on the level of contract price resulting from the tender in the environment of Slovak public procurement. Based on the results obtained, we can say, that this assumption holds

– meaning the higher the number of competitors and bids, the higher is the psychological pressure on suppliers, and the higher is the price decrease from initial price in competition to contract price. Therefore, we do not reject our working hypothesis: Higher competition among suppliers leads to decrease in the product price within electronic reverse auction, what provides the supportive evidence for previous studies devoted to this topic (Beall *et al.* 2003, Schoenherr and Maber 2007, Major 2007, Singer *et al.* 2009), which emphasize the importance of the number of participants as one of the factors guaranteeing the lower prices.

Beyond this, the results shows the price movement in the electronic reverse auction is not merely related to level of competition, what might be explained by suppliers´ propensity to start the auction competition with inflated prices?

However, many open questions still remain in this topic – some of them with ability to be solved having in mind the data available. In this context, it would be very interesting to understand, how stable this relationship is over time, or for different product families.

Acknowledgement

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Job Satisfaction and Socio-Demographic Nexus:
An Examination of Business Link Employees in England

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Abstract

The paper investigates the effects of age, gender and length of service on job satisfaction at work place. The cross-sectional study was conducted by utilizing the "the Job Satisfaction Survey". 25 out of 42 Business Links in England selected at random for this study where 14 out of 25 Links participated in the study that constituted a total sample of 101 employees with a response rate of 30.8%. A three-way ANOVA statistical tool was used to test the strength of relationship. While the socio-demographic factors were adjusted for each other; length of service in the present job was found to be significantly negatively related with the satisfaction level of promotion and female employees were found to be significantly more satisfied than male counterparts with fringe benefit. The findings have invaluable policy implications for business executives as well as policy-makers, particularly for those interested in the management of the Business Links.

Keywords: job satisfaction, age, length of service, gender, business link, England.

JEL Classification: O15, M2, Z13.

1. Introduction

Job satisfaction is commonly defined as the extent to which people like their work within the global economic labour market. Its numerous dimensions and their causations have become a popular subject of interests among researchers in business and social sciences for the last 50 years (see for example, Hamermesh 2001, Lydon and Chevalier 2002, Bryson *et al.* 2003, Crossman and Abou-Zaki 2003, Ibrahim *et al.* 2004, Crossman and Harris 2006). Traditionally employees are thought to be the most effective, precious or important resource to an organisation, but often their job satisfaction is ignored at workplace. Study shows that dissatisfaction with the present job may be one of the predominant reasons for a move to a new job (Burdett and Mortensen 1998) and in many cases less satisfied employees are more likely to have quit their jobs (Lydon and Chevalier 2002). On the other hand, it has also been well documented that a satisfied workforce is a productive one and successful organisations are very much aware of it (Roznowski and Hulin 1992, Hamermesh and Biddle 1994). As work is a major part of one's life, there can be a positive effect on the rest of an individual's life and thus be collectively beneficial for employer as well as for the society as a whole.

Job satisfaction is related to intrinsic and extrinsic factors but also to the socio-demographic characteristics of the employee such as age, gender, length of service, and rank/job level. Research has been carried out in these areas for quite some time for example, according to Davis factors such as age, gender, work status and seniority did not show significant impact on overall job satisfaction in the USA (Davis 2004). Ellickson (2002) showed that age was found to have no significant association with overall job satisfaction levels of municipal government employees. On the other hand, in a Malaysian study on small and medium industries respondents were generally satisfied with their working environment and job (Abdullah *et al.* 2007). Secondly, previous studies have indicated the relationship between length of service and level of job satisfaction (Ibrahim *et al.* 2004). Using meta-analysis on 21 independent studies Brush *et al.* found that age and organisational tenures were the most important determinants of job satisfaction (Brush *et al.* 1987). Studies that reported on the impact of the interaction between age and tenure on job satisfaction are relatively few (Lee and Wilbur 1985, Luthans and Thomas 1989, Sarker *et al.* 2003). Sarker *et al.* (2003) reported that among hotel employees, age is not significantly associated with overall job satisfaction but the tenure is and the effect of tenure on job satisfaction is

significantly modified by age. Thirdly, Burke and McKeen (1994) have reported success factors for women in the early stages of their management careers. Finally, it has been found that rank / job level is positively correlated with job satisfaction. (Ellickson 2002, Cranny *et al.* 1992)

Despite all these efforts a significant gap in the research is identified where little analysis has been carried out on combining all these factors, with specific reference to gender, age and length of service as they are so inextricably linked. It is therefore necessary to examine whether job satisfaction as a whole or any of its facets vary significantly according to gender, age, or length of service while they are adjusted for the effect of each other. Thus the study aims to assess whether the socio-demographic characteristics (age, gender, tenure and rank) of the employees are, by themselves, associated with job satisfaction or whether it is due to the confounding effect of ageing or the interaction among them. The rest of the paper is organised as follows. In section 2, the relevant literature on job satisfaction is reviewed. Section 3 deals with sampling design, survey instrument and data collection procedures. The results of statistical analysis are presented in section 4 followed by a brief discussion and conclusion in section 5.

2. Literature review

Job satisfaction

According to Spector (1997), job satisfaction is defined as "how people feel about their jobs and different aspects of their jobs. It is the extent to which people like or dislike their jobs" (p. 2). A number of potential negative ramifications and positive effects of dissatisfied and satisfied employees have been proposed by researchers such as overall non-productiveness (turnover and absence) outlining the importance of this subject to the commercial world.

Turnover: According to Spector (1997), "job dissatisfaction leads to turnover". Most theories of turnover view it as the result of employee job dissatisfaction e.g., Bluedorn (1982). People who dislike their jobs will try to find alternative employment. Studies have been reasonably consistent in showing a correlation between job satisfaction and turnover e.g., (Crampton and Wagner 1994; Hulin *et al.*, 1985). Nicholson and Miljus concluded in their own studies that promotion and salary policies and administrative practices appeared to be at the very heart of the turnover problem (Nicholson and Miljus 1972). These studies did not directly relate to turnover and length of service with job satisfaction. Brockner and Kim (1993) investigated factors affecting the job satisfaction of stayers in response to a co-worker who departed for a "better" job. Length of service was not found to have any influence on job satisfaction level of stayers. (Brockner and Kim 1993)

Absence: It is now evident that absence can reduce the efficiency and overall effectiveness of an organisation by increasing labour costs. On many jobs such as teaching or health care professions, substitutes are required for absent employees. The employee may continue to be paid, resulting in increased costs to pay substitutes. Where absence rates are high, the costs can also be quite high therefore organisations are concerned about absence. Theories suggest that job satisfaction plays an instrumental role in an employee's decision to be absent (Steers and Rhodes 1978). People who dislike their jobs should be expected to avoid work.

Job performance: One would expect that a satisfactory employee in workplace would be a productive employee. Studies have shown that the association between the two variables is quite weak. Some studies such as Iaffaldano and Muchinsky (1985) and Petty *et al.* (1984) found the mean correlation of job satisfaction with global satisfaction to be approximately 0.25, which is unexpectedly low. However, there are problems with job performance measures according to Spector (1997) and as such should be considered a conservative lower bound estimate. The above analysis establishes a correlation between job performance and job satisfaction, even though it is low. However, the opposite direction of causality is also true as shown by Spector, that is that people who perform better as they like their jobs better because of the rewards that are often associated with good performance Spector (1997).

Facets of Job Satisfaction: Global satisfaction can be measured to understand overall attitudes towards a job. However, the facet approach is used to determine what aspects of the job give rise to levels of satisfaction or dissatisfaction. Spector has suggested nine job facets that represent the most important characteristics of a job about which people have effective responses Spector (1997). These are pay, promotion opportunities, supervision, fringe benefits, contingent rewards, operating procedures, co-workers, nature of work and communication.

Demographic Factors and Job satisfaction

Gender: Previous studies show that organisational members hold different perception about the role of

gender in terms of productivity and achievement (Fraser and Hodge 2000, Metle 2001, Howard 2005, Busolt and Kugele 2009). O'Brien and Dowling (O'Brien and Dowling 1981) identify a statistically significant difference between satisfaction level of males and females, but are unable to offer any explanation. Evidence of differences in job satisfaction between men and women is also provided by Clark (1997), whose findings suggest a slightly higher level of satisfaction among women compared to that of men. On the contrary, Clark *et al.* (1996) found males exhibiting higher levels of satisfaction than females.

Age: Most studies in literature show a relationship between age and job satisfaction. Some studies such as Lee and Wilbur (1985) and Savery (1996) suggest that job satisfaction is positively linearly related with age. Similar linear relationships are presented by Oshagbemi (1997, 2000), Hickson and Oshagbemi (1999), Rhodes (1983) based on the job satisfaction of university teachers. Unsurprisingly, they found satisfaction with both teaching and research increased with rank. Rhodes suggests a positive linear relationship between age and job satisfaction up to the age of 60 (Rhodes 1983). In contrast, other studies such as Clark *et al.* suggest that job satisfaction shows a U-shaped with age, with higher level of morale among young workers but that this declines after the novelty of employment wears off and boredom with the job sets in Clark *et al.* (1996).

A number of different explanations have been offered with regard to the association between age and job satisfaction. For example, limited career prospects at a certain age (Ang *et al.* 1993); that older workers may be more tolerant and have developed coping strategies (Oshagbemi 2000) or that intrinsic motivators become less important as people grow older (Savery 1996). Bernal *et al.* (1999) draw attention to the weakness of age as a reliable predictor of job satisfaction. This suggests that other physiological variables associated with the ageing process may have a more significant impact on satisfaction than is generally recognised. The literature opens the question as to whether the interaction effect between age and other factors affecting job satisfaction should be examined. The question being posed overall then, is how valid is it to consider the effect of age or any other factor affecting job satisfaction on its own? Indeed, as shown above, this is a specific approach in which there has not been significant work done. There are many possible combinations with which the interaction effect between age and any other factors related to job satisfaction can be examined.

## Socio-economic factors and Job satisfaction

Length of service/Tenure: A number of studies have indicated that length of service (LoS) is related to job satisfaction level of workers. Oshagbemi (2003) has found in a study of the university teachers that the effect of tenure on job satisfaction level is positively related to overall job satisfaction. The assumption is that the less satisfied staff will leave while the more satisfied ones will tend to remain in the job (Oshagbemi 2003). This is consistent with the earlier research conducted by Ronen, who suggests that intrinsic satisfaction in a job is a major contributor to changes in the overall satisfaction of workers over time, where tenure is resulted to job satisfaction and dissatisfaction (Ronen 1978). Alternative explanations are that workers tend to adjust their work values to the conditions of the workplace, resulting in greater job satisfaction (Mottaz 1987), or that workers who experience little responsibility, interest, recognition or achievement are more likely to experience dissatisfaction and leave the organisation (Savery 1996). Workers with longer service may experience higher satisfaction because they have found a job that matches their needs (Clark *et al.* 1996), or find opportunities for promotion which might lead to higher job satisfaction. (Kalleberg and Mastekaasa 2001)

The results of looking at the effect of just length of service or age independently on job satisfaction are somewhat questionable. In a study of combined effect of age and tenure, Gibson and Klein (1970) found evidence of a linear negative relationship between age and job satisfaction and a linear negative relationship between tenure and satisfaction up to 12 years' tenure. Bamundo and Kopelman (1980) presented evidence of a non-linear relationship between job satisfaction and tenure when this effect was moderated by age. In a study of supervisors, controlling for tenure, Luthans and Thomas (1989) found a curvilinear relationship with satisfaction highest among respondents in their 40s and lower for those in their 30s, 50s and 60s. Snyder and Deitrich (1992) who adopt the job descriptive index of Smith *et al.* (1969) present evidence of a similar curvilinear relationship.

Occupational level: A study conducted by Mottaz (1987) suggests that overall job satisfaction is positively related to occupational level. Clark *et al.* (1996) report a similar finding. However, other researchers have found negligible associations between job satisfaction and the rank (MacEacheron 1977, Bretz *et al.* 1994). To explain these results and analysis will be required summarising in terms of type of companies, for example private companies may give different results than public companies. The nature of work will also need to be accounted for, as jobs of similar rankings can vary in duties depending on the company, industry and economic climate etc.

Economic Climate: Examining the table reproduced by Spector (1997), shows a variation in satisfaction levels without any specific reasons. For example, the UK and Chile are very closely related for no apparent reason; however, it is possible that the economic job climate affects job satisfaction levels. That is to say, if jobs are easy to get then people will be more relaxed, employers will be competing for employees therefore offering better remuneration packages leading to more satisfied workers. By contrast, if the climate is poor, employee's prime concern in first world countries will be paying the bills and particularly the mortgage. In poorer countries, less people will have mortgages and general lower expectations and therefore will not be so worried and therefore more satisfied. A little analysis has been carried out on combinations of these factors, with specific reference to age and length of service as they are so inextricably linked.

The way forward to enhance the literature on the study of job satisfaction is then to examine in logical steps, combinations of the factors affecting job satisfaction. As stated in the literature, it is likely that length of service and job satisfaction will affect each other. However, it can be argued that age itself is not a determinant of job satisfaction; rather it affects both length of service (LoS) and job satisfaction. For example, a person cannot have twenty years' experience if they are only thirty years old. Likewise, gender can play a similar role. Therefore, both age and gender can act together as confounders in the relationship between length of service and job satisfaction as represented in the schematic diagram below (Figure 1).
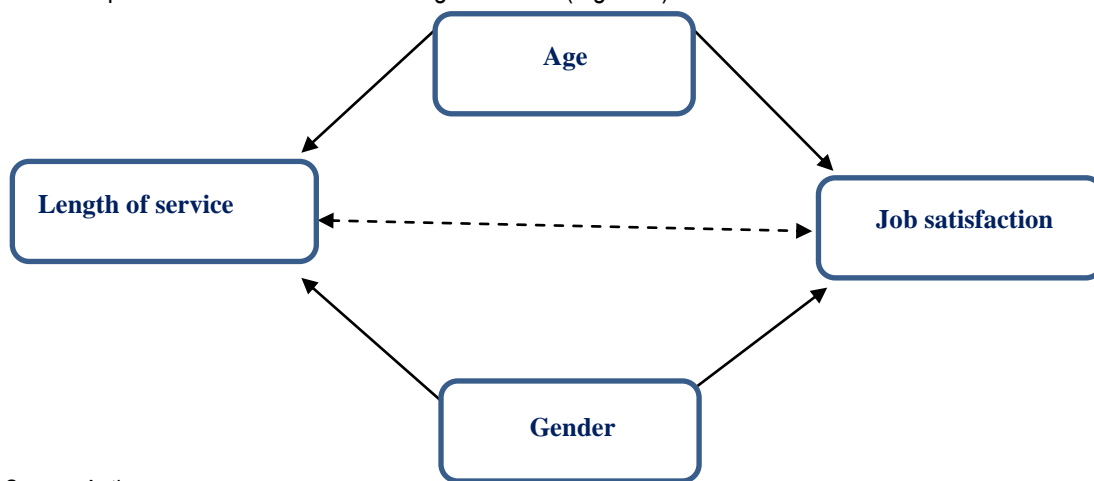
Source: Authors own.

Figure 1 - Conceptual framework for factors affecting job satisfaction

3. Methodology

Target Population and Sampling Design

Business Link is a British Government initiative to set up and helping small to medium sized enterprises that grow in England. The main vehicle for doing this is to understanding the interaction between employed or sub-contracted Business Advisors and/or Specialist Consultants with clients who fall within a specified geographical area. The Business Link has now 42 branches across the country by which it runs. Each branch has a limited autonomy as to how it operates and is accountable to local regional Government. The generic corporate aim of the organisation is to grow the economies within their geographical designated area. It is therefore imperative that the workforce of all ranks be satisfied with their jobs in order to support the corporate goal. A list of all the Business Links in the country was obtained from *www.businesslink.org* and used as the sampling frame to draw 25 branches out of the 42 via simple random sampling. The total population of the targeted Business Links is estimated to be 615.

Data Collection Method

A questionnaire survey was conducted among the Business Link employees as it is suggested by Reeves and Harper for the purpose of understanding job satisfaction. The questionnaire used for this study was divided into two sections (Reeves and Harper 1981). In the first section, Spector's the Job Satisfaction Survey popularly known as 'JSS' was used, see Spector (1997, 1985) for details. It examines nine facets of job satisfaction with four questions per facet giving a total of thirty-six questions. The facets examined are pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, co-workers, and nature of work and communication. A second section was added to the end of the questionnaire in order to help answer the research

question. These included questions regarding, age, position/rank, length of service in present job and in the business consultancy industry. The validity of the questionnaire has been meticulously established, for details see, Spector (1997).

Field Work

Using Excel, 25 random numbers were drawn and then using the sampling frame, 25 Business Links were selected. Questionnaires were then distributed among the Human Resource / Personnel managers of these selected links. There is a high rate of "non-response" in postal survey (Scott 1961). As a poor response rate is already anticipated, the questionnaire was sent out by e-mail (instead of post), as this is a fast, easy and cost effective method. Initial contact was made by phone with the Human Resource / Personnel function of the targeted Business Links. Permission was sought to send them the questionnaire, introducing the researcher and explaining the project. Incentives offered for co-operation were the contact details of other Business Link Human Resource/Personnel functions and a summary of the results found through the current investigation.

The request was made with regard to completing the questionnaire and sending it back by return with assurance of confidentiality and anonymity. Some people responded within one hour of sending the e-mail questionnaire, some people took up to a week longer as clearance had to be given from higher authorities for the questionnaire to be distributed among some Links. The exercise took a three-week period in total, from sending the questionnaire out to receiving the last replies.

Out of 25 Business Links contacted, 3 of which did not respond at all, 8 refused and employees responded from 14 Links. The total number of employees within the participating Business Links was 344. The total response received was 106. Therefore, the response rate was 30.8%. However, the response rate was anticipated to be low due to the internal strict regulations of Business Links. It appears that the main reason for not participating was the Business Links had just undergone or were about to embark on a similar conceptual internal survey, see, Table 6 in Appendix. Although an assurance of confidentiality was given, a number of people, due to the nature of the subject matter, sought reconfirmation of confidentiality in their responses to the questionnaire. All who responded with this concern were sent an individual e-mail assuring confidentiality.

Reliability

The reliability coefficients were calculated based on the full data set of this study and were compared with the reliability figures supplied by Spector (1997). It shows that the Cronbach Alpha values of the JSS items found in this study are higher than 60%, which affirms the reliability of the instrument (Tables not shown and may be made available upon request). On the other hand, all the reliability coefficients are higher than the values reported by Spector (1997) except supervision. This shows that this scale is more reliable to use in the UK data than that of the USA data for which it was originally designed.

Statistical Methods

Five questionnaires could not be used as they had missing values either in age or length of service leading to a sample size of 101. Each item in the questionnaire scored from 1–6. Having reversed the negatively phrased items, the numbered responses of the appropriate questions are summed up. The total satisfaction score is the sum of all thirty-six questions, with individual facet scored being calculated by summing the scores of the relevant questions. Thus individual scores can range from 4–24 and total scores range from 36–216. Pearson's correlation coefficient was used to examine the individual linear relationship of age and length of service with the job satisfaction level and its facets. Then to test the hypothesis regarding age, gender and length of service a three-way ANOVA was used to see the combined effect of these socio-demographic variables on the level of job satisfaction and its facets.

4. Results

Table 1 provides the background information to the respondents in the study. It shows that the respondents in general were of a young age that is below 55 years old. The majority of respondents were in Middle Management making up 44% of the respondents. The majority of respondents (32%) had only been working in their present job for less than a year; however, the majority of the respondents (29%) had been in the industry for 3-5 years. The gender distribution of the respondents was predominantly female, with the roughly 60/40 female/male split.

Table 1 - Respondents' Profile

Background Information	Frequency
Age (years)	
Less than 35 year	29
35-44	24
45-54	36
55+	12
Total	**101**
(Mean 42)	
Gender	
Male	41
Female	60
Total	**101**
Job Position	
Advisory	16
Senior Management	17
Middle Management	44
Junior Staff	7
Support Staff	17
Total	**101**
LoS in the Present Job (years)	
Less than 1	33
1-2	27
3-5	27
6-10	14
Total	**101**
(Mean 2.48)	
LoS in BCI (years)	
Less than 1	15
1-2	18
3-5	28
6-10	27
10+	13
Total	**101**
(Mean 5.17)	

The bivariate distribution of the characteristics of respondents is presented in Table 2 with the respective overall mean in job satisfaction level. It shows that generally overall job satisfaction decreases with LoS. However, there is no clear picture of the relationship between age and overall job satisfaction.

Table 2 - Bivariate distribution of respondents by age and length of service (LoS)

LoS in the Present Job in years, Frequencies (mean JS)						
Age Group (years)	<1	1 -2	3-5	6-10	All LoS groups Frequency	Overall JS Mean (SD)
<35	13 (158)	11 (140)	5 (134)		29	147 (26)
35 -44	12 (160)	7 (148)	5 (137)		24	152 (24)
45 - 54	7 (167)	6 (161)	10 (129)	13 (142)	36	146 (29)
55 +	1 ( )	3 (139)	7 (158)	1 ( )	12	152 (21)
All age groups Frequency	33	27	27	14	101	
Overall JS Mean (SD)	160 (20)	147 (27)	139 (29)	143 (22)		148 (26)

Overall the respondents were most satisfied with Supervision and Nature of Work followed by co-workers, see Table 3. The minimum score for any facet is 4. However, for co-workers the minimum score was found to be 9. This suggests that the respondents were in general very satisfied with their co-workers. These are essentially intrinsic facets of job satisfaction. Equally interesting is the result that Operating Conditions and Promotion are the facets with which the respondents are slightly dissatisfied. Communication and pay are shown to be the next least satisfying.

Table 3 - Satisfaction Levels by Facet

Facet	Mean	Std. Deviation
Pay	14.78	5.31
Promotion	13.20	4.75
Supervision	20.46	4.21
Fringe Benefits	15.43	4.74
Contingent Rewards	16.56	4.59
Operating Conditions	13.10	3.99
Co-workers	19.48	3.78
Nature of Work	20.15	3.99
Communication	14.77	4.41
Overall Job Satisfaction	147.93	25.95

While age and length of service were used as continuous, in Table 4, the correlation coefficient between age and overall job satisfaction is non-significant and hence, in Business Link, there is no linear association between employees' age and their overall job satisfaction level.

Table 4 - Pearson's Correlation Coefficients

	Age	LoS (Present Job)	LoS (BCI)
	r (2-sided sig.)	r (2-sided sig.)	r (2-sided sig.)
Pay	0.05 (0.60)	-0.20 (0.04)	-0.11 (0.29)
Promotion	-0.01 (0.95)	-0.32 (.001)	-0.11 (0.25)
Supervision	-0.09 (0.36)	-0.16 (0.11)	-0.15 (0.13)
Fringe Benefits	-0.14 (0.15)	-0.17 (0.08)	-0.19 (0.13)
Contingent Rewards	0.02 (0.87)	-0.20 (0.05)	-0.10 (0.30)
Operating Procedures	-0.10 (0.32)	-0.27 (.007)	-0.23 (0.02)
Coworkers	0.10 (0.30)	-0.11 (0.29)	-0.05 (0.58)
Nature of Work	0.18 (0.07)	0.01 (0.90)	-0.30 (0.73)
Communication	-0.08 (0.43)	-0.18 (0.07)	-0.10 (0.30)
Overall Job Satisfaction	-0.02 (0.88)	-0.28 (.005)	-0.19 (0.06)

There is a negative correlation between overall job satisfaction and length of service in the present job that is highly significant due to dissatisfaction with Pay, Promotion, Contingent Rewards and Operating Procedures, see Table 4. Three out of four of these are extrinsic rewards. Length of service within the business consultancy industry (BCI) is negatively correlated but not significant at 5% level of significance. However, there is a significant negative correlation between the satisfaction of Operating Procedures and length of service within the business consultancy industry.

In univariate analysis it has been found that age is not significantly correlated with the level of job satisfaction. However, it was indicated that there exists a relationship between age and level of job satisfaction when the relationship was studied according to gender (result not presented). On the other hand, there was a clear negative linear correlation between length of service in present job and job satisfaction for males whereas a U-shaped curve was identifiable for females (not presented). However, level of job satisfaction did not vary markedly according Length of Service in the Business Consultancy Industry (BCI) and job position while they were considered individually. Therefore, the effects of these variables were studied in a combined manner using a 3-way ANOVA for the overall job satisfaction as well as for each facet of the job satisfaction (Table 5).

Table 5 - ANOVA results: overall job satisfaction and satisfaction with promotion and fringe benefits

Source	d. f.	Overall job		Promotion		Fringe benefits	
		F-value	Pr>*F*	*F*-value	Pr>*F*	*F*-value	Pr>*F*
Age group	3	0.21	0.89	0.92	0.43	0.77	0.52
LoS group	3	1.99	0.12	3.48	0.02ε	1.01	0.40
Gender	1	0.41	0.52	0.01	0.94	3.52	0.06γ
Age group x LoS group	7	1.33	0.25	0.83	0.57	1.27	0.28
Age group x Gender	3	0.13	0.94	0.46	0.71	0.42	0.74
LoS x Gender	3	1.74	0.17	0.46	0.71	1.43	0.23
Age group x Gender x LoS group	2	1.22	0.30	0.19	0.83	1.34	0.27

Note: LoS = Length of service in the present job; Overall job satisfaction = Total of the nine facets of job satisfaction; ε = p<0.05, γ = p <0.10

It is clear that overall job satisfaction is not significantly related with the socio-demographic characteristics of the respondents when age, gender and Length of Service were considered together, see Table 5. However, satisfaction with promotion varies significantly (p=0.02) according to the Length of Service in the present job at the 5% level of significance. This was explained further by Figures 2-3. It is clear from Figure 2 that among males and females, satisfaction with promotion decreases significantly with the increase in Length of Service in the present job.
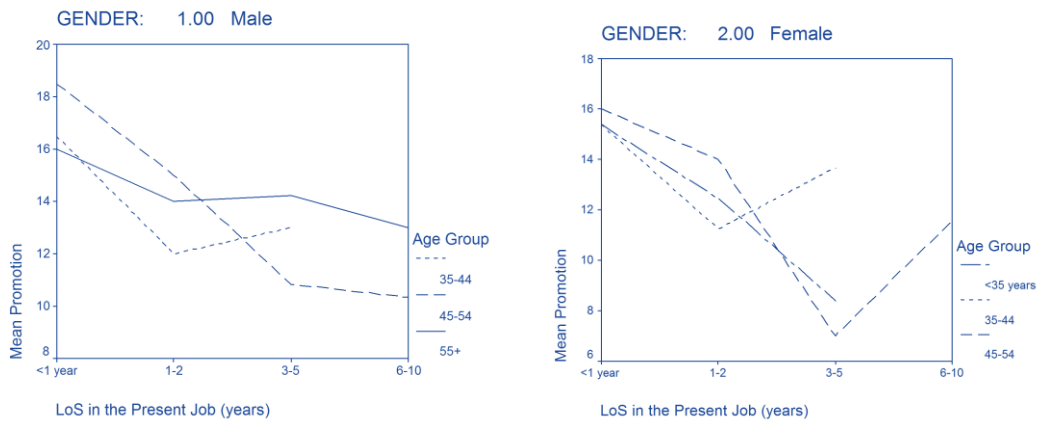
Figure 2 - Mean satisfaction with promotion against length of service in present job and gender

On the other hand, Table 5 shows that there is a (borderline) significant variation on the level of satisfaction with the fringe benefits among male and female employees, which is further explained in Figure 3. The ANOVA and Figure 3 clearly show that female employees are (borderline) significantly more satisfied with the fringe benefits than the males irrespective of their age and Length of Service in the present job.
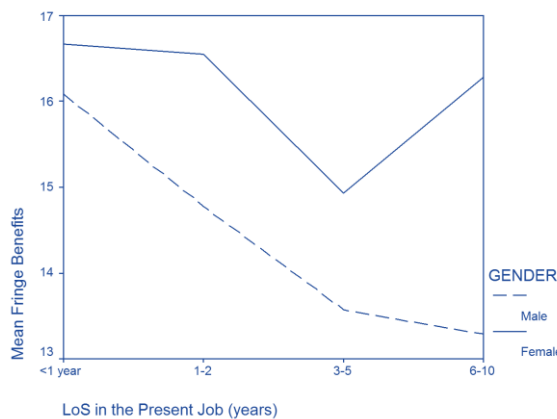

Figure 3 - Mean satisfaction with fringe benefits against length of service in present job and gender

5. Discussion and conclusion

The aim of this study has been to examine the effects of age, length of service (LoS) and gender on the job satisfaction of employees in Business Links throughout the country. In total, responses from 101 employees were analysed and details can be found on this link www.businesslink.org (Business link UK 2007). Length of service in present job was not found to be significant on overall job satisfaction. This result is consistent with Oshagbemi (2000) who found that in the first 10 years of working in the present university the mean job satisfaction remains unchanged.

A negative correlation was identified between length of service in present job and also job satisfaction for males. Most of the males within Business Links are in advisory or management positions. Also, the vast majority of them has come from commercial backgrounds or has run their own businesses, which operate significantly differently, to Public Sector Organisations. It can be suggested that the increased bureaucracy accounts for the increasing dissatisfaction.

However, a U-shaped curve is identified for females (Figures 2 and 3). Although Job Satisfaction increases after 5 years of service, a look back at Table 1 shows that only 14 respondents had served for more than six years. If we use an average proportion of 60% females (established from Table 1) this means that only seven or eight females make up the positive end of the U-shape. Clearly this is not enough to make a generalisation and these results should be treated with caution.

However, when length of service was examined with respect to the facets of job satisfaction after controlling for age and gender, satisfaction with promotion was found to be significantly negatively related (see, Table 5 and Figure 2). However, the literature review shows that no study was found to have looked at the effect of Length of Service on the facets of job satisfaction after controlling for age and gender.

There is a negative relationship between job satisfaction with length of service in the present job which is highly significant due to significant dissatisfaction with Pay, Promotion, Contingent Rewards and Operating Procedures with the increase of Length of Service (see Table 4). However, age and gender were not controlled for these results and as such less emphasis has to be given to these as compared to the result mentioned above where promotion was still found to be significant having controlled for age and gender.

There is an apparent negative relationship between Length of Service within the Business Consultancy Industry (BCI) and Job Satisfaction for females but no discernible trend can be identified for the male respondents. This result is supported by the literature as Simpson who reports that women holding the MBA degree continue to be less successful than men counterparts in regard to salary and career advancements (Simpson 1995, 1996).

When length of service and gender were controlled for, age did not show a significant effect on overall job satisfaction (Table 5). However, when the data were split up into male and female respondents, a U-shaped curve for job satisfaction was observed with respect to age, for males whilst a positive linear relationship was found for females, however these were not tested in this paper.

Gender was found to have insignificant effect on overall job satisfaction when length of service and age were controlled for. However, females in general were more satisfied than males but not significantly even when age and length of service were not controlled for. It was revealed that females were significantly more satisfied with fringe benefits than males irrespective of their age and Length of Service in the present job (Figure 3). This could be due to the fact that females in general having less financial responsibilities; thus they do not feel dissatisfied with fewer fringe benefits compared to male counterparts.

This study reveals that males in the advisory rank are more satisfied than females; this is perhaps why there are, in general, more male Business Advisors than female. Also of interest is that women are much more satisfied than men when working in Support Services. This may also be the reason why more women are found working as Secretaries, Personal Assistants and in Administration posts than men. Rank, however, was not found to be significantly related to overall job satisfaction. The interaction effects among age, length of service in the present job and gender were also considered (see Table 5) as some of the interaction effects were justified in the literature review. However, none of the interaction effects were found to be significant.

The economic climate can have a major effect on the results. If the economic situation of the respondents is relatively bad then according to Maslow's theory, the lower level needs become the priority above higher level needs such as belonging and self-esteem. In such situations, job satisfaction will, in general, be higher as expectations are lowered. The opposite can also be true, i.e., job satisfaction decreases as the economic situation of the respondents improves. Applying this theory to international economies, higher job satisfaction could be expected from respondents in similar jobs but in developing economies compared to respondents in

developed economies. If this is correct then the results obtained from this study, that in general, job satisfaction with promotion decreases as length of service increases, could suggest a buoyant economy.

A counter argument to this is that in a relatively poor economy, other factors are also influencing job satisfaction such as morale and autonomy may also come into play. If there is low organisational morale, due to significant organisational change, as is currently happening with Business Link, or if there is low national morale due to the onset of recession, then people in general will have raised concerns of job security, thus lowering job satisfaction and effecting the results.

None of the socio-demographic factors were significantly related to overall job satisfaction, while they were controlled for each other. However, length of service in the present job was found significantly negatively related with the satisfaction level of promotion. Age was found to be non-significantly related with the satisfaction level of any one of the facets of job satisfaction mainly due to small sample size (only 12 respondents are found to be over the age of 55 years). In general, female employees were more satisfied than their male counterparts, although it was not statistically significant partly due to small sample size. However, female employees were significantly more satisfied than male with fringe benefits. In conclusion, socio-demographic characteristics of the employee are significantly related at least with the satisfaction level of some of the facets of job satisfaction. The length of service does have an impact and what it tells us is that in the context of public sector cuts, longer serving staff has a more negative outlook on work.

A number of important issues have been identified in the present study which has obvious policy implications on how Business Links are to be closely monitored as well as effectively managed in modern world. The predominant issues identified being promotion, gender and bureaucracy.

The dissatisfaction found with promotion as length of service increases has implications for management as this essentially means that employees are dissatisfied with their prospects for promotion as time goes by. With respect to rank, junior staff members were more dissatisfied than support staff due to their aspirations. The danger for Business Link is that if these expectations are not met, then staff will leave and find employment elsewhere. Thus becoming a potential staff retention problem and Business Link will be seen as a springboard to other opportunities and will be used by employees as such. This is supported by most theories of turnover which view it as the result of employee job dissatisfaction e.g., Bluedorn (1982) and Mobley *et al.* (1979). Past studies have been reasonably consistent in showing a correlation between job satisfaction and turnover e.g., Davis (2004) and Crampton and Wagner (1994). Spector (1997) stated a causal link between the two i.e., job dissatisfaction leads to lower turnover. Also, Nicholson and Miljus (1972) concluded in their own studies that promotion and salary policies and administrative practices appear to be at the very heart of the turnover problem. This final reference seems to fit exactly with the interpretation of the results of this study and re-emphasises the importance of dealing with this issue.

Females were significantly more satisfied with the fringe benefits available than males and were more satisfied overall (although not significantly). However, the facet analysis allows management to interrogate which aspects of the job are dissatisfying to whom and thus gives management the opportunity to develop strategies which will cater for the employees' needs. It is, however, too costly in terms of time and other resources to try and satisfy everyone, therefore management needs to negotiate a balance. One way to do this is to involve a representative sample of the employees in a process where they can assist management in developing suitable strategies to increase satisfaction in the highlighted areas. This will give the employees ownership of the issue and demonstrate that management is willing to address the issue.

As Business Link is a Government organisation, it cannot fundamentally change the way it works as principally Government directs it. However, it can invest and implement systems designed to take the strain of the majority of bureaucracy required by the reporting requirements of the Government. This will aid satisfaction with Operating Procedures which has been highlighted as having a negative relationship with Length of Service although not significantly.

A number of respondents sought reconfirmation of confidentiality of information indicating that respondents might have little hesitance to completing and returning the questionnaires and hence the lower response rate. However, despite the low response rate, we do not think that our sample is not representative to the Business Links in England and is fairly small in numbers.

The reasons for U-shaped relationship between the age and overall job satisfaction among female employees and linear relationship for male employees need to be examined in future studies. Further in depth (possibly qualitative) study is necessary to find out the reasons why females are significantly more satisfied with

fringe benefits than males. To get a complete picture other factors like morale, autonomy and income level also need to be considered.

Acknowledgements

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Productivity and Accounting Profitability in Omani listed Companies: An Empirical Study for a Period 2010-2014

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Abstract

This study analyzed the relationship between productivity and profitability in industrial, finance and services sectors in Sultanate of Oman. The data were collected from the annual reports of the 48 industrial, 29 finance and 32 services companies listed on Muscat Securities Market for 5 years from 2010-2014.

This study tested two models for the effect of productivity on profitability. The productivity is measured by the relationships between cost of sales and number of staff (Total, Omani and Expatriate), while profitability is measured by two independent proxies; net operating income (NOP) in the first model and return on assets (ROA) in the second one. The results of the correlation indicated that the correlations of independent variables of productivity are statistically insignificant at 5% with NOP in the industrial sector while the regression analysis in the industrial sector is significant at 5%.

In the second model the correlations are statistically insignificant at 5% with ROA in all three sectors. Also, the regression analysis in the three sectors is insignificant at 5%.

Keywords: productivity, Omani productivity, expatriate productivity, net operating profit, return on assets.

JEL Classification: D23, E24, M41.

1. Introduction

There are several researchers who try to clarify and propose the effects of productivity on profitability of a firm. In general, the term profitability is more often defined as the link between inputs and outputs in a certain organization (system). Productivity can be computed or calculated from single, multiple and total-factor opinion (views). The single measures symbolize the link between outputs and equipment, labor or ability space. Multiple measures like the relationship between outputs and employment in addition to materials. The total factor productivity measure includes all probable factors of production into a scheme. On the counterpart, the term profitability shows the potential to often make profits over the finite period of time. As result, there are many ratios that conceal this consequence, for example, the ratio of outputs divided by inputs (such as revenue divided by cost or profit divided by cost) or of outcomes divided by outcomes (such as profit over revenue or revenue from rework over revenue). The two terms productivity and profitability are part of the basic seven performance standards (innovation, effectiveness, quality of work life, efficiency and quality) in which a firm needs to evaluated, analyzed and measured. Basically, the characteristic to become more profitable is productivity whereas influences from productivity twig from quality of work life and other residual performance criteria. Figure 1 explains the connections among the seven performance standards.
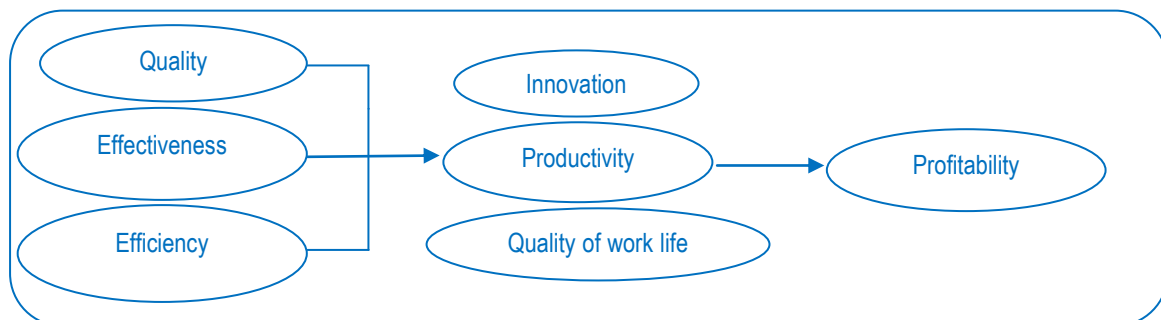
Source: The Atlantic Canada Opportunities Agency. (1998)

Figure 1- The Interlink between 7 Performance Standards

For long years back, the industrial, finance and services sectors in Sultanate of Oman have been facing fluctuations (ups and downs) in the achievement (performance) as per profitability and productivity. Thus, it is essential to explore the performance of these sectors and test how they can achieve the targeted aims and operational expertise.

The aim of this study is to examine the relationship between the productivity and accounting profitability in terms of return of assets and net operating profit. The study consists of five sections. Theoretical issues and productivity in Oman discussed in the first section. The second section presents the literature review. In the third section, the study presents the model, data and methodology used in this study. Sections four and five provide results of the analysis, and finally, in section six; the study presents the summary and conclusions.

1.1. Productivity in Oman

Productivity is one of the most important issues in the Gulf Cooperation Council (GCC) countries because it is a vital indicator of economic performance of an economic system. Also, productivity has a strong relation with sustainable development. Now, most of GCC countries, especially in the Sultanate of Oman, try to invest out of the oil and gas field. In Oman, up to the mid of 2014, there are (1468) industrial projects with 4.2% growth rate. On the other side, the amount of growth rate in the size of investment in the industrial sector amounted 27%.

In the banking and finance sector, the total assets for all banks working in Oman are 58.1 billion US dollar at the end of 2013 with notable increases in the products of these banks. Also, Omani government gave the private sector more freedom were most of services are provided by this sector. This is because the Omani government is depending on economic diversification principle since the collapse of oil and gas in 1986 and it encouraged the establishment of new projects in all economic fields out of oil and gas area.

Despite this growth rate and other good indicators, there is a very crucial question regarding the productivity in the companies listed in the three sectors in Muscat Securities Market (MSM). This question is: What is the relationship between productivity and accounting profitability in three sectors in Oman? This question is very important because the Omani economy was depending on the oil and gas since the 70s of the last century till the late of it. After 40 years, it is very important to assess the relationship between the productivity and accounting profitability in terms of return on assets and net operating profit.

1.2. Measuring the productivity

In general, the productivity refers to the relation between inputs and outputs (Gupta and Dey 2010). Practically, productivity has many definitions based on the researcher's point of view and the context in which it is used. According to Pekuri *et al.* (2011) productivity means "a relationship between output produced by a system and quantities of input factors utilized by the system to produce that output". Productivity is closely connected to the use and availability of resources. The productivity will increase if the company properly use the resources and vice versa. On the other side, productivity is closely connected to the creation of value. The high productivity is achieved when activities and resources in the process add value to the products or services produced by the company (Tangen 2002). Eatwell and Newman (1991), Wazed and Ahmed (2008) have agreed on the same content of productivity. Accordingly, Gupta and Dey (2010) decided that there are three main sub-concepts of productivity. The first one is the technological concept which means the ratio of outputs to inputs. The second one is the engineering concept which is the relationship between actual and potential outputs. The third one is the economic concept that is the efficiency of resources allocation. In this case, Wazed and Ahmed (2008) determined that the good definition of productivity is to be useful in practice.

The main other issue is the measurement of productivity. There are many measurements of productivity and each one depends on the availability of data, nature of firm or output and input and the objective of productivity measurement. (Gupta and Dey 2010)

According to Wazed and Ahmed (2008) there are three categories to measure the productivity; total factor productivity (TFP); single (or partial) factor productivity (SFP) and multifactor productivity (MFP). Total factor productivity is the combined or weighted average of productivity of all inputs. The single or partial factor productivity is the productivity of a single factor of input (Owyong 1997). The multifactor productivity is a comprehensive and analytical to measure the changes in productivity. The multifactor productivity is the ratio of output to the sum of two or more inputs for the same period. (Wazed and Ahmed 2008)

Gupta and Dey (2010) listed some "well-known approaches / methods adopted for analysis of productivity" such as "Kendrick-creamer model, Craig-Harris model, American productivity center model and Productivity accounting model".

In this study, we are depending on the Productivity accounting model. This model was introduced by H. S. Davis. In 1955, Davis published a book titled "Productivity Accounting" in which he presented a productivity index model. This model is depending on the accounting information provided by accounting system which isolated all other external information such as price inflation. The formula of productivity under this model as follows:

$$Total\ Productivity\ \frac{Monetary\ Value\ of\ Production}{Monetary\ Value\ of\ all\ Inputs} \qquad (1)$$

$$Pratial\ Productivity\ \frac{Monetary\ Value\ of\ Production}{Monetary\ Value\ of\ any\ Input} \qquad (2)$$

Productivity is the link between amount produced (production) of goods and services and the inputs of factors of production used in the production practice, with the relationship generally articulated in ratio form. The ratios may relate to the nationwide or worldwide economy, to one industry, or to a corporation (Small and Medium Enterprises).

Due to The Atlantic Canada Opportunities Agency (Report 1998) as well as Davis, productivity measures are sub-divided into partial and total factor productivity measures. The first are defined as the association between output and one input, such as labor or capital, while the second stand for the link between output and an index of two or more inputs.

Productivity is find out by a number of factors, involving the amount and availability of natural resources, industrial formation, capital buildup, the speed of technological advancement, excellence of human resources and the macroeconomic and the microeconomic environments. According to the total productivity formula, changes in input and output have to be measured comprehensively of both quantitative and qualitative changes. In application, quantitative and qualitative changes take place when relative quantities and relative prices of different input and output factors change.

The measures of partial productivity are material measures, nominal price value measures and fixed price value measures. These measures differ from one another by the variables they measure and by the variables taken out from measurements. By not including variables from measurement makes it possible to better focus the measurement on a given variable, yet, this means a more narrow approach.

2. Literature review

The term 'productivity' means different things to different fields. Anwarul Islam and Zaman (2013) decided that the productivity as defined in the industrial sector is not the same as in the finance or service sectors. Therefore, the literature reviews discussed the productivity from different point of views. Some of these literatures are focused on technical issues of productivity and others on the managerial issues. Also, some of the literatures are concern to economic productivity and some of them concern to accounting measures and so on.

Eslava *et al.* (2004) examine the association between market allocation, and productivity and profitability for a period 1982-1998. The study showed that the market reforms are associated with rising overall productivity that is largely driven by reallocation away from low- and towards high-productivity businesses.

Gumulka *et al.*, (2009) analyzed production and economic results for six production cycles of three broiler chicken farms in the years 2005–2006 in European countries, including Poland. The results indicate that despite the good production results obtained, profitability of live broiler production decrease in the agricultural income declining 6–86% in the 2006 cycles compared to the 2005 cycles.

Pekuri *et al.* (2011) examine the relationship between productivity and performance management in Finnish construction industry. The study showed that the rate of productivity development in the Finnish construction industry has been moderate at best. A further review of the performance measure in the construction industry indicates that productivity is an inadequate measure for identifying improvement targets and control activities.

Kouser *et al.* (2012) examine the association between firm size, growth, and profitability of sample of 70 (700 observations) non-financial companies listed at Karachi stock exchange for 10 years (2001-2010). The study indicated that there is a strong positive relationship between profitability and the growth of the firm; but size has less significant and negative impact on the profitability.

Alsughayir (2013) examines the association between quality management, profitability, and productivity in Saudi Arabia's dried date industry. The result of study indicates that productivity serves as a mediator for the link

between profitability and quality management.

Anwarul Islam and Zaman (2013) tested the impact of productivity on profitability covering the specific objects like determinants of productivity performance and analyzing productivity performances. Total number of 15 private commercial banks operating in Bangladesh for a period from 2007–2011 were selected. The study concluded important results. One of the most related to this study that there is a strong association between productivity and profitability.

Yu (2014) investigates the association between productivity, profitability, investment and growth (in terms of sales), based on China's manufacturing firm-level dataset during the period 1998 - 2007. Also, this study concluded more results. One of the most important results is that Firm's contemporaneous and lagged profitability display positive and significant effect on the probability of having an investment spike, which is an evidence of the existence of financial constraint, in particular, the degree of financial constraint is much more severe for China's domestic privately-owned firms than state-owned enterprises.

It becomes especially worthwhile to examine the productivity in Oman since there is a huge interest in productivity in this country. This study try to examine the relationships between the productivity and profitability in Omani listed Companies. The productivity is defined as three proxies; Total Productivity (P), Oman Productivity (O) and Expatriate Productivity (E).

3. Research Method

3.1. Model for productivity and profitability

The econometric model developed comprises two equations. The first model utilizes net operating profit NOP indicator and the second model utilizes return on assets ROA indicator. These equations are tested in the current paper and are formally presented below:

Equation 1 $$\text{ROA}it = \alpha0 + \beta \text{P}it + \varepsilon it$$

Equation 2 $$\text{NOP}it = \alpha0 + \beta Pit + \varepsilon it$$

Notes: ROA= Return on Assets; NOP= Net Operating Profit; P= Productivity; α= Constant; β= Beta; ε= Error term; i= *i*th firm; t= *t*th period.

These models were tested on two levels, all three sectors together and for each sector separately. Normality check of the data was also carried out in this study in addition to correlation, regression and F-test.

3.2. Sample selection and data collection

This study tested the relationship between productivity and accounting profitability. The target population is all companies listed in Muscat Securities Market (MSM) in Sultanate of Oman. There are 115 companies in three sectors listed in (MSM) during the period of this study. There are 47 companies in industrial sector; 36 companies in services sector and 32 companies in finance sector. Data of this study was collected from financial statements as secondary sources. Accounting and productivity information were collected from MSM database. The methodology of the study is a content analysis of annual reports of a sample 108 companies out of 115 (93.9%) for the period 2010-2014. The study excluded 7 companies (4 from services sector and 3 from finance sector) because the financial statements of these companies are not completed. Table 1 summarizes the population and sample for all three sectors.

Table 1 - Population and sample observations

Sector	Population	No. of sample	% of sector	% of population
Industrial	47	47	43.0%	100.00%
Finance	32	29	28.5%	90.60%
Services	36	32	28.5%	88.88%
Total	**115**	**108**	**100.0%**	**94.00%**

Source: Data of MSM

The annual reports for the sample were checked then calculate the value of determinants (ROA, NOP and P) for testing by using the statistical package for the social sciences (SPSS) software. Unfortunately, the only annual reports of this period are presented on the website of MSM because the market itself began to publish the reports since 2007. Some of the companies in the sample were registered in the 2008.

4. Research findings

4.1. Test of normality

The Shapiro-Wilk test is used for testing the normality of data. This test provides better power than the Kolmogorov-Smirnov (K-S) test even after the Lilliefors correction. According to Ghasemi and Zahedias (2012, 487) "some researchers recommend the Shapiro-Wilk test as the best choice for testing the normality of data." The result of data normality test is shown in Table 2. Population or sample assumed normally distributed when the significant at more than 0.05 (P>0.05) and this means all the variables are failed to meet the normality test. With large enough sample sizes (> 30 or 40), the violation of the normality test should not cause major problems (in our case the sample is large, 108 observations). This implies that researchers can use parametric procedures even when the data are not normally distributed. (Ghasemi and Zahedias 2012)

Table 2 - Tests of Normality

Variables	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
P	.124	32	.200*	.974	32	.624
O	.121	32	.200*	.933	32	.047
E	.087	32	.200*	.972	32	.560

Source: output of SPSS

4.2. Correlation Matrix

Table 3 shows the results of correlations between independent variables (total productivity, Omani productivity and Expatriate productivity) and dependent variables (NOP and ROA).

Table 3 - Result Correlation matrix

Variables	T	O	E
NOP	.770**	-.201*	.204*
	.000	.037	.034
ROA	-.416**	-.192*	-.242*
	.000	.046	.012

*Note******* Correlation is significant at the 0.01 level (2-tailed); Correlation is significant at the 0.05 level (2-tailed).

The results indicate that there are positive associations between total productivity, Omani productivity and expatriate productivity and net operating profit at 0.01 for total productivity and 0.05 for other two independent variables. On other hand, there are negative associations between all three independent variables and return on assets as 0.01 and 0.05 respectively.

4.3. Regression analysis

This study tested two regression models. In the first one, the regression results tested the effect of three independent variables on NOP, whereas in the second model the effect of the three independent variables on ROA. Table 4 showed the results of the regression of two models.

Table 4 - The results of the regression of two models

Model	I.V	D.V	R-Square	F-Value	Sig.	Coefficients		
						Variables	**T-Value**	**Sig.**
1	P	NOP	0.041	4.483	.037a	Constant		
	O					P	-2.117-	.037*
						O	.033	.974
	E					E	-.377-	.707

Model	I.V	D.V	R-Square	F-Value	Sig.	Coefficients		
						Variables	T-Value	Sig.
2	P	R O A	0.063	2.334	.078a	Constant	3.501	.001
	O					P	1.591	.115
	E					O	-1.197-	.234
						E	-2.116-	.037*

Note: correlation is significant at the 0.05 level (2-tailed).I.V= Independent Variables, D.V= Dependent Variable,

Source: output of SPSS

In the first model, the total productivity has a significant effect on the NOP at 0.05 but there are no significant effects for the two other variables on NOP. In the second model, the expatriate productivity has a significant effect on the ROA but not for the other two variables.

4.4. Empirical Analysis for each sector

The study examines the associations and regression for each sector separately as follows.

4.4.1. Regression Model 1 (dependent variable NOP)

The study tested the correlation and regression in three sectors in Oman; industrial, finance and service sectors. These sectors are the most important sectors in the Sultanate of Oman beside the sector of Oil and Gas which is the main sector in Oman. This is because the government of Oman encourages the investments in these sectors. In Oman, vision 2020's economic diversification mandate has seen Oman's industrial segment expand rapidly in recent years, with the non-oil sector expanding by 7.6% in 2013. The strong growth being witnessed in the petrochemicals, aluminum, steel and mining segments which expected to continue with government investment in the industrial sector projected to reach $517.88m between 2014 and 2020.

The results as it is shown in table 5 the correlations of independent variables P, O, and E are positive and statistically significant at 5% with NOP in the industrial sector, while the correlation of the three independent variables are insignificant at 5% in all other sectors.

Also, Table 5 shows the summary of regression analysis. In the industrial sector, the R-square supports the significance of regression where the model is dependable. The model of regression is significant at 1% because the Sig. of F-Value (0.000) is less than 1%.In this case, there is at least one variable in the model does have an impact on the NOP. As indicated in the Table 2, the coefficients of P, O and E are significant at 5% because the Sig. of T-value is less than 5%.

The regression analysis in the finance and services sectors is insignificant at 5%. The coefficient of determination is equal to 14.4%% and 4.5% respectively. The R-squares are not supporting the significance of regression where the model is not dependable. The model of regression is insignificant at 5% because the Sig. of F-Values is more than 5%.

4.4.2. Regression Model 2 (Dependent variable ROA)

The results of the correlation showed as in the table 5 that the correlations of independent variables P, O, and E are statistically insignificant at 5% with ROA in all three sectors. Also, the regression analysis in the three sectors is insignificant at 5%. The coefficient of determination is equal to 1.5%, 14.5%% and 9.3% respectively. The R-squares are not supporting the significance of regression where the model is not dependable. The model of regression is insignificant at 5% because the Sig. of F-Values is more than 5%.

Table 5 - Summary of correlations and regression for three subsectors

D.V	I.V	Industrial (N=47) R^2(38.8), F-Value(9.069), Sig.(0.000)			Finance (N=29) R^2(0.144), F-Value(1.398), Sig.(0.267)			Service(N=32) R^2(0.045), F-Value(0.443), Sig.(0.724)		
		Correlation	T-Value	Sig.	Correlation	T-Value	Sig.	Correlation	T-Value	Sig.
NOP	P	.572**	1.110	.0273	0.010	-.663-	.514	-.132-	.019	.985
	O	.608**	1.790	.0211	0.058	.902	.376	-.084-	.218	.829
	E	.540**	1.064	.0293	-0.115	-.113-	.911	-.171-	-.376-	.710

		R²(0.015), F-Value (0.220), Sig.(0.882)			R²(0.145), Sig.(0.264)	F-Value(1.408),		R²(0.093), Sig.(.426)	F-Value(.959),	
ROA	P	0.029	.791	.433	.001	-.268-	.791	-.169-	1.280	.211
	O	0.016	-.779-	.440	.048	.520	.607	-.200-	-1.403-	.172
	E	0.025	-.743-	.462	-.133	-.520-	.608	-.170-	-1.195-	.242

Note: ** Correlation is significant at the 0.05 level (2-tailed).
Source: Output of SPSS

In summary, total productivity, Omani productivity and expatriate productivity have an impact on the NOP in the Industrial sector. This means that more productivity will increase the profitability in terms of NOP but not ROA. This is maybe because it is very big sector and needs more finance and investment. The level of the competition between the companies in this sector is high which may led to improve the levels of production in this sector. On the other hand, the all three types of productivity do not have an impact on the profitability in finance and service sectors. This is maybe because the productivity in those two sectors is depending on the human capital and technologies more than the fixed assets as in the industrial sectors.

5. Differences analysis

The study used F-test (ANOVA) to test the differences between three samples. The test of normality showed that the distribution is normal for all three samples because the Sig. is more than 0.05. Therefore, the study used F-test analysis to examine the differences between three subsectors.
Table 6 showed that the result of this analysis indicates that there are no differences between the three subsectors about independent variables.

Table 6 - F-test analysis

Variables	ANOVA	
	F	Sig.
P	4.763	0.010
O	1.230	0.296
E	12.159	0.000

Source: output of SPSS

The ANOVA analysis showed that there are differences between the sectors regarding the total productivity and expatriate productivity at 0.01 level of significant. In the total productivity and the expatriate productivity, the differences are between finance and industrial sectors. In order to determine the source of differences, the result of Schaffe analysis as in table 7 observed a difference between the industrial and finance sectors and these differences are for the finance sector.

Table 7- Schaffe analysis results

Sectors	P		E	
	Mean	Sig	Mean	Sig
Industrial	1.53	0.012		0.000
Finance	2.07		2.65	

Source: output of SPSS

Conclusions

This study examined the relationship between the productivity and accounting profitability in terms of return of assets and net operating profit. In this study, the productivity is measured by the relationships between cost of sales and number of staff in three sectors. We use the same proxy for productivity to facilitate the comparison between the three sectors. Two models were tested for the effect of productivity and profitability. In the first model, the study tested the relationship between productivity and net operating profit while the second one was tested the relationship between productivity and return on assets.

There are 115 companies in three sectors listed in (MSM) during the period of this study. 47 companies in industrial sector; 36 companies in services sector and 32 companies in finance sector. Data of this study was

collected from financial statements as secondary sources for a period of five years 2010-2014. Accounting and productivity information were collected from MSM database. The methodology of the study is a content analysis of annual reports of a sample 108 companies out of 115 (93.9%).

In the first model, the results of study in the industrial sector indicate that the R-square supports the significance of regression where the model is dependable. The model of regression is significant at 1% because the Sig. of F-Value (0.000) is less than 1%.In this case, there is at least one variable in the model does have an impact on the NOP. The coefficients of P, O and E are significant at 5% because the Sig. of T-value is less than 5%.

The regression analysis in the finance and services sectors is insignificant at 5%. The coefficient of determination is equal to 14.4%% and 4.5% respectively. The R-squares are not supporting the significance of regression where the model is not dependable.

In the second model, the results of the correlation showed that the correlations of independent variables P, O, and E are statistically insignificant at 5% with ROA in all three sectors. Also, the regression analysis in the three sectors is insignificant at 5%. The coefficient of determination is equal to 1.5%, 14.5%% and 9.3% respectively. The R-squares are not supporting the significance of regression where the model is not dependable.

The ANOVA analysis showed that there are differences between the sectors regarding the total productivity and expatriate productivity at 0.01 level of significant. In the total productivity and the expatriate productivity, the differences are between finance and industrial sectors. Schaffe analysis observed that the differences are for the finance sector.

The findings of this study are consistent with results of most of previous studies. Owyong (1997), Kouser *et al.* (2012), Alsughayir (2013) and Anwarul Islam and Zaman (2013) are concluded that the productivity can serve as an indicator to improve the productivity. This is true but may be only in the industrial sector because there is a positive relationship between productivity and profitability. Also, Anwarul Islam and Zaman (2013) indicated that the productivity in the banks has effect on the profitability but this is not consistent with our findings in this sector. This is because the banks in Oman are less in number (about 20% of number of companies in the finance sector) and most of them are new.

This study has certain limitations. Firstly, it uses only one measure of productivity which is monetary measure. Our models are depending on the accounting information provided by accounting system which isolated all other external information such as price inflation. Secondly, because this study is employed the accounting data, this might have some effects on the findings that are caused by the diversity of accounting practices.

We will improve the paper in two aspects in the future. First, the econometric models will be refined in the future work through adding some other measures of productivity, in order to solve the bias due to endogenous variables. Second, cross- sectional studies on the relationship between the productivity and profitability may helpful in improving the productivity practices in GCC countries in general and specifically in Oman.

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Factors affecting Tax Income Revenues in the Visegrad Countries. An Empirical Evidence based on Regression Analysis

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Abstract:

The paper provides evidence on the latest empirical research of domestic and foreign sources that determine tax revenues in the particular V4 countries. The income tax is an important source of governmental budget that is affected by a numerous economic, social, and political factors, whereby the degree of the influence may vary according to the intensity of the relation between variables. We applied the OLS regression to identify and evaluate the relationship between exogenous determinants and revenue from income tax, the estimates of the examined parameters of the model and validate the theory on the correlation in the V4 countries during the period 2000 - 2013. The regression model results indicate differences in statistical significance determinants in the V4 countries, while at the same time correspond with existing investigations and findings of other authors.

Keywords: income tax, OLS regression, determinants of tax revenues, Visegrad countries.

JEL Classification: C51, C52, G12, G32.

1. Introduction

Tax is a variable that is also changing in time. To follow this aspect we also need to consider the influence of particular factors affecting tax. The issue of tax revenue determination is currently often a topic of discussion, specifically due to fiscal consolidation. The fiscal consolidation can be interconnected with the concurrent improvement of actual law and establishment of new tax law to increase tax revenues from the state budget perspective. Inflow of tax revenues has been influencing by a number of determinants. Considering their character the determinants can be divided into economic, social, political, legal, demographical, socio-historical, or even technological aspects as reviewed by Castro and Camarillo 2014, Karagöz 2013, Hansson, Porter and Williams 2012, Gupta 2007, Klazar 2003, Kubátová 2012, Bayer 2011, Kubátová and Říhová 2009, Raisová 2012. Total volume of tax returns is the result of large number of different determinants interact each other.

Their influence may be reflected directly through tax structure itself, or indirectly through the behaviour of taxpayers. The actual factors are very specific and dynamic phenomena that are constantly evolving and interacting (Bayer 2011, Mura and Buleca 2012). The degree of influence may vary according to the intensity of the relation between the variables. Either the different variables affect the tax revenue with varied impact during a particular period or the same variable may affect with different intensity across different periods. Subject of review of domestic and foreign researchers is to explore the important determinants of tax revenue and their components in different countries, using different explanatory variables based on cross section as well as time series data a different methodology.

2. Materials and methods

The aim of the paper is to identify factors, using the methods of quantitative economics, that affect income tax (i.e. taxes on personal income tax as well as on corporate income) in the V4 countries and based on the results to enumerate, compare and assess the impact of factors on the volume of revenues from income taxes in the analysed countries.

In accordance with the formulated aim the analysed dependent variable as well as the explanatory variables are expressed quarterly in the time series range from Q1 2000 to Q4 2013, and are seasonally adjusted to mitigate the seasonal influences within the analysed time series of the particular V4 countries. The stationarity of time series has been tested in the first part because we had been using macroeconomics variables and according to empirical evidence most of macroeconomics variables tend to be non-stationary. To obtain reliable estimates of model parameters it was also necessary to test time series stationarity of the V4 countries, and even help to prevent so-called false regression or spurious correlation in the model.

In the second part we applied econometric analysis. In accordance with the set objectives and parameters of the model by quantification of model parameters was selected OLS (Ordinary Least Square) regression, which is provided for all individual V4 countries. For estimating parameters of the regression the environment of R programme was used.

In accord with the objective of the present current paper, which is the analysis of selected factor influencing revenues from income tax (personal or corporate income tax), the theoretical part of the paper is focusing on a review of literature from perspective of factors determining revenues coming from income taxes. We went through scientific books and journals and conducted a research of local as well as foreign literature sources dedicated to research topics. We used this recherché to establish our test hypothesis about anticipated effects of selected factors affecting revenues coming from income taxes.

The analytical part is based on data of selected exogenous and endogenous variables gained from Statistical Office of the European Community – Eurostat, the national statistical web sites and the individual ministries of finance in Visegrad Group (V4) countries.

Factors potentially affecting revenues coming from taxes are reflected quarterly, and in the same units for the period of time from Q12000 to Q42013.

The main method used in our paper is analytic-synthetic method. Statistical analysis of secondary data is provided using mathematical and statistical methods supported by different statistical programs and software. Spreadsheets models as well as SPSS Base software and software R are applied. While fulfilling the objective of the research the general methods as analysis, comparison, induction, synthesis, and statistical methods in the form of descriptive statistics and graphical as well as numerical data description had been used.

3. Literature review of factors determining revenues from income taxes

One of important factors is the subject of several studies is GDP or GDP per capita (Castro and Camarillo 2014, Gupta 2007; Pessino and Fenochietto 2010) Livermore (2004) researched dependency between GDP and tax revenues. He came from an assumption that the basis for calculation of income tax is positive outcome from entrepreneurial activity or profit. The analysis was based on a model that assumed unit elasticity between the tax basis (corporate profit) and explanatory variable, i.e. nominal GDP. The result of the analysis is that profit growth in the analysed period was proportionally same as the rate of GDP growth. Finally, he adds that the growth rate of tax revenue should not significantly exceed the growth rate of GDP. The impact of GDP on tax revenues, namely revenues from corporate income taxes are also considered by Kubátová and Říhová (2009) and Bayer (2011), who through a panel regression analysis show the positive impact of GDP.

Another important factor is the tax rate (nominal, and average effective tax rate). The nominal rate is a statutory tax rate for the taxation of income in the country. The nominal tax rate is adjusted and based on the specific components of the tax base, forming the effective value of the tax burden. However, there is an objective indicator for interstate comparison. Effective tax rates have a higher predictive value than the nominal tax rate. They are used not only to investors but to a large extent, politics and economics. To determine the effective tax rates there are many ways and methods, usually are determined based on a set methodology (Devereux and Griffith 1999, 2003). Kubátová *et al.* (2012) shows the breakdown of effective tax rates on fictitious (microeconomic effective tax rates EATR and EMTR) and real. The relationship between tax rates and tax revenue discussed Clausing (2007), Mirdala (2013), Mura, Buleca, Hajduová and Andrejkovič (2015), Michalski (2012), and Devereux (2006) in their publications. The results of their research show that the higher tax rate increases tax revenues.

Demographic factors are relative monitored variables in the context of tax revenues, particularly due to the current increasing trend of population aging in the world. The phenomenon of population aging has negative effect on revenues of tax income and ultimately on the fiscal imbalance of countries, since there is a reduction of economically active population (persons aged 15-67 years). From the government's perspective there is a decrease in revenues collected from taxes on wages and consumption, while in same time increase the total

amount of paid transfers, what cause a pressure on public budgets. This trend has implications on forecasting of tax income, mainly related to personal income tax and social welfare contributions. The issue of the impact of demographic development is engaged in several research studies such as Goudswaard and van de Kar (1994), Al-Mamun, Entebang, Mansor and Yasser (2014), Hasseldine (1999), Devos (2008), Felix and Watkins (2013), Hajdu, Andrejkovič and Mura (2014) etc. The studies suggest that an aging of population is likely to have a larger negative effect on individual income tax revenue than sales tax revenue. However, the effects of population aging on tax revenues is only one factor that policymakers are likely to consider in fiscal policy deliberations. At the same time research results shos that demographic change alone will likely reduce individual income taxes and sales taxes in nearly every state in the nation on a per capita basis in the coming years, holding all other factors constant. At the same time, total revenues will likely increase with total population growth in most states. According Goudswaard and van de Kar (1994) simulations for the Netherlands indicate a 27% rise in tax revenue until 2010 because of population growth and a relatively older labor force. After 2030, revenue falls as a consequence of a declining population and a rapidly rising share of the elderly.

Labor market indicators such as employment, unemployment rate, the structure of the workforce, and wages and volume of salaries paid are important factors that can directly affect tax revenues and therefore are often used in relation to the estimated tax revenues. As reported Kubátová *et al.* (2012) data on total employment and nominal wage growth are the main variables entered into the model for calculating the estimated revenue from taxes on personal income, corporate income tax and social insurance. Research in labor market mainly focuses on exploring the impact of taxation on wages and employment (OECD 2013, Blundell 1995, Dolenc and Laporšek 2010, Bocconi 2011). However, the subject of interest is also an inverse relationship, i.e. the impact of wage and labor market indicators on the volume of revenues from income taxes (Kennedy, McMillen and Simmons 2015, Karagöz 2013, Campbell 2010, Gupta 2007, Bauer *et al.* 2008, Clausing 2007, Kenny and Winner 2006).

Mentioned research shows a positive relationship between employment growth and the volume of revenues from income taxes. At the same time a high unemployment rate is negatively correlated with the tax rate, indicating that governments lower tax rates to stimulate the economy during economic downturns. Campbell (2010) states that in the long-term factors such as real per capita income and the rate of unemployment have only marginal influence. Migration is a phenomenon that is closely related to economic, political and social life and significantly affects society of host as well as source country.

The impact of migration also appears in the fiscal area, through direct financial transfers - taxes and social security contributions paid, indirect taxes paid by immigrants – value added tax and excise taxes and the financial transfers received via unemployment and social assistance benefits, disability payments, family allowances etc. These are not only components that should be considered in assessing the fiscal impact of immigration (OECD 2013). Research on migration focuses not only on researching of the economic impact, but also the fiscal effects in a country are considered, namely an influence from the perspective of revenue, expenditure and fiscal balance of the country (Rowthorn 2008, Dustmann and Frattini 2014, Nowrasteh 2014, OECD 2013, Vargas-Silva 2015). OECD (2013) realized comparative analysis of the fiscal impact of immigration in OECD countries for the years 2007 – 2009 based on analysis of net (direct) fiscal position, which consists of assessing immigrants´ tax and social contributions, on the one hand, and immigrants´ receipts of social transfers and use of government services, on the other, at a specific point time, through a static accounting (cash-flow) model. The study shows that the impact of migration varies depending on the methodology used and the assumptions upon which, there are differences between countries of the OECD. According to the results of the analysis of OECD (2013) impact of migration tends to be small – with the average impact value ± 0.35% of GDP. The country with the most positive fiscal impact from migration is Luxembourg and Switzerland (+ 2% of GDP and + 1.9% of GDP), while the country with the more negative fiscal impact from migration was Germany (-1% of GDP). V4 countries belong to group with very small fiscal impact ±0.12% of GDP.

As Rajan (2010) states, per capita public expenditure reveals development needs of the nation and the levels of economic development. And the government will be able to mobilise additional personal income tax whenever there is an increase of public expenditure. This shows the positive association between the two (Rajan, 2010). Rajan (1996) tried to investigate the stability of the determinants of personal income tax and the results of the analysis reveal that the variables such as per capita GDP, literacy rate, per capita public expenditure are positively associated with tax revenues. Per capita public expenditure and public debt have been analysed by Karagöz (2013), who examined the effect of selected factors on tax revenues. These two factors are two indicators of financial position of the government. As reported by author (year), whenever the government needs

more resource to finance its expenditure or to pay balance due, government has to mobilize more tax revenue. Hence, a positive relationship is expected between tax revenue and both the per capita public expenditure and public debt. Results of the analysis indicate a positive impact on tax revenues. The most important form of international business relations is international trade that ensures the exchange of goods and services between particular countries. Another factor trade openness, trade liberalization or export is the subject of multiple researches as mentioned by Cassou (1997), Gupta (2007) and Bird *et al.* (2008). Gupta (2007) highlighted the fact that trade openness is a significant and strong determinant of revenue performance. The trade volume measured as the sum of exports and imports of goods and services as a percentage GDP

It was one of the explanatory variables in tax revenues in research Castro and Camarillo (2014). The results of their analysis show that factors are not statistically significant; respectively their effect is undetermined or can have opposite effects. According authors, explanation of this is that OECD economies, on the one hand, are open economies and have reduced import taxes gradually and, on the other hand, the expansion of exports increases the performance of the economy (Castro and Camarillo 2014). Similar findings introduce Karagöz (2013), whose results of econometric model suggest that openness to foreign trade (measured as the ratio of total foreign trade (exports plus imports) to GDP) has no significant impact on income tax revenues.

4. Analysis of factors' influence on the revenue from personal and corporate tax income in V4 countries

4.1 Seasonal cleaning of time series and stationarity testing of researched time series

The aim of seasonal data cleaning is to reduce seasonal distortion in a time series that represents more or less regularly recurring fluctuations in the values of the time series around the trend (Huček and Doliak 2014). The identification and verification of seasonality can be determined by using different methods (Arlt and Škuthanová 1995, Ghysels and Osborn 2001, Výrost, Baumöhl and Lyócsa 2013, Mirdala 2013...). The sophisticated, most commonly used methods include CENSUS X-11, X-11 ARIMA X-12 ARIMA of class X-11A TRAMO / SEATS using a model estimate for which it is possible to consider the impact of working days, holidays, or other factors (Shiskin *et al.* 1967, Dagum 1992 Ghysels and Osborn 2001 Maravall 2005, U.S. Census Bureau, © 2015).

For the seasonally adjusted time series of examined exogenous factors and endogenous variables during Q12000 - Q42013 in the V4 countries was applied CENSUS X-12 program implemented in EViews. Seasonal adjustment was made for all explanatory variables except of x10, x11 and x13 since it is a tax factor, which determines especially political decisions in a context of fiscal policy's implementation in the country. Original and transformed time series (seasonally adjusted) of explanatory variables X1 - X9 and X12 are for all V4 countries represented graphically. The paper, due to number of graphical figures and their extent, is concentrated on presentation of seasonally adjusted time series for the Slovak Republic. Selection of represented variables depends on the fact that factors present statistically significant determinants of revenues from income tax provided by OLS regression in the V4 countries.
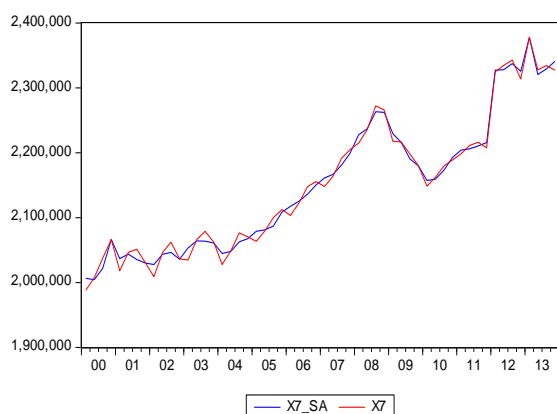
Figure 1 - Seasonal cleaning of exogenous variable x1. Source: the output of EViews

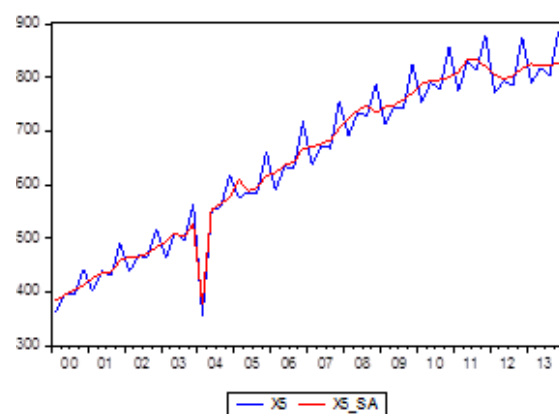Figure 2 - Seasonal cleaning of exogenous variable x5. Source: the output of EViews

For variables minimum wage (x4) and average wage (x5) in the Slovak Republic regular seasonality (in Q4) is visible (Figure 2). Seasonal fluctuations in the evolution of the minimum wage as compared to the seasonality of the average wage are significantly lower. In the case of variable GDP and GDP per capita (x8, x9)

were observed significant regular seasonal influence from Q42008 to the end of the specified period. In the time series of total employment (x1) is in the raw time series hardly visible seasonal component (Figure 1). After applying the selected smoothing technique the corrected data significantly copy the former time series. Result of seasonal adjustment of time series of total population (x2) is a pale seasonal component of time series, because the used smoothing method could smooth only small seasonal variations.

Most macroeconomic time series are non-stationary and do not meet the minimum condition of time invariance of mean value, variance and autocorrelation structure. This fact may cause problems in testing and obtaining reliable and adequate testing statistics in the form of so-called spurious regression (Hadri and Rao, 2009). Stationarity of time series can be tested using a number of tests. Augmented Dickey-Fuller (ADF) unit root test is frequently used to test the stationarity of time series. The alternative or complementary unit root test is Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test. By testing both the unit root hypothesis and the stationarity hypothesis, one can distinguish series that appear to be stationary, series that appear to have a unit root, and series for which the data (or the tests) are not sufficiently informative to be sure whether they are stationary or integrated. KPSS test unlike the ADF test in H0 assumes the stationarity of the analysed time series. The alternative hypothesis H1 is assumed to be non-stationary. If the test statistic (LM-Stat.) were higher than the selected threshold value (asymptotic critical value) at a certain level of significance (1%, 5% or 10%), then the null hypothesis would turn down and the process would be considered as non-stationary. In our case stationarity of the time series in their undifferentiated form was confirmed among all seasonally adjusted exogenous variables as x1_SA - x9_SA and x12_SA, exogenous variables x10, x11 a x13, as well as the reviewed endogenous variables – the amount of income tax (y). In regard to scale of individual tests and the number of examined variables only restricted number is illustrated, specifically only the result of stationarity test for exogenous variables x1_SA,x5_SA and x13 for the Slovak Republic. The selection of presented variables is conditioned by a fact that exactly these factors have statistically significantly influenced tax revenues from personal and corporate income taxes in provided OLS regression in V4 countries. As shown in Table Tab. 1 KPSS test statistic for the seasonally adjusted time series x1_SA is 0.690282 and x5_SA is 0.699615, where the test statistic for non-seasonally adjusted time series x13 is 0,607898. The published values of LM-Stat. are lower than critical value at the selected significance level of 1%, so we cannot rejects H0 on the stationarity of time series. In very similar way the other exogenous variables of the V4 countries as well as the endogenous variable have been tested. The specific OLS model was set after verifying stationarity of seasonally smoothed time series.

Table 1 – Results of KPSS stationarity testing for exogenous variables x_1, x_5, x_{13}

KPSS Stationarity Testing		
Null Hypothesis: x_{1_sa} is stationary		
Null Hypothesis: x_{5_SA} is stationary		
Null Hypothesis: x_{13} is stationary		
Exogenous: Constant		
Bandwidth: 6 (Newey-West automatic) using Bartlett Kernel		
		LM – Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic (x_{1_SA})		0.690282
Kwiatkowski-Phillips-Schmidt-Shin test statistic (x_{5_SA})		0.699615
Kwiatkowski-Phillips-Schmidt-Shin test statistic (x_{13})		0.607898
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000
Sample: 2000Q1 - 2013Q4		
Included observations: 56		

Source: The output of EViews

4.2. OLS Regression

4.2.1 Model construction

Since the amount of tax revenues of a country is affected by many different factors, that impact and intensity vary depending on the economic situation and the implementation of fiscal policy of the state, in the model were included those factors that can be considered as the most important based on the available literature and analysed domestic and foreign studies. The basic model is defined in the form:

$$y = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \cdots + \alpha_{13} x_{13} + u_t \tag{1}$$

Specified model explored the influence of selected factors as well as exogenous variables in selected period reaching from Q12000 to Q42013 in regard to the selected endogenous variable – total tax revenues of state from personal and corporate income tax, expressed in million euros.

Into the model input thirteen exogenous variables (x1 -x13):

- total employment (x_1) – number of people employed - the quarterly series based on the quarterly results of the EU Labour Force Survey: x1 represents all persons who worked at least one hour for pay or profit during the reference week or were temporarily absent from such work, unit of measure: 1000 of persons;
- total population (x_2) - defined according Eurostat as resident population and represents the number of inhabitants of a given area on 1st January of the year, expressed in number of persons;
- economically active population (x_3) – total population the ages 15 to 64 - based on the quarterly results of the EU Labour Force Survey: x3 represents active population (labour force) defined as the sum of employed and unemployed persons, unit of measure: 1000 of persons;
- minimum monthly wage (x_4) - according Eurostat, minimum wage statistics refer to national minimum wages for V4 countries, unit of measure: euro;
- average monthly wage (x_5) - represents average gross monthly earnings of employees in national economy of V4 countries, according to Eurostat, unit of measure: euro;
- amount of government expenditure (x_6) – volume of financial resources in a public budget determined for fulfilling the fiscal function of the state, total general government expenditure according Eurostat, compiled on national accounts (ESA 1995) basis, unit of measure: million euro;
- GDP per capita (x_7) - according Eurostat, based on quarterly national accounts form, expressed as integral part of the ESA 1995, GDP at market prices is the final result of the production activity of resident producer units, unit of measure: euro per inhabitant;
- GDP in Euro (x_8) - according Eurostat, based on quarterly national accounts form, expressed as integral part of the ESA 1995, GDP at market prices is the final result of the production activity of resident producer units, unit of measure: million euro;
- State's export (x_9) - exports of goods and services by Member States of the EU/third countries according Eurostat based on quarterly national accounts form, expressed at current prices as integral part of the ESA 1995, unit of measure: million euro;
- Tax rate of personal income tax (x_{10}) – basic personal income tax rate according to valid legislative regulation in period from 2000 to 2013;
- Tax rate of corporate income tax (x_{11}) – basic corporate income tax rate according to legislative regulation in period from 2000 to 2013;
- human migration (x_{12}) - expressed as number of people migrate - according Eurostat, denotes the action by which a person, having previously been usually resident in the territory of a Member State, ceases to have his or her usual residence in that Member State for a period that is, or is expected to be, of at least 12 months; unit of measure: number of emigrants within reference period;
- average income tax rate (x_{13}) – determined as simple arithmetic mean of personal and corporate tax income rates.

In defined equation based on the OLS regression model described in equation (1), α_0 is a variable that represents an intercept, variables $\alpha_1, \alpha_2, \cdots, \alpha_{13}$ are the particular regression coefficients, and u_t is the random variable. For OLS regression was used an implementation focusing on software R.

Each of econometric models has been a subject of economic and statistical verification aim to study the impact of selected factors on the income tax revenues in the V4 countries, therefore there was necessary to create four separate models for each country due to economic differences and diversity of the tax systems because one assumes that each country will be affected by other factors in the overall tax revenues and also the intensity of factors will be different.

The statistical model verification includes verification of basic assumptions of the regression model. Testing was based on verification of the significance of individual exogenous variables, assuming a normal distribution of residues, provided homoscedasticity verification, verification of the hypothesis of zero-diagonal elements of the covariance matrix of random components of covariance and verify the presence of multicollinearity. A normality test was used to confirm that the residues have a normal distribution. Test of

significance of the variables was excluded from the model. The presence of heteroscedasticity was checked by Breusch-Pagan test using p-value of all models under consideration with consideration that the value is larger than α with considered statistically significant equals 0.05, which indicated that the heteroscedasticity was not present. Violation of the assumption of zero-diagonal elements of the covariance matrix of random components covariance represents the presence of autocorrelation. To detect autocorrelation Durbin-Watson test was used. Multicollinearity presence was verified using VIF test which confirmed that each of the tested models was unaffected. Specification of the model was proofed using the Reset test, the value for individual models confirmed that the models are well specified.

4.2.2 Results of regression model

4.2.2.1 Assessing the impact of factors on the revenues from income taxes in the Slovak Republic

From testing the defined OLS regression model in the case of the Slovak Republic can be noted that during the analysed period (2000 – 2013) the revenues from personal and corporate income taxes are affected by three factors, specifically:

- total employment,
- number of people aged 15 to 64 years,
- average monthly salary in euros.

Figure 3 shows the result of the model, where it can be seen that the three above-mentioned factors are statistically significant, and so they should be included in the model and affect the income tax flowing into governmental budget of the Slovak Republic. Using the comparison of resultant p-values of α and considering the level of statistical significance equals 0.05 it can be seen that all three of the above explanatory variables are statistically significant. Likewise, statistically significant is the model as a whole, because the p-value (2.2e-16) is less than the significance level (α = 0.05). On the basis of the multiple R-squared it can be simultaneously observed its value of 96.87%, which expresses the tightness of power between explaining variables and the resulting exogenous variables. A 96.66% level of the variability of revenues from personal and corporate income taxes is explained by the resulting regression function.

Residuals:				
Min	1Q	Median	3Q	Max
-94900594	-22836751	450303	22461026	79844027
	Estimate	Std.Error	t value	Pr > (/t/)
(Intercept)	-2.920e+09	4.585e+08	-6.367	9.73e-08 ***
x1	2.354e+03	1.795e+02	13.118	< 2e-16 ***
x3	-4.378e+02	1.317e+02	-3.325	0.001789 ***
x5	3.920e+05	9.546e+04	4.106	0.000172 ***

Signif. Codes: 0´***´ 0.001 ´**´ 0.01 ´*´ 0.005 ´.´ 0.1 ´ ´ 1				
Residual standard error: 38260000 on 44 degrees of freeedom				
Multiple R-squared: 0.9687, Adjusted R-squared: 0.9666				
F- statistic: 454.3 on 3 and 44 DF, p - value: < 2.2e-16				

Source: own, based on results of OLS regression as the output of the programme R

Figure 3 - Factors affecting income tax revenues in the Slovak Republic

The resulting regression model that meets all basic assumptions of the econometric model in the case of the Slovak Republic has the following form:

$$y = -2,920 \cdot 10^9 + 2,354 \cdot 10^3 x_1 - 4,378 \cdot 10^2 x_3 + 3,920 \cdot 10^5 x_5 + u_t$$

As can be seen form the equation, an increase of unit in total employment causes an increase in tax revenues of the Slovak Republic to 2354 units, which is logical because increasing employment should pull the income tax paid to the state budget. The second factor that affects the income tax in the Slovak Republic is the number of people aged 15 to 64 years. An interesting feature of this factor is that the unit increase causes a drop in tax revenues of 437.8 units. One explanation why this is so, it may be that employers can retain people in employment aged over 64 years who "threaten" jobs of younger people. Another reason for this may be the

problem of high unemployment among recent graduates of either high or even other secondary schools. The third and also the last factor affecting income tax in the Slovak Republic is the average quarterly salary in euros. The increase in the average quarterly salary of one unit causes an increase in income tax of 3.920 + 05 units, which is also logical because under ceteris paribus condition, wage growth also causes an increase in income taxes paid to the state budget.

4.2.2.2 Assessing the impact of factors on the revenues from income taxes in Hungary

According to the results of the regression model for Hungary it was found that the from originally considered fourteen factors only four factors significantly affect the revenues from income taxes in Hungary, specifically:

- number of people aged 15 to 64 years,
- minimum monthly wage in euro,
- average quarterly wage in euro,
- income tax rate of individuals.

The results are illustrated in Figure 4, where the tightness of dependence between endogenous variables and exogenous variables is 85.53% measured by the Multiple R-squared. The resulting model reflects 84.18% of the variability of revenues from income taxes in Hungarian conditions. Figure 4 also states that the four before mentioned explanatory variables included in the model are statistically significant because their p-value is less than the selected significance level ($\alpha = 0.05$) and the model as whole is also statistically significant.

A result of testing is the final OLS regression model that has the following form:

$$y = -1{,}035 . 10^{10} + 1{,}305 . 10^3 x_3 + 5{,}251 . 10^6 x_4 + 8{,}614 . 10^5 x_5 + 3{,}991 . 10^7 x_{11} + u_t$$

This equation shows that each factor has a positive effect on income tax in Hungary. This means that the unit increase of a factor may also cause an increase in tax revenues of Hungary. The first statistically significant factor affecting income tax in Hungary is the number of people aged 15 to 64 years. The increase of this factor by one unit causes an increase in budget revenues from income taxes of 1.305 + 3 units of the euro. Labour market analysis of Hungary pointed out that Hungary is primarily employ people from this age interval, which is reflected in the results of the model.

Another statistically significant factor affecting income tax in Hungary is the minimum monthly wage in euro. The increase of one unit causes an increase in income tax of 5.251 + 6 units of the euro. The third important factor affecting the income tax in Hungary is the average quarterly wage in euros. An increase of this factor by one unit causes an increase in tax revenue from income taxes of 8.614 + 5 euro units. There is also important that minimum monthly wage in euro as well as average quarterly wage in euro affect the total income tax collection in Hungary. This increase is due to the fact that the labour market substitution effect prevails, which means that the increase of wage is accompanied with an increase of labour supply. Logically, this effect works only temporarily and as long as people are willing to replace their free time to work. In other words, the substitution effect on labour paid until benefit from additional unit of work is greater than the benefit of an additional unit of leisure time. After the substitution effect on the labour market starts to operate a pension effect.

The final factor affecting revenues from income taxes in Hungary is the tax rate on income of individuals. According to the analysis of tax rates in the V4 countries, from all analysed V4 countries has Hungary the second highest income tax rate for individual. The increase in the personal income tax rate by one unit causes an increase in tax revenues of 3.991 + 7 euro units. In practice, this means that in Hungary, it is possible to increase the rate of personal income tax, but only to a certain extent, what is also very well expressed by Laffer curve, which states that with the growth of tax rate tax revenue increase, but only to a certain extent and then begins fall. It has different shape in short-term perspective compared to long-term perspective. In the short term it is possible to increase the tax revenue of the state, but in the long run the impact might not be as clear, as there may be various situations, for example emigration abroad, transfer to the black market or a preference of free time over work.

Residuals:				
Min	1Q	Median	3Q	Max
-398887219	-116679488	28119742	122852526	328103407
	Estimate	Std.Error	t value	Pr > (/t/)
(Intercept)	-1.035e+10	1.455e+09	-7.111	8.88e-09 ***

x3	1.305e+03	2.102e+02	6.207	1.83e-07 ***
x4	5.251e+06	1.071eľ06	4.903	1.39e-05 ***
x5	8.614e+05	3.127eľ05	2.755	0.00857 **
x11	3.991e+07	5.115e+06	7.802	9.06e-10 ***

Signif. Codes: 0´***´ 0.001 ´**´ 0.01 ´*´ 0.005 ´.´ 0.1 ´´ 1				
Residual standard error: 1748000000on 43 degrees of freeedom				
Multiple R-squared: 0.8553, Adjusted R-squared: 0.8418				
F- statistic: 63.53 on 4 and 43 DF, p - value: < 2.2e-16				

Source: own, based on results of OLS regression as the output of the programme R

Figure 4 - Factors affecting income tax revenues in Hungary

4.2.2.3 Assessing the impact of factors on the revenues from income taxes in the Czech Republic

The results of econometric modelling in the conditions of the Czech Republic suggest that the tax revenue flowing from personal and corporate income taxes are only affected by three factors, specifically:
- total employment,
- total population and
- governmental spending in euro.

In Figure 5 we can see that all above mentioned factors also called as explanatory variables are statistically significant. This is visible from the fact that the p-value has lower values than the chosen significance level $\alpha = 0.05$. Likewise, the model as a whole is statistically significant.

lm (formula = y – x1 + x2 + x6 , data = data)				
Residuals:				
Min	1Q	Median	3Q	Max
-502.70	-86.94	-7.32	81.38	368.37
Coefficients:				
	Estimate	Std.Error	t value	Pr > (/t/)
(Intercept)	5.266e+02	2.528e+03	0.208	0.835955
x1	2.331e+00	3.621e-01	6.436	7.69e-08 ***
x2	-1.317e+00	3.273e-01	-4.024	0.000222 ***
x6	7.498e-10	7.117e-11	10.536	1.30e-13 ***

Signif. Codes: 0´***´ 0.001 ´**´ 0.01 ´*´ 0.05 ´.´ 0.1 ´´ 1				
Residual standard error: 158.9 on 44 degrees of freeedom				
Multiple R-squared: 0.9294, Adjusted R-squared: 0.9246				
F- statistic: 193 on 3 and 44 DF, p - value: < 2.2e-16				

Source: own, based on results of OLS regression as the output of the programme R

Figure 5 - Factors affecting income tax revenues in the Czech Republic

Ordinary least square regression model for the Czech Republic has the following form:

$$y = 5,266 \cdot 10^2 + 2,331 \cdot 10^0 x_1 - 1,317 \cdot 10^0 x_2 + 7,498 \cdot 10^{-10} x_6 + u_t$$

From this equation is visible that two factors from three statistically significant factors positively influence the income tax and with their increase total tax revenue grows in the Czech Republic. One factor has a negative impact on overall tax revenues and its increase might cause a decline in income tax revenues.

The first important factor that affects income tax in the Czech Republic is total employment. Increase in the total employment by one unit represents an increase in tax revenues of 2.331 units. This is logical since employment growth has a positive impact on the state budget in the form of increase of state budget revenues from income taxes. Another factor influencing the tax revenues of the Czech Republic's total population. With population growth of one unit the total government tax revenue fell by 1.317 units. The relationship between tax revenues and the overall population cannot be interpreted easily. The inverse relationship may be underlined by a diversity of the total population, because the total population also includes people unemployed, students,

pensioners and others whose increase might negatively affect total income tax. The third and also the last factor affecting income tax in the Czech Republic is government expenditure in euros. The growth of government spending by one unit will cause an increase in taxes on income countries about 7.498 units. The relationship between these factors is proportional, which means that growth causes an increase in explanatory variable explaining variable. It is important to note the fact the government can increase its spending and meet the public needs of the population if there are the resources for such expenditure. The most common way of obtaining resources to meet the needs is an enhanced form of taxation. Our analysis shows that Czech citizens support the public services provided by the state and are willing to contribute to their security because their personal limitations are compensated by public service of the state. The resulting value of adjusted R-squared indicates that this defining model represents 92.46% of the variability of revenues from income taxes. At the same time it is based on the values of multiple R-squared, the model represents 92.94% depending on the tightness of power between endogenous variables and the resulting statistically significant exogenous variables.

4.2.2.4 Assessing the impact of factors on the revenues from income taxes in Poland

Results of regression analysis for the last analysed country Poland point out the fact that the revenues from personal and corporate income taxes are affected by the four factors from the original thirteen factors considered. A statistically significant are:

- total employment,
- total population,
- minimum monthly wage in euro,
- number of migrating persons.

Figure 6 illustrates a reality that considered explanatory variables are according to the result of modelling statistically significant. The resulting p-value of each factor is below the significance level α=0.05. This means that all explanatory variables must be included into the regression model and the model as a whole is statistically significant. Based on the output values of reliability we can assume that defining models represents 91.54% of variability of revenues from income taxes and in the meantime model represents 92,26% depending on the tightness of power between endogenous variables and the resulting statistically significant exogenous variables, what is expressed by the value of multiple R-squared.

Shape OLS regression model in terms of the Republic of Poland, which reflects the impact of various factors on the revenue from personal income tax and the corporate income tax is as follows:

$$y = 6,916 \cdot 10^{10} + 1,081 \cdot 10^3 x_1 - 2,200 \cdot 10^3 x_2 + 1,718 \cdot 10^7 x_4 - 2,661 \cdot 10^4 x_{13} + u_t$$

The equation states that two factors have a positive effect on income tax and the other two factors negatively affect the tax revenues of the countries analysed.

The first factor that affects the income tax revenues in Poland is total employment in the country. With the growth in employment per unit of total tax revenues of the country will increase by 1.081 + 3 units. This effect can be seen as a logical, since employment growth causes higher amount of wages on which to calculate the total tax income countries analysed.

Another factor influencing the income tax in Poland is overall population. In contrast to the first factor, the factors that determine the tax charge negative, which means that with the increase of the total population of the one unit of the total tax lower 2.200 Euro + 3 units. The problem with this is inversely proportional to the demographic development in Poland that is accompanied by aging of population. According to European Commission (2010) it is believed that if preserving the current demographic trends Poland by 2060 there will be more than one third of the population (36.2%) over 65 years.

lm (formula = y – x1 + x2 + x4 + x13 , data = data)				
Residuals:				
Min	1Q	Median	3Q	Max
-838515048	-232189393	-1067139	231376326	1241092997
Coefficients:				
	Estimate	Std.Error	t value	Pr > (/t/)
(Intercept)	6.916e+10	2.330e+10	2.969	0.004874 **
x1	1.081e+03	1.535e+02	7.039	1.13e-08 ***

x2	-2.200e+03	6.050e+02	-3.637	0.000734 ***
x4	1.718e+07	2.467e+06	6.966	1.44e-08 ***
x13	-2.661e+04	5.046e+03	-5.274	4.11e-06 ***

Signif. Codes: 0´***´ 0.001 ´**´ 0.01 ´*´ 0.005 ´.´ 0.1 ´´ 1				
Residual standard error: 439200000 on 43 degrees of freedom				
(9 observations deleted due to missingness)				
Multiple R-squared: 0.9226, Adjusted R-squared: 0.9154				
F- statistic: 128.1 on 4 and 43 DF, p - value: < 2.2e-16				

Source: own, based on results of OLS regression as the output of the programme R

Figure 6 - Factors affecting income tax revenues in Poland

The third factor that affects the revenues from taxes on income in Poland is the minimum monthly wage in euro. The increase in the minimum monthly wage by one unit means a growth of the income tax of 1.718 + 7 euro units. Indicator of the minimum wage has an impact on various areas of economic life, and it is clear that with the professional growth of the employee's tax liability and state revenues from income taxes increases.

The final factor affecting income tax Poland is the number of people emigrating. With the growth of the emigrating people of one unit of gross income tax will drop by 2,661 units + 4 euro. Emigration as such is very dangerous for the country, and particularly Poland, which joined the EU since there was mass emigration abroad, which impact on the demographic structure of the country. Emigration in Poland is particularly true because of young ambitious people seeking work abroad. Priority countries for the Poles became the United Kingdom and Germany. Emigration has a negative effect on income tax as the reduction in the workforce means a decrease of income tax in their home country Poland.

4.3 Comparison of the factors impact affecting revenues from income taxes in V4 countries

Results of the provided analysis are interesting because there is no common factor of all thirteen considered factors that would affect revenues of income taxes in all of the analysed countries. In Table 2 are shown results of statistically significant regression coefficients where we can see how individual factors affect the revenues of personal and corporate income taxes in the individual V4 countries.

Table 1 - Comparison of factors affecting income tax in the V4 countries

Slovakia		Hungary		Czech Republic		Poland	
Factor	Value	Factor	Value	Factor	Value	Factor	Value
x_1	2.354e+3	x_3	1.305e+3	x_1	2.331e+0	x_1	1.081e+3
x_3	-2.378e+2	x_4	5.251e+6	x_2	-1.317e+0	x_2	-2.200e+3
x_5	3.920e+5	x_5	8.614e+5	x_6	7.498e-10	x_4	1.718e+7
		x_{11}	3.991e+7			x_{13}	-2.661e+4

Source: own, based on results of OLS regression as the output of the programme R

As shown in Table 2 the income tax revenue of three countries of the Visegrad group countries, namely the Slovak Republic, the Czech Republic and Poland are significantly affected by the total employment. It is really true that the intensity of this factor varies between countries, but in all mentioned countries has showed the positive impact on income tax revenue. This means that the growth of total employment is accompanied with an increase in income tax revenues of the Visegrad countries. In the Czech Republic and Poland the negative impact of population growth on the total income tax revenue has been identified. The reason for this relationship is the aging of population and the associated change in the demographic development of the country. Other statistically significant factor is the number of people aged 15 to 64 years, but that has a different impact on the income tax revenue in Hungary and Slovakia. While in Hungary the growth of the factor causes an increase in income tax, in the Slovak Republic the growth of the factor induces a decrease of income tax revenue. One reason for the contradictory effect can be seen in very different employment policy in these countries. This means that Hungary is likely to employ the right people in this age range, i.e. 15 to 64 years, while in the Slovak Republic in selected fields such as health the employment of people over the age of 64 years is preferable. Another statistically significant factor affecting income tax revenue in Hungary and Poland is the minimum monthly wage

in euro. Based on the results of the regression coefficients estimated for these countries we can see that an increase of this factor by an unit is reflected in an increase in income tax revenue in the territory of these countries, and therefore it makes sense (at least from this model perspective) to raise the minimum wage each year at least once. The positive impact of the average monthly wage in euro was reflected in Hungary and the Slovak Republic. On this basis, we can conclude that continuous growth of average monthly wage is meaningful because of its growth that tends to increase the income of the state budget in the form of a growth in revenues from income taxes. Interestingly is that only country where the minimum monthly wage and the average monthly wage have an impact on income tax revenues is Hungary. Government expenditure is statistically significant only in the Czech Republic. With the growth in government spending there is an increase in the income tax revenue. In general we usually force and highlight income tax rates as a major factor that affects the income tax revenues. Unfortunately, the regression model we used had not found statistically significant impact on tax revenue in the Visegrad countries. From this point of view an interesting result of the analysis is that only country that is affected by the income tax rate is Hungary, specifically by the personal income tax. The final factor affecting income tax revenues especially in Poland is the number of people emigrating. Emigration as such is very dangerous for the country and can significantly impact the demographic structure of a country. In the case of Poland emigration has a negative effect on income tax as the reduction in the workforce means a decrease of income tax.

Conclusion

Tax and taxation is a continuing issue because money earned by the state is realized thanks to taxation. A specific role plays personal and corporate income tax, which is very large and complex issue even because the legislation and condition of governing income tax is often modified to achieve macroeconomic objectives of the economy. Generally, taxes are one of the most popular tools by which the government of each economy can influence and manage the economic development in the country. The income tax is an important source of governmental budget that is affected by a numerous economic, social, and political factors, whereby the degree of the influence may vary according to the intensity of the relation between variables. Taxes are used for financing the costs of public goods what can bring large positive externalities if there is not enough supply by the private sector. In our paper we applied the OLS regression to identify and evaluate the relationship between exogenous determinants and revenue from income tax in the V4 countries during the period 2000 - 2013. The regression model results indicate differences in statistical significance determinants in the V4 countries, while at the same time correspond with existing investigations and findings of other authors. We see the dominant influence of demographic factors in all analysed countries, specifically the total employment or the number of economic active population. Demographic factors are the most important variables in the context of tax revenues, particularly due to the current increasing trend of population aging in the world. There is also visible a negative effect of emigration, specifically in Poland. From the perspective of income tax revenue the current immigration wave in the EU countries can be seen as a specific opportunity in long-term period, which significantly differ from the current Visegrad group countries position. Very detail overview of immigration and its benefits is presented in a paper of Kahanec and Zimmermann (2009) who highlighted positive economic effects of immigration that can enhance demographic characteristics of V4 countries in short run and improve economic perspectives and conditions in long-run. An interesting fact is that six factors like for instance gross domestic product per capita, overall GDP, export corporate income tax rate are not statistically significant and are not affecting income tax revenues in the Visegrad countries significantly.

Acknowledgements

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Workflow Systems as a Tool for Small and Medium Size Enterprises Business Processes Management

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Abstract

Workflow Systems become a useful tool that any SMEs may choose to use in the business processes support. The article is the result of a thorough literature review regarding workflow systems, a new and very interesting theme. Taking in count thee static and dynamic aspects of a workflow system and their advantages we applied the technology on a data structure regarding Romanian SMEs. The data structure contains financial-economic information of a representative sample of Romanian SMES, such as return of investments, turnover, and net profit, number of employees, current assets, fixed assets, inventories, receivables, debts, total capital, total incomes, and total expenses. In our case study we created a workflow system for the Romanian SMEs interaction in a Network Business Environment. The workflow surprise the: order - invoice reference - product delivery - payment registration - sending invoice process between two SMEs. Through our case study we showed how important is to use this technology in processing data, rather than using a general programming language (e.g. Java, C++) or any ORM tool (e.g. Hibernate).

Keywords: workflow systems, business processes, Romanian SMEs, network business environment.

JEL Classification: M15.

1. Introduction

In the era of big data all the specialists recommend to support business processes by workflow systems than by databases or data warehouses. After a literature review, in articles and books available on international databases, such as Web of Science, EBSCOhost, IS journals and IS conference proceedings we found out that the aim of workflow systems is to support business processes and that is a better tool for tracking and analysing the workflow process between SMEs as member of the same digital network environment. A business process consists of a sequence of tasks. Workflow management system (WFMSs) uses databases and maps the dynamic workflow engine to rules of an active database system. WFMSs provide an environment to define and execute complex processes that are frequent in urgent computing and science scenarios. In our article we studied the methodologies of implementing data based workflow systems and demonstrate how to create one for the Romanian SMEs.

2. Research methodology

For this article we decided to study the literature with the focus on workflow management systems. Our study has 4 steps:

1. Defining the research questions to answer: What workflow systems mean and which is the aim? Does WFMS may be use by SMEs?;
2. Choosing databases to search articles, chapters' books and scratch. In this respect we have chosen Web of Science, EBSCOhost, IS journals and IS conference proceedings;
3. Screening papers and extracting information that might be transformed in knowledge. There have been chosen especially new articles. For the selection we asked several keywords, such as: "workflow systems", "Business process"," workflow systems for SMEs", etc.;
4. Using Oracle Database 11g Express Edition to create the workflow, designing a program that reads a process node as table records, as we describe in the case study. The data structure contain

information regarding Romanian SMEs: name, contact information, activity' domain (CAEN: Classification of Activities in the National Economy), economic-financial data (assets, liabilities, equity, debt, stocks, net income, total expenses, turnover, profit, number of employees, etc. on a period of 2006-2013;), orders, products, stocks, receipts, status and nodes.

3. Literature review

Scientific workflows arose from the need to analyze data from different scientific domains in e-science, especially in the life sciences, with the computational power. Complex experiments had been done by the scientists using scientific workflows. (Holl 2014)

Workflow system is responsible to solve complex scientific problems from different domains, even in urgent computing (UC) infrastructures, solving the issues of deadline-driven scheduling. Workflows capabilities allow interactive systems to be described by consolidation of heterogeneous resources: high performance computing, users, software, external devices and data sources. (Knyazkov 2013)

Large-scale, multi-stage simulation and data analysis, asked by modern science, are recommended to use workflow management systems. These computations can be done with scalable workflow management systems that are very efficient in the coordination of data processing and task execution on distributed resources, such as campus clusters, national cyber infrastructures, and commercial and academic clouds. (Deelman 2015) The scientists have to deal with large- scale of data and a single workflow-management server might affect the process performance, not giving the response in real time, especially in urgent computing. In these cases the solution is distributed workflow-management server architecture. (Tsai 2010)

Nowadays the big data collection processing and interacting with data reports and visualization is based on modern methods and algorithms of data analysis, such as in BI solutions. The extraction of knowledge from this amount of data may be dome with "Formal Concept Analysis Research Toolbox" (FCART). (Neznanov 2014)

3.1 Workflow management system

According to the Workflow Management Coalition (WMC), a WFMS is a system that completely defines, manages and executes business processes through the execution of software whose order of execution is driven by a computer representation of the process logic. [WMC94]

The business process specifies:
- the tasks to be performed,
- in which sequence, depending on decisions which are part of the process,
- by whom,
- under which constraints: time, quality, etc.

A workflow concerns the definition and execution in sequential order of various activities. We can identify the following main topics of workflow management:
- Specification - workflow models and methodologies for capturing a process as a workflow specification.
- Implementation - methodologies/technology for using information systems, and human agents.
- Execution - scheduling and controlling the workflow tasks as described by the workflow specification.

Advantages of applying workflow systems to business processes comprise the following [Eder 1996]:
- *Specification*: This feature refers to a better specification of business processes, of regular (standard) processes or of special ad-hoc processes. It self, organizational analysis and design made to implement workflow systems leads to high quality business processes.
- *Documentation*: Exact documentation is needed in a quality management, supporting a better traceability of processes, built-in status accounting, and improved responsiveness.
- *Turn-around:* Workflow systems improve reactiveness, reducing turn-around times.
- *Flexibility*: Workflow systems allow adaptation to business needs, being very easy to redesign the business processes. Furthermore, standard cases / processes as well as non-standard ones can be dealt within the range of one system.
- *Integration*: In workflow systems is very easy to integrate different ITs solution, such as legacy systems.

The static aspects of a workflow comprise all components which can be extracted from a workflow meta-model. There, the basic elements of a workflow are:
- Activities are characterized by several attributes (like name or state) and methods (e.g., start, succeed). Elementary activities (tasks) describe the real work items in a process. We can distinguish between:

- Manual tasks are performed mainly by human agents. This includes in particular the manual start and manual termination of the task.
- Interactive automatic tasks are associated with specific programs (software applications) which are executed after a responsible human agent has selected the task from his work list.

▪ Automatic tasks (batch tasks) are specific software programs which are started by the WFMS and which are fully executed under the control of the WFMS.
▪ Data objects: concerning data which is manipulated within the tasks and data which is needed for process execution (scheduling, etc).

More precisely, in a workflow application we find the following data types:
- Application data: The application data structured or not that is consumed and produced by the tasks (applications) in a workflow.
- Process data: Process data are necessary to define and control the execution of workflows.

Agents are users of programs who are eligible to carry them out. For our classification it is only necessary to distinguish between human and machine agents.

Table 1 - Used diagrams in workflow development after (Brüning and Gogolla 2011)

Development time	Workflow model with data aspects	Data model
Metamodeling	Class diagram	
Design time	Flowchart diagram as a workflow model	
Runtime	SQL result query as workflow-execution data	

Source: own prelucration after Brüning and Gogolla 2011

3.1.2. Dynamic aspects of a workflow

The execution of a workflow mainly comprises the answer to the following question: What (activity) has to be executed when, by whom and with which data? In (Jablonski 1994) these W-questions are termed as:
▪ functional (what?),

- behavioral (when?),
- organizational (whom?),
- informational (which data?) perspectives.

We are now able to identify at least two main types of Workflow Systems:

Table 2 - Workflow Systems Comparison (Wang and Kumar)

Document-Driven Workflow	Control Flow Workflow
The documents help the conduction of the process.	Process is driven by the control flow.
Changing constraints helps the process to be adapted right away	Flow patterns make the process less flexible. Control flow pattern it is shared by all instances and this makes difficult to change a control flow of an instance.
The is no need to control flow, thus there is no need of fork/join design issues	Control flow is described by fork/join elements. Resource dependencies are ignored and this can affect the control flow.
The process and application data are separated.	The process and application data are attached.
Designed for ad hoc workflows.	Designed for production workflows, where the processes are fixed and have large number of tasks.
It is easy to verify the workflow.	It is difficult to verify the workflow.
Complex workflows are solved with conflict resolution.	Conflict resolution is not applied.
It is difficult to have a panorama for the process.	It is easy to have a panorama for the process.

3.2. Database workflow systems

The database-based systems store the documents and the process information in a database to which all agents (users and programs) must have access to. A database is essential for Database Workflow Systems because it contains: (Shankar *et al.*)
- The declaration and specification of workflows, processes and data;
- The invocation of a specific workflow;
- The ability to monitor workflows.

This approach has several advantages:
- The execution of a workflow is a typical task for a client-server application. Usually, many clients from different location, running on different platforms connect to the workflow server.
- The recovery mechanism of the database management system ensures that after crashes of clients or the server a backup of every running process is restored.
- The transaction mechanism permits to increase concurrency in a safe way. For example, it is possible that different users view a document concurrently, or different users edit different parts of the same document.
- A modern database management system provides application programming interfaces (APIs) to various languages and allows access over the network. The applications can communicate with the server only by making selects and updates in the server's database.
- The presence of all information about the dynamic state of processes and tasks in the database allows an easy implementation of a monitoring component.
- All this can be retrieved by simple SQL queries. The authorization system of the database is used to control the different privileges of the users.

Database Requirements after: (Bonner, Shrufi and Rozen)
- Each database access from a user or an application program (CRUD methods) is seen as an event, which can trigger the application of a rule. An event history log table must be kept for debugging purposes.

▪ Dynamic schema evolution means that data integrity must be preserved even if the table structure is altered adding or removing columns when modifying object properties. This may be achieved by adding new columns to existing indexes or defining new ones when a single-attribute index is removed. Tables like domains and classifications must be added in order to keep data integrity.

The data representation in a workflow system is event oriented. This means that information about a process is stored in a different place that the information regarding a material. In order to retrieve information about a material, the user must know what step(s) measured its value.

4. Case study

In our case study we demonstrate how WFMS may be use by SMEs. The SMEs activity within the Network Business Environment dedicated to Romanian SMEs is very well implemented by a data workflow data structure, allowing changing the status of SMEs orders as the process requires, jumping from one node to another. This flexibility is very difficult to be implemented in a datawarehouse. The business rules between 2 SMEs are described in (Pistol 2015), where we designed a Petri Net Simulator that is a very useful tool for the Business Process Management.

We have created a workflow that simulates interaction between 2 SMEs in the B2B environment. The workflow steps are presented in the table below: receiving order, invoice preformed reference, product delivery, payment registration, sending invoice.

Table 3 - Workflow steps

Business activity	Query
▪ Receiving Order	INSERT INTO "IMMWFMS"."COMENZI" (IDCOMANDA, CUI, DATA, IDSTARE, CUICLIENT, IDPROD) VALUES ('5', '13446570', TO_DATE('2014-08-28 00:00:00', 'YYYY-MM-DD HH24:MI:SS'), '1', '16402241', '1')
▪ Invoice Preformed Reference	SELECT "IDFACT","CUI","NRFACT","SERIE","DATA","TOTAL","TVA","PROFORMA" FROM FACTURA WHERE IDFACT=1;
▪ Product Delivery	UPDATE STOCURI S SET S.TOTAL=S.TOTAL-(SELECT CZ.CANT FROM CZ WHERE S.IDPRODUS=CZ.IDPROD) WHERE S.IDPRODUS=1;
▪ Payment Registration	UPDATE CONT C SET C.RULAJ=C.RULAJ+(SELECT CZ.CANT * CZ.PRET FROM COMENZI CZ WHERE C.IDCOMANDA=CZ.IDCOMANDA) WHERE C.IDCONT=1;
▪ Sending Invoice	SELECT "IDFACT","CUI","NRFACT","SERIE","DATA","TOTAL","TVA","PROFORMA" FROM FACTURA WHERE IDFACT=2;

In our case study we designed a program that reads process nodes as table records. A node can be a decision block, a read / write block or an execution block. Browsing can be done with a simple cursor. The structure of a node records will invariably contain an index (or sequence), like a field node type, a field which will contain a condition - if a decision node - or the name of a procedure - in case execution node - as well as other information such as error codes or jump instructions. Conditions are descriptions of database states, actions or operations, which can modify the database or start external procedures. Actions are database actions formulated in SQL. Most of these queries can be divided into four categories: (ftp://ftp.cs.toronto.edu/db/bonner/papers/workflow/nsf96.ps)

1. Queries that look-up a particular experimental step.
2. Queries that examine the workflow history of a particular material.
3. Data-dredging queries, aimed at identifying bottlenecks in a workflow
4. Report-generation queries that fills the event history logging table.

A rule is defined with create trigger statement which reacts on changes of the table. The basic structure of a rule is presented in Appendix 1.

The event triggers the code and the conditions follow the keyword WHEN. Creating a process is equivalent to the insertion of nodes in node table and updating work-flow, similar as an update process. The RESULT field from the node table may change its value depending on the outcome of a specific node execution. That field references what node is to be executed next as in Turing finite state automata. The source code is presented in Appendix 2.

Table STARE (status) is descriptive for table NODES. It describes the RESULT field for each state, as we may see in our case study. The source code is presented in Appendix 3.

The workflow execution is resumed in the following steps:

- A cursor is set to pars each record of the nodes table;
- For each record the type field is checked for node type:
  - If an execution node is met, then the name of the function is red, the needed parameters are provided, and the result is stored in a local variable (optionally, the result field maybe load with the exit code)
  - If a decision node is met, then a select query is built with the appropriate condition, and the result is displayed. Same here, the result field might be filled with the stop exit code.
- The next record is parsed accordingly to result field previous stored value.

In this paper we use the syntax of PL/SQL delivered with Oracle Database 11g Express Edition.

Conclusion

In the current economic context Romanian SMEs face a big competition due globalization process, the lack of financial resources, the lack of information and the wide spread of technologies. To answer all these problems they have to form a network business environment that offer them access of innovative information and technology, marketing and financial counselling services, protection of intellectual property and other benefices as I detailed in (Tonis 2015). The SMEs in this environment develop different partnerships, with specific business rules as we shown Petri Net Simulator developed and described in (Pistol 2015). The workflow of the business process in this environment is modelled by a workflow system as we demonstrate in our paper. It is more efficient use these technology because it allows changing the status of SMEs orders as the process requires, jumping from one node to another, rather than using a general programming language (e.g. Java, C++) and any ORM tool (e.g. Hibernate).

In our paper we describe the workflow system designed for Romanian SMEs that form a network business environment in order to sustain the business processes between network members.

Acknowledgements

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APPENDIX 1

```
CREATE [ OR REPLACE ] TRIGGER trigger_name
BEFORE UPDATE
  ON table_name
  [ FOR EACH ROW ]

DECLARE
  -- variable declarations

BEGIN
  -- trigger code

EXCEPTION
  WHEN ...
  -- exception handling

END;
```

APPENDIX 2

```
CREATE TABLE "IMMWFMS"."NODES"
  (    "ID" NUMBER NOT NULL ENABLE,
       "TYPE" NUMBER,
       "VALUE" VARCHAR2(20 BYTE),
       "RETURN" NUMBER
  ) SEGMENT CREATION IMMEDIATE
  PCTFREE 10 PCTUSED 40 INITRANS 1 MAXTRANS 255 NOCOMPRESS LOGGING
  STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
  PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE
DEFAULT CELL_FLASH_CACHE DEFAULT)
  TABLESPACE "USERS";

Insert into "IMMWFMS"."NODES" (ID,TYPE,VALUE,RETURN) values (1,1,NULL,2);
Insert into "IMMWFMS"."NODES" (ID,TYPE,VALUE,RETURN) values (2,2,'IDFACT=1',3);
Insert into "IMMWFMS"."NODES" (ID,TYPE,VALUE,RETURN) values (3,3,'S.IDPRODUS=1',4);
Insert into "IMMWFMS"."NODES" (ID,TYPE,VALUE,RETURN) values (4,3,'C.IDCONT=1',5);
Insert into "IMMWFMS"."NODES" (ID,TYPE,VALUE,RETURN) values (5,2,'IDFACT=2',0);
```

APPENDIX 3

```
SET SERVEROUTPUT ON

declare
cursor mycrs is select * from nodes;
total number(9):=0;
fstring varchar2(50);
begin
for rec in mycrs loop
if (rec.type=1) then
execute immediate ('INSERT INTO IMMWFMS.COMENZI (IDCOMANDA, CUI, DATA, IDSTARE, CUICLIENT,
IDPROD) VALUES (5, 13446570, TO_DATE('2014-08-28 00:00:00', 'YYYY-MM-DD HH24:MI:SS'), 1, 16402241,
1) ')
end if
if (rec.type=2) then
```

```
fstring := 'SELECT  IDFACT,CUI,NRFACT,SERIE,DATA,TOTAL,TVA,PROFORMA FROM FACTURA WHERE '||
rec.value;
  execute immediate (fstring) into fstring;
  dbms_output.put_line(fstring);
end if
if (rec.type=3) then
fstring := 'UPDATE  STOCURI  S  SET  S.TOTAL=S.TOTAL - (SELECT  CZ.CANT  FROM  CZ  WHERE
S.IDPRODUS=CZ.IDPROD ) WHERE '|| rec.value;
execute immediate (fstring);
end if
if (rec.type=4) then
fstring := ' UPDATE CONT C SET C.RULAJ=C.RULAJ+(SELECT CZ.CANT * CZ.PRET FROM COMENZI CZ
WHERE C.IDCOMANDA=CZ.IDCOMANDA)  WHERE '|| rec.value;
execute immediate (fstring);
end if
if (rec.type=5) then
fstring := 'SELECT  IDFACT,CUI,NRFACT,SERIE,DATA,TOTAL,TVA,PROFORMA FROM FACTURA WHERE '||
rec.value;
  execute immediate (fstring) into fstring;
  dbms_output.put_line(fstring);
end if

end loop;
end;
```

Industrial Cluster Development in Thailand: There is still a Long Road Ahead

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Abstract

This paper aims to study and analyse the performance of industrial cluster development during the fiscal year of 2012, and proposes stages and indicators for an industrial cluster life cycle to guide more appropriate policy for further enhancement of industrial cluster development. The support of industrial clusters improves their competitiveness and also raises productivity in terms of increased sales, cost reduction, and creativity. The performance of industrial cluster development is financially and economically feasible. The industrial cluster life cycle should take an average of 19.14 years: 2.90, 4.43, 6.76, and 5.05 years for initial, developing, mature, and transformation stages, respectively.

The essential factors for success in the initial and developing stages of an industrial cluster life cycle are awareness, structure, trust, knowledge, innovation, and cluster goals. Meanwhile, factors indicating the structure, innovation, trust, awareness, knowledge, and goals of clusters are crucial factors which need to be examined for success in the mature and transformation stages of the industrial cluster life cycle.

Keywords: industrial cluster development evaluation, industrial cluster life cycle.

JEL Classification: O11, O21, O25.

1. Introduction

In Thailand, industrial cluster development was formally initiated during the Ninth National Economic and Social Development Plan (1999–2004). It was stated under the seventh strategy of the plan that the managerial system of SMEs should be promoted through industrial clusters and networks such as linkage with industrial enterprise production, training in management and technology, and increased investment in research and development to enhance their competitiveness. The Department of Industrial Promotion (DIP), Ministry of Industry, is the major government agency responsible for the implementation of this plan, and has supported the development of more than 200 industrial clusters. At the present time, industrial clusters are still a major part of government development policy, especially those in the ten special economic zones due to start in 2015, and also included in the Twelfth National Economic and Social Development Plan (2016–2020). Despite continual government promotion, industrial clusters in Thailand are still far behind in development. The clusters face various problems: including collaboration among cluster members, inappropriate guidelines for development, and a lack of knowledgeable supportive government officers and consultants.

More importantly, it is still doubtful how long each stage of industrial cluster development should take. For this reason, at the end of each fiscal year, the DIP has to conduct a performance evaluation of its industrial cluster support. This paper presents the results of such evaluation for the fiscal year 2012 consisting of two main objectives: (1) to investigate the existing status and development performance of the industrial cluster, and (2) to propose the life cycle of the industrial cluster and essential key performance indicators for each stage, in order to guide further policy for appropriate enhancement of industrial cluster development.

The remainder of this paper will tackle the following topics. Section 2 describes the concept relating to industrial clusters and related methodologies. Section 3 presents a brief background of supported industrial clusters, performance evaluation results together with developmental contribution and efficiency. Section 4 elaborates on the assessment of the stages in industrial cluster life cycle development using success key performance indicators. Finally, Section 5 discusses and documents the topic conclusions.

2. Concepts and methodologies

This study uses the following five concepts as a guideline to fulfil two main objectives. Firstly, the concepts of industrial cluster were discussed by several scholars including Porter (1990, 1998, 2000) who used this popular and favorable academic term. However, the definitions of cluster are often used differently by certain academics such as Krugman (1991), Saxenian (1994), Hill and Brennan (2000), and Van den Berg, Braun, and Van Winden (2001). Generally, the most commonly used definitions are descriptions and operations for conceptual framework. For this reason, the wide ranges of ideas from authors depend on the contexts of terminology to expand and clarify the different meanings of cluster and focus of the objectives, methodology, and unit of analysis for each study. This study follows Porter who defined industrial cluster as a concentrated area of interconnected complementary business units and institutions linked by commodities. Porter illustrates the Diamond Model which looks at the immediate business environment surrounding and influencing competitiveness. The Diamond Model influences conditions likely to have a fundamental impact on the productive potential of firms: factor input conditions, demand conditions, firm strategy and rivalry, and availability of related and supporting industries. The process of economic development is about improving the Diamond Model so that firms in each cluster can achieve successively higher levels of achievement and productivity. This study utilises the Diamond Model to evaluate the existing competitiveness status of supported industrial clusters.

Secondly, the development of industrial cluster aims to enhance enterprise competitiveness, enabling the development process to raise productivity of enterprises in the clusters, in terms of increased sales, cost reduction, and innovation. It is hypothesised that enterprises located in strong clusters are more likely to innovate, and some evidence was found to support this. Porter (1990) argued that rivalry fosters innovation, and likewise, Rui Baptista and Peter Swann (1998) suggested that innovation, entry, and growth tend to be stronger in clusters. The reason for this may be the effects of location externalities on innovative performance. However, certain contrary results by Geroski (1990) indicate that concentrations hinder innovation. It has also been suggested that other measures such as the number of workers per firm in each industrial region might create more local rivalry, providing competition for new innovative ideas (Feldman and Audretsch 1995).This study defines three types of innovation: (1) development of new products, (2) changes or improvements in the production process, and (3) the extension of distribution channels. These innovations seem to enhance the advantages of cluster rivalry.

Thirdly, an efficiency tool via cost-benefit analysis is also added to measure the worthiness of the performance of industrial cluster development appraised by net present value (NPV), benefit-cost ratio (BCR), internal rate of return (IRR), and payback period.

Fourthly, the industrial cluster life cycle concept which outlines the policy concerning cluster development is adapted from Andersson, Serger, Sorvik *et al.* (2004), who stated the following four stages: (1) agglomeration and emerging; (2) development; (3) mature growth; and (4) transformation.

Finally, the determining factors for cluster development are identified by several scholars. Erlandsson (2005) distinguishes critical factors for cluster development which include: leadership and communicative skills, process management ability facilitators, comprehensive development strategy, trust in the clustering process and benefits of cooperation, shared vision of the benefits of regional economic development, and good relations between local government, businesses, and research and development institutions. Pasieczny (2006) presents endogenous and exogenous factors determining the clustering process and formation of clusters. Endogenous factors include the emergence of cluster results from historically shaped factors, conducive to the development of certain activities in a given area. Such conditions include, but are not limited to the following: advantageous geographical locations, developed transportation and telecommunication links, developed technical infrastructure, highly developed working culture, long-term regional (local) manufacturing, craftsmen, service provision traditions, specific knowledge, existing science infrastructure, and research and development facilities. Exogenous factors include clusters intentionally and purposely formed by central and local authorities, universities and research and development institutions, and business support organisations. Cluster initiatives undertaken by universities and research and development institutions are quite rare in Poland but a few attempts have been made to shape exogenous clusters. The shape of company concentrations as a result of exogenous processes have to meet certain criteria to be regarded as clusters: (1) companies should be located in a certain compact area; (2) bonds should exist between companies; (3) the process of shaping a cluster should be coordinated by the state or self-government bodies or institutions, a resilient research and development institution, or a strong enterprise such as a key supplier or customer of other participants in the cluster. Pasieczny (2006) also identifies the hard and soft factors which are both conducive and hampering to cluster formation. Hard endogenous factors include: distinct diversification of technical and telecommunication infrastructure,

incentives for businesses, proximity to large markets, inadequate enterprise promotion and support policies, bureaucracy, high business set-up costs, and lack of support. Soft factors are: industrial traditions, diversified access to a qualified workforce, low level social confidence, and the fact that scientific and research institutions usually prefer teaching to research and development activities. Hard exogenous factors include a developed technical infrastructure, proximity to absorptive domestic and foreign markets, special economic zones, the existence of big enterprises (vendors, customers), attractive real estate prices, poor transport infrastructure, the unclear legal status of real estate and land, a lack of spatial development plans, and bureaucracy. While soft factors involve the active engagement of local governments to attract foreign capital, culture, and industrial traditions, a lack of cooperation between enterprises, scientific and research and development institutions, and distrust of external investors, particularly in regard to foreign capital.

Stachowicz (2008) describes the integration levels of following factors or driving forces to establish the formation process of entrepreneurial regions and clusters. Organisational factors include the character and level of political authority, relations with the national centre (self-government level), forms and the range of financial support for research and development units, organisational participation and mechanisms for capital and technology transfer located outside the region, organisation of the research and development sector in the region, number and condition of entities for innovation support (technology parks, entrepreneurship incubators, technology incubators, etc.), system of education, as well as social factors and the potential for social capital in enterprises and organisations. Cognitive factors are the quantity and quality of knowledge cumulated in units including research and development entities, the structure of knowledge development, and level of knowledge transfer channels, and institutions. Lilla Knop, Marek Krannich, and Slawomir Olko (2011) identify the factors affecting success at each development stage of industrial cluster divided into six aspects: (1) awareness; (2) goal of industrial cluster development; (3) innovation; (4) knowledge; (5) structure and (6) trust, which are applied in this research for the investigation of factors that affect success in each stage of industrial cluster development.

This study compiles data and information from 23 targeted industrial clusters, mostly purposively selected for development supported by the DIP in the fiscal year 2012. These targeted clusters are classified using the Thailand Standard Industrial Classification (TSIC version 2001) into the following industrial sectors: agricultural, food, garments, parawood and rubber products, services, fabricated metal products, machinery and equipment, and furniture and decorative items. Collecting data and information is via face-to-face interviews with those who play a significant role in the development of each industrial cluster. These include the cluster leaders, cluster development agents (CDAs), members of the cluster committee, and advisers total 115 persons. These representative members account for 25% of all cluster members. Field observations in the located areas of the targeted industrial clusters are also used for compiling accurate data and information. Descriptive statistics are major analytical tools for fulfilling the study's objectives.

3. Background of the supported industrial clusters and their performance evaluation

3.1 Brief background of the supported industrial clusters

The establishments of industrial clusters have commonly been initiated since 2008. These are mostly limited companies, followed by partnerships, farmers, women's professional groups, and cooperatives. Investigation of their competitiveness based on the Diamond Model is summarised below.

Factor input conditions: During 2012, each enterprise employed an average of 59 workers – mostly labourers on production lines. In addition, the majority apply their local wisdom to the production of raw materials sourced inside the located province. The major problems facing enterprises are a lack of capital, qualified workers, and sufficient knowledge for technological development and innovation.

Demand conditions: There was a tendency towards increased sales for enterprises in 2010 to 2012 due to expansion of the operational area, more product varieties, and extra distribution channels. However, during the same period, some enterprises experienced constant sales due to non-expansion in distribution channels. Most enterprises are likely to make higher net profits, averaging 21.73% on sales, due to the fact that they produce higher value-added products and their sales have been increased. Each enterprise generally produces three main products. The domestic market holds the major distribution share although some enterprises distribute their products to both the domestic and foreign markets, for example: USA, Australia, China, Japan, Singapore, Malaysia, Europe, and the Middle East. Insufficient demand, caused by low market share, is still an obvious problem.

Firm strategy, structure, and rivalry: There is intense competition in the market between enterprises for their products. The companies have not received any prizes or awards, even though they have been certified to

various standards: TIS, Product Certification, ISO 9001:2000, ISO 14001, Q-Mark, HACCP, GAP, GMP, BRC, IFS, TFQS, Thai FDA Standard, Clean Tapioca Chip Standard determined by the Department of Foreign Trade, and Halal Standard. However, most enterprises have been faced with problems in product design and development, lack of marketing information, and competitive pricing.

Related and supporting industries: When joining the cluster, sample enterprises experience benefit from more frequent participation activities. For example, coordination among each industrial cluster members, expansion in goods production resulting from cluster collaboration in marketing, and consultation to resolve common problems.

3.2 The developmental evaluation of industrial cluster performance

The performance of industrial cluster development in the fiscal year 2012 is evaluated through the enhancement of industrial cluster competitiveness. The development of industrial clusters is aimed at enhancing enterprise competitiveness, and the development process should raise their productivity in terms of increased sales, cost reduction, and innovation as follows:

Increase in sales: 11 of the 23 clusters or 47.83% have experienced sales increases, estimated at 133,271,703.00 to 498,744,576.40 THB in total for all clusters. However, the total sales for all 23 clusters supported by the DIP in the 2012 fiscal year are calculated at 0.00108 to 0.00482% of Gross Provincial Product (GPP), or 0.00321 to 0.01433% of GPP classified by industrial sectors. At the same time, these clusters generate increases in sales of only 0.00001 to 0.00005% of GPP classified by industrial sectors.

Cost reduction: From the 23 clusters, 5 or 21.74% have experienced cost reductions, and for all cluster members the total cost reduction is estimated at 12,732,000.00 to 49,060,800.00 THB.

Innovations: As aforementioned, this study defines three types of innovations – new product development, improvement of production processes, and the extension of distribution channels. These innovations seem to be more advantageous to cluster rivalry. The observed data indicates that 22 clusters have developed and commercially introduced innovations; 12, 11, and 6 clusters have developed innovations in products, processes, and delivery, respectively. Most innovations are developed from existing products, while processes are developed via the application of modern technologies in production, and delivery innovations are developed via the set-up of distribution centres as well as shops displaying cluster products.

3.3 The efficiency of industrial cluster development

Despite the difficulties in acquiring data and information to evaluate the efficient performance of industrial cluster development in the study period, the marginal benefit and cost of the project has been calculated for financial feasibility indicating 665,592,916.00 THB for NPV, 5.01 for BCR, and 0.55 years for the payback period. For economic feasibility, the development project has also been evaluated for worthiness indicating 674,924,401.00 THB for NPV, 5.52 for BCR, and 0.49 years for the payback period. Both financial and economic internal rates of return cannot be evaluated due to the project benefits being exceedingly greater than the costs. In fact, the project costs are mostly financed by the government. On the other hand, there might be some over-estimation of the project benefits since it is assumed that the current benefits will be constant throughout the next five years, even if there is no additional government support during such period.

4. The industrial cluster life cycle and key success indicators

4.1 The industrial cluster life cycle

The representatives of 23 industrial clusters are requested to provide their opinions on the length of each life cycle period. Almost 97% agree that the cluster life cycle should be classified into four stages: initial, developing, mature, and transformation. These four stages should take an average of 19.14 years (Table 1).

However, the development periods of each industrial sector are different, especially for the mature and transformation stages. The service cluster requires the longest life cycle length of 28 years in total. Agricultural industrial clusters need longer periods of time in the transformation stage since the members mostly apply their local wisdom to the production process, even if they invent new innovations, but they mainly rely on traditional-based production and management. This reflects that there is still plenty of room for dramatic changes in various areas such as marketing, technology, and management.

Each stage and key success performance indicators are summarised as follows:
- The initial stage of agglomeration and emergence should take an average of 2.90 years, and should be a process of searching for members to create the potential industrial cluster. The main activities and

network linkages of members should be identified, both inside and outside the clusters. Operating systems including regulations and plans for the cluster should be developed at a later stage. Therefore, the following key performance indicators should be included for success:

- *Awareness*: members are interested and participate in industrial cluster activities.
- *Goals*: there must be a specific and clear target for cooperation of cluster members.
- *Innovation*: the clusters provide training, workshops, and the transfer of technology among members.
- *Knowledge*: members play an important role in sharing knowledge and experience, as well as the distribution of information.
- *Structure*: there are support activities in clusters which are driven by external organisations such as government agencies.
- *Trust*: the trust of members is a crucial initial factor in all further industrial development processes.

The developing stage should take an average of 4.43 years. There should be strong network linkages among major players in the cluster. Cooperation with both formal and informal institutions should occur to promote cluster activities in each region. The following key performance indicators should indicate success:

- *Awareness*: members should ensure that industrial clusters are beneficial to all.
- *Goals*: there should be a concrete target for innovative cluster development.
- *Innovation*: the cluster should focus on the development of innovative new products, production processes, and service.
- *Knowledge*: members should apply technical knowledge to cluster development.
- *Structure*: there are still some cluster support activities driven by external organisations such as government agencies. However, members play an increasingly important role in such activities.
- *Trust*: the mutual trust and cooperation of cluster members in activities have increased.

The mature stage should take an average of 6.76 years and should involve the strengthening of relationships and network linkages both inside and outside the clusters. Sustainability should also be created by establishing new businesses, join-ventures, subsidiary, etc. The following key performance indicators for success should be included:

- *Awareness*: members realise that industrial clusters are beneficial to their business operation.
- *Goals*: there are members upstream, midstream, and downstream of the cluster.
- *Innovation*: technological development and innovations emerge to meet the needs of industrial cluster members.
- *Knowledge*: members play an important role in sharing knowledge and experience, as well as the distribution of information by using efficient communication processes to improve their operation.
- *Structure*: members play an increasingly vital role in the development of industrial activities and cooperate with external organisations for financial provision.
- *Trust*: members agree to set common product standards.

The transformational stage should take an average of 5.05 years. During this stage, the industrial cluster should change in various areas such as marketing, technology, and management, shown by the following key success performance indicators:

- *Awareness*: members realise and recognise the importance of integration to the international cluster.
- *Goals*: there must be a specific and clear target for cluster innovations.
- *Innovation*: technologies and innovations are developed to meet market requirements.
- *Knowledge*: members play an important role in sharing knowledge and experience, as well as the distribution of information.
- *Structure*: new businesses established and developed from the existing cluster are promoted.
- *Trust*: cluster members specify common product standards.

Table 1 - Stages of industrial cluster development classified by industrial sectors

Industrial sectors	Period of development stages (years)				
	Initial	Developing	Mature	Transformation	Total
Agricultural	3.00	4.97	7.69	9.21	24.86
Food	3.06	5.06	8.06	6.18	22.37
Garment	3.00	5.64	9.09	2.33	20.06

Para wood and rubber products	2.88	4.50	5.50	5.00	17.88
Services	3.00	5.00	10.00	10.00	28.00
Fabricated metal products, machinery and equipment	2.30	3.56	6.89	5.56	18.35
Furniture and decorative items	2.80	3.60	4.75	4.67	15.82
All industrial sectors	2.90	4.43	6.76	5.05	19.14

Source: Author's own study

4.2 Determinants of success in industrial cluster development

The determinants contributing to success in each stage of the industrial cluster development life cycle can be classified clearly into two groups, namely.

In the first two stages of agglomeration and emergence, the developing key success performance indicators should consequently be: (1) awareness, (2) structure, (3) trust, (4) knowledge, (5) innovation, and (6) cluster goals. Whereas, for the mature and transformational stages, key success performance indicators should be: (1) structure, (2) innovation, (3) trust, (4) awareness, (5) knowledge, and cluster goals, respectively.

It should be realised that "structure" does not mean the organisational structure of the cluster, but represents the network linkages among the cluster members and all stakeholders, including government agencies. Besides, it covers the participation of members in making decisions on the development approach, communication systems, infrastructure, research and development, and sourcing financial funds, as well as establishing new business from the existing industrial cluster. For these reasons, representatives of most clusters provide information indicating that the process of structural development comes second in determining the success of an industrial cluster, while the first priority is creating awareness and understanding among participant members of its importance and benefits.

Guidelines for determining key performance indicators for industrial cluster development can be classified as follows. Awareness should be composed of the following indicators:

- Changes in the knowledge and understanding of cluster members before and after project participation.
- Changes in awareness and giving precedence to the project by cluster members before and after participation.
- Benefits of joining the industrial cluster both in terms of cash and in-kind.
- Determination of the cluster organisation structure, drafting of strategic and operational cluster plans.
- Monitoring and evaluation of determined indicators to improve further project development.

Goals should comprise the following indicators:
- Association with members across the industrial value chain upstream, midstream, and downstream.
- Setting principal target activities of cluster both in monetary and non-monetary terms, i.e. collective production and marketing, allocation of purchase orders, and production cost reduction.
- Development of innovative new products, production processes, and forms of service in commercial operations or expected to operate in the next stage.
- Review and adjustment of organisational structure, management, and the strategic and operational cluster plan.
- Monitoring and evaluation of determined indicators to improve further project development.

Innovation should comprise the following indicators:
- Provision of training and workshops to transfer knowledge among members within the cluster or by outside experts.
- Commercial development of innovative new products, production processes, and forms of service based on cluster needs for monetary evaluation.
- Commercial development of innovative of new products, production processes, and forms of service based on customer or market needs for monetary evaluation.
- Establishment of a centre for product quality and testing of standards.
- Establishment of a distribution centre for cluster products.
- Review and adjustment of organisational structure, management, and strategic and operational cluster plans.
- Monitoring and evaluation of determined indicators to improve further project development.

Knowledge should comprise the following indicators:

▪ Substantial sharing of experiences and information among members through media or various effective networks.
▪ Study tour to share knowledge between members inside and outside the cluster.
▪ Application of academic and technical knowledge in the production process, management, marketing, workforce development, etc. to evaluate both monetary and non-monetary success.
▪ Review and adjustment of organisational structure, management, and strategic and operational cluster plans.
▪ Monitoring and evaluation of determined indicators to improve further project development.

Structure should comprise the following indicators:
▪ Use of the Internet for coordination and communication involving the external sector.
▪ Steadily increasing member participation in cluster activities.
▪ Formulation of projects to support developments in manufacturing, marketing, management, workforce efficiency, and technological progress to acquire funds from external promotional organizations.
▪ Formulation of projects to support research and development for the cluster to acquire funds from external promotional organizations.
▪ Review and adjustment of organisational structure, management, and strategic and operational cluster plans.
▪ Monitoring and evaluation of determined indicators, including monetary and non-monetary, such as cost efficiency, in order to further improve project development.

Trust should comprise the following indicators:
▪ Steadily increasing members who continuously participate in cluster activities.
▪ Clear division of labour among members to perform specific tasks according to the strategic and operational plans.
▪ Determination of common product standards and commercial operations in line with developed procedures.
▪ Skills development and labour exchange within the industrial cluster.
▪ Collaboration in the use of machines, tools, and equipment among cluster members as necessary.
▪ Review and adjustment of organisational structure, management, and strategic and operational cluster plans.
▪ Identification of roles and duties of members, regulations, and guidelines for the development of industrial cluster activities for fair and equitable treatment of all members in accordance with social ethics.
▪ Monitoring and evaluation of determined indicators, including monetary and non-monetary, such as cost efficiency, in order to further improve project development.

Determination of the industrial cluster development target indicators mentioned above should be based on the DIP, and/or the industrial cluster implementing activities under the development project each year. Besides, the expected target should depend on the particular stage of industrial cluster life cycle, and/or the industrial sector. Some target indicators could therefore be generic for all clusters and some would be specific to each cluster. This means industrial clusters can be self-assessed under the plan and project framework for prior selection before implementation.

5. Discussions and conclusions

The results of competitive analysis show that supported industrial clusters are small and medium scale enterprises, mostly concentrated in the food sector. Based on such findings, six strategies and policy guidelines are suggested for the development of industrial cluster as follows:
▪ Strengthening of industrial clusters via: (a) encouragement for activities to enhance the understanding of industrial cluster and continual development of the relationship with trust and member participation: (b) provision of courses for industrial cluster leaders, community leaders, officers and personnel at district and provincial level to broaden their understanding to boost collaboration in the cluster development process; and (c) encouragement for fundamental cluster activities such as collective production and marketing and more linkages between various clusters or creating industrial cluster networks.
▪ Creation and promotion of market opportunities via: (a) organization of national trade exhibitions of industrial cluster products; and (b) encouragement for market research of products for each cluster.

▪ Development of sustainable and integrated industrial clusters via conducting research on supportive possibilities of various organizations relevant to production, marketing, funding, and development of technology and innovation.

▪ Development of human resources via: (a) organization of workshops on business management; (b) training for workers in production processes; and (c) studying specific aspects of industrial cluster development to be summarised into manuals, for example, a manual for collaborative production, marketing, technological development and innovation.

▪ Development of industrial technologies and innovations by conducting workshops and field trips for industrial clusters in similar sectors.

▪ Monitoring and evaluation of industrial cluster development projects via: (a) knowledge development in the planning process; (b) development of indicators classified by stages in the industrial cluster life cycle; and (c) database development.

In conclusion, industrial cluster development in Thailand still has a long way to go, as well as plenty of room for development, depending on the selection of industrial cluster for development, various developmental approaches, industrial cluster life cycles, performance self-assessment, monitoring, evaluation, etc. Additionally, key success indicators in terms of endogenous, exogenous, soft, and hard factors should be further classified for investigation and policy recommendation. Last but not least, government infrastructure may be one of the most influential factors. However, this paper provides findings, practical implications of its original value, and limitations as follows:

Research limitations

This study has certain limitations in relation to generalisation, but the statistical tools applied to characterise the industrial cluster stages of development are proven to be valid. In view of this, further research on self-assessment for effectiveness and efficiency is suggested in order to strengthen the real industrial cluster development in Thailand.

Findings

The results reveal that the life cycle of all types of industrial cluster development is an average of 19.14 years. There are different key success indicators for comparing the first two agglomeration and emerging stages, and the developing stage with the last two mature and transformational stages. This paper also identifies some of the key success indicators in each stage.

Practical implications

The proposed approach provides a good basis for self-assessment of the industrial cluster development performance. This can also help both researchers and practitioners in deciding how best to improve the development of each industrial cluster.

Originality/value

This research is an attempt to propose a period for industrial cluster life cycles and length of the four development stages. This also helps in developing recommendations for improving strategies. In addition, the key success performance indicators are essential for self-assessment of each industrial cluster depending on their life cycle stage. Recommendations are also made for improving cluster performance. The findings should also prove useful to guide agencies towards more appropriate policies and measures for strengthening, monitoring, and evaluation of industrial cluster development.

Acknowledgements

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Tax Competition Phenomenon among ASEAN Member Countries

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Abstract

Globalization has attracted the economists to examine the concept of tax competition. This research is conducted in order to review tax competition in the ASEAN member countries during the period 1990 – 2012 due to corporate tax rate reduction phenomenon. Scope of this research is corporate income tax in six ASEAN member states, namely Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam, which are sufficient to represent ASEAN. This research uses a quantitative methods approach, starting from quantitative descriptive analysis of statutory corporate income tax rate, calculation of the effective rate of corporate income tax – both Effective Marginal Tax Rate (EMTR) and Effective Average Tax Rate (EATR) – based on the Devereux's formula, and revenue shifting of corporate income tax to other taxes are considered to cover corporate income tax revenue reduction. Based on the result, this research does not find any sufficient evidence regarding indications of tax competition in the ASEAN region.

Keywords: tax competition, effective marginal tax rate, effective average tax rate.

JEL Classification: H2.

1. Introduction

Globalization has increased the international economic activities, such as trade, investment, activity of multinational company, and capital mobility (Campbell 2009). One of the advantages of globalization is the economic activities become smoother because of the loss of tariff and non-tariff barriers in trade and investment. Investment allows a country to intensify economic activities, employment opportunities, national income, and the prosperity of its citizens. With the increasing of economic activities, it provides a comprehensively profitable potential for the investors (McGee 2004). In an open economic system with high capital mobility, Tax policies have essential effects of cash flow, as could be seen when countries compete each other by conducting corporate income tax rate reduction to attract investment. (Viard 2008)

The emergence of globalization drives a country to pay attention to the tax system by making adjustment through tax reform in order to intensify fiscal climate which has implication on investment. According to the research conducted by World Bank in 2012, with survey data from 183 countries, it could be concluded that the tax payment pattern ranks the third position as a consideration by investors for planning investment in a country. This research only reviewed tax aspect in a country, meanwhile other factors were not reviewed, with the idea from company perspective, the effective tax rate has a role in determining selected location for investment.

2. Main text

Over the past few years, a lot of countries have attempted to make the investment climate more attractive for foreign investors. According to the survey data conducted by KPMG (one of the Big Four Auditors in Indonesia) from 1993 – 2012, it shows that the worldwide average corporate income tax rate has gradually decreased from the average rate of 38% in 1993 to 24.4% in 2012. ASEAN-6 member states have gradually decreased the statutory corporate income tax rate, triggered by Singapore because in 1993 Singapore has implemented the lowest corporate income tax rate in compared with the other ASEAN-6 member states. During the research period, the corporate income tax rate reduction in Singapore was 15% (from 32% to 17%), making it as the country with the lowest tax rate in the ASEAN region. OECD member states have lowered the average income tax rate which was 12.84% from the average of 37.99% in 1993 to 25.15% in 2012, while the country with the lowest corporate income tax rate is Ireland 12.5%.
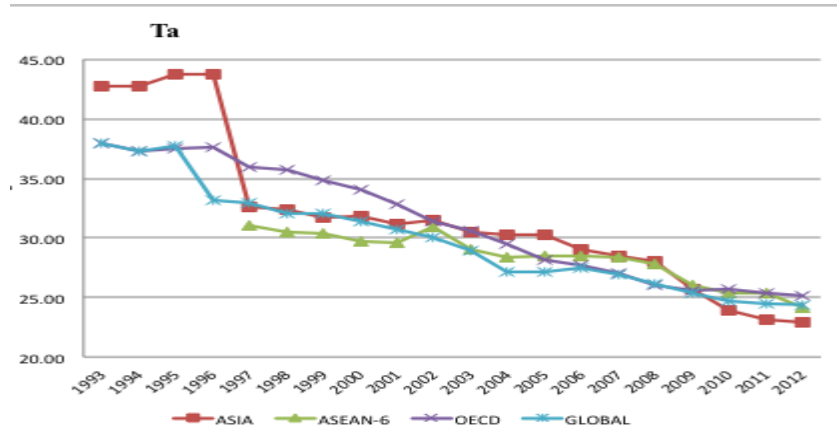
Figure 1 - Corporate income tax rate (1993-2012)

The flow of FDI (capital mobility) in ASEAN member states makes ASEAN become a potential area for developed countries to invest as shown in Figure 1. During the period from 1990 - 2012, it shows that the FDI inflows tended to increase, except in 1998 and 2008, there was a significant decreasing. During that period, there was a crisis that affected Asia but after the crisis had been overcome, it shows that FDI inflows increased again.
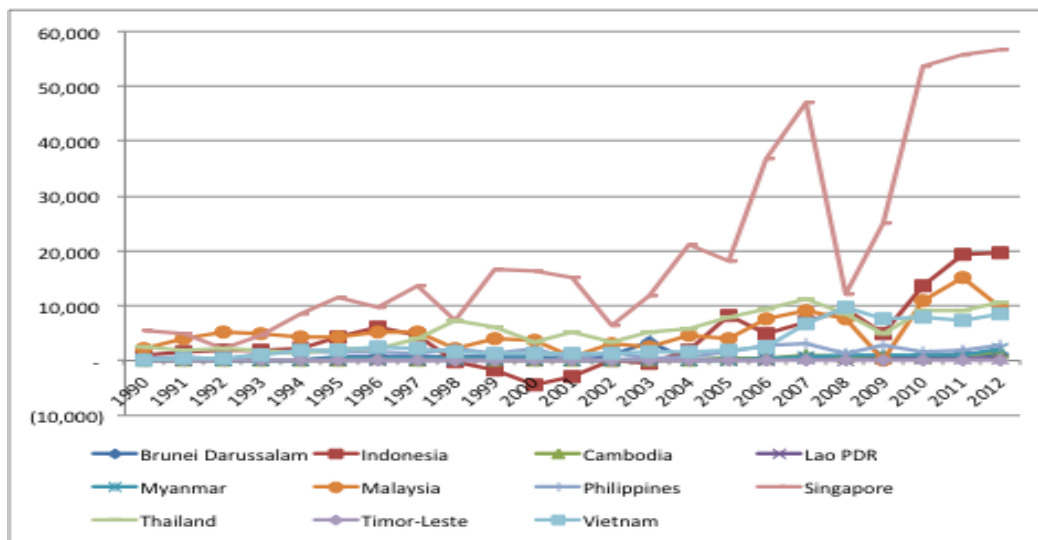

Figure 2 - FDI Inflows ASEAN member countries 1990 – 2012 (Millions USD)

According to the data from Figure 2, during the period 1990-2012 as could be seen that FDI inflows intended to increase, except in 1998 and 2008 there was a significant decrease. During that period, there was a crisis that affected Asia however after the crisis had been overcome, there was re-enter of FDI inflows. In 2011, FDI inflows have reached USD 111.994 million or have exceeded FDI inflows in 2007 which was amounted to USD 86.414 million. The detail of FDI inflows during 1990 - 2012 could be found in Appendix. Singapore has the highest FDI inflows during the period 1990-2012 because Singapore is a country with second highest competitive economy in the world and a lot of foreign direct investment companies have domiciled in that country (Edwards and de Rugy 2002). Meanwhile, Brunei Darussalam, Cambodia, Laos, and Myanmar were far behind. The Growth of FDI in Vietnam also needs to be examined because Vietnam is a country that currently has internal conflict, but not too affected by the crisis. The FDI inflows which come in to a country or region could be conducted in two ways such as in form of foreign direct investment (FDI) or indirect FDI via a portfolio. Foreign direct investment also could be conducted in two ways, by operating subsidiary or branch. Branch could be conducted by establishing a subsidiary of FDI. Referring to the legal perspective, in regards to taxation, the relationship between subsidiary and parent company is a separate legal entity.

Meanwhile the foreign company branch is basically a business expansion division which established in a separate geographical area. In tax perspective, the relationship between head office and branch is a single entity, although the transactions between them must be based on arm's length principle (Gunadi 2002). The main effort in enhancing competitiveness to attract foreign direct investment both from inside and outside ASEAN is to create conducive investment climate. The increase of foreign direct investment could enhance the economic performance and ASEAN community itself.

This research regarding tax competition uses theoretical model which explained by Devereux and Griffith, with considering Effective Average Tax Rate (EATR) and Effective Marginal Tax Rate (EMTR). According to Devereux and Griffith, the investment location decision is mutually exclusive. It means that two activities could not be conducted at the same time, so investors should choose the most profitable investment location, with tax as one of factors to be considered. The reason for using Devereux and Griffith theory in this research because after King and Fullerton, it seems only Devereux and Griffith give an effective tax rate calculation formula for the investment consideration. The use of effective tax besides the statutory tax rate in this research because the effective tax rate is the actual tax liability borne by the taxpayers which represents the percentage of income before tax, instead of taxable income.

Devereux and Griffith believe that investment choices are made by considering EATR because EATR formula is not only concerned about statutory tax rate but also take into account the marginal financial rate of return, discount rate, and inflation rate in a country. A number of theoretical models, Caves, Horstman and Markusen, and Devereux and Griffith provide evidence that the Effective Average Tax Rate (EATR) is an empirically significant factor in the decision-making of US multinational companies in placing production facilities in Europe (Devereux and Griffith 1998). EMTR reflects the impact of tax on cost of capital, the minimum pre-tax rate of return demanded by the investors. EMTR could be interpreted as a tax rate that theoretically could be used to measure the scale of investment (Bahmann and Bauman 2005). While the EATR is the actual tax rate paid which shows the size of the economic income. The comparison of EATR could reflect the tax impact of the investment location decision which is seen from the net present value (NPV) after tax.

The value of investment is contingent on the EMTR while the location decision is contingent on the EATR (Devereux and Griffith 2003). Investment decision uses EATR by considering every aspect of tax system where investment will be invested as the impact of expenses that could not be calculated, depreciation and tax exemption. By considering every aspect of tax system in the location of investment, investors will get a more optimal refund after-tax.

The purpose of this research is to analyze the indications of tax competition among ASEAN-6 member states which refers to the tax competition theory in terms of:

- The applicable statutory corporate income tax rate;
- The effective income tax rate either EMTR or EATR according to the formula which explained by Devereux and Griffith;
- The shifts in corporate income tax revenue to the other taxes as a form of revenue recovery, such as Personal Income Tax and Goods and Services Tax.

2. Literature review

According to Edward, broadly, tax competition could be interpreted as the effect of tax policy from one country to the other countries. The mobility or transfer of capital from countries with high tax rate to the countries with low tax in a purpose of reducing global tax burden is the impact of tax competition (Edwards and de Rugy 2002). Wilson and Wildasin explain tax competition in three categories. In a broad definition, tax competition is defined as any form of tax policies that are non-cooperative between countries. Definition of tax competition in narrower definition is any tax policies that affect the allocation of government tax revenue. While the narrowest definition is uncooperative tax regulation by government, which means that each policy that has been chosen will affect the tax base allocation on moving factor between regions, represented by the government.

Teather (2005) gives explanation tax competition clearly, which is defined as a process of attracting capital to a country which conducted by the government in form of offering the low tax rate or other tax incentives. Tax competition is conducted by the government by implementing a lower effective tax rate to attract more business and investment activity in one country.

There are two differences scope of tax competition according to Garza which is the global and regional levels. World-wide tax competition is defined as a reaction of uncooperative tax policy between the governments of various countries in the world which are not necessarily geographically adjacent to each other, but in the same

economic condition and with a purpose to affect the tax base allocation in the world. In other words, global tax competition is a tax competition between different countries in the world without giving any importance to the geographic location but give much more attention to the economic condition. Regional tax competition is tax competition between countries which are adjacent to each other in a geographical area (Garza 2006), as an example of the phenomenon of tax competition between ASEAN member countries.

Generally, the indicators of corporate income tax are divided into two groups. The first group is based on tax provision analysis itself, such as applicable statutory tax rate, tax base, also EMTR and EATR, which not only measure off the statutory tax rate, but also incorporate macroeconomic factors. EMTR is the rate that shows the difference between the rate of return on investment before and after tax. Chua also defines EMTR as the difference between the marginal rates of return on investment before tax to the rate of return after tax used to fund an investment (Chua 1995). EMTR is reflecting the impact of tax on the cost of capital (cost of capital), the minimum pre-tax rate of return demanded by investors. EATR is the ratio of tax actually paid which shows the size of the economic benefits. EATR reflect the tax impact on the choice of investment location seen from the net present value (NPV) after tax. EATR can be used to indicate the location of the most profitable investment. As for the elements - the decisive element EATR is the statutory corporate income tax rates, the source of investment funds, real interest rates, inflation, discount rates, EMTR, marginal financial rate of return, real financial return on investment. (Devereux dan Griffith 2003)

The second group consists of indicators which based on tax revenue, such as tax revenue per GDP, total tax revenue, or some estimated tax base. The main differences between those two indicators are the first one is a forward looking approach, which explains the tax effects on expected future profit of investment projects. This approach could be use to estimate the effective tax on investment. While the second is a backward looking approach, which explains the tax effects on rate of return in each period in the past because it was acquired from a country's tax revenue in the previous period.

Devereux and Griffith calculate the effective tax rate with the aim of assessing other factors, besides the statutory corporate tax rate, which need to be considered in the discussion of FDI location decision. Therefore, in the formula for calculating the effective tax rate also considers other factors, such as investment fund, depreciation period, profits after tax, personal income tax rate on dividend, inflation, discount rate, interest rate, and the rate of return. There are several approaches to measure the effective investment income tax rate; the most popular one is the approach which was explained by King and Fullerton in 1983, subsequently deepened by Devereux and Griffith in 1998. Devereux and Griffith gave explanation how to calculate the effective tax rate by inserting macro economic factors on the formula. The effective tax rate reflects the actual and implicit tax rate, which is not explicitly stated in the tax law, but considering the economic factors.

Devereux also developed the empirical research that has compiled steps of relationship between those variables, which were summarized in form of EMTR. The higher EMTR encourages the increase of capital costs; it will reduce the capital inflows and increase the capital outflows. The basic approach is to construct a future marginal investment projects, need to be calculated the tax impact on capital costs.

3. Methodology

This research uses a positivism paradigm which attempt to give an explanation regarding tax competition between ASEAN member states according to the theories and formulas that have been previously stated, using quantitative data and processing of statistical data to provide understandings of tax competition among ASEAN member states. This research uses a quantitative approach, which is conducted by using quantitative descriptive analysis. Population in this research is ASEAN member states, namely Brunei Darussalam, Indonesia, Cambodia, Laos PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. Selection of the samples in this research is using a non-probability techniques, namely purposive sampling which using certain criteria in selecting the samples. (Neuman 2007)

This research is classified in pure research. According to Saunders, the basic or fundamental research or purely aims to expand knowledge, produce general principles find significance or value for society in general. Pure research (basic, fundamental or pure research) is generally performed in the context of the academic agenda. (Saunders, Lewis and Tornhil 2009, 8) This study was conducted for the purpose of academic development oriented solely on science. This study is expected to be the basis for further research thinking about tax policies related to corporate income tax competition, especially in the ASEAN region.

The samples in this research are ASEAN-6 member states, namely Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam. According to Saunders, purposive or judgmental sampling permits the

assessment of researchers in sample selection to answer research questions and also adjust to the research objectives to be achieved (Saunder 2009, 233). The reason for selecting these six countries as sample is because according to GDP data, these six countries contribute the largest GDP in ASEAN. Therefore, it is sufficient to consider those countries to represent the condition of economy in the ASEAN region.

4. Discussion

Tax policy is one of the factors that need to be considered when companies determine the investment locations. Assuming ceteris paribus, the higher corporate income tax rate the greater reduction corporate income after-tax. As the result of collected income tax in a country, it could lead to the displacement of capital to another country with lower tax rate; statutory corporate tax rate is the most visible factor in a country's corporate income tax structure. The phenomenon of global statutory corporate income tax rate reduction is an indication of the commencement of tax competition.

To enhance the attractiveness of a country either individually or collectively in one area, many investment barriers have been reduced. The consequences of reducing investment barriers are capital or investors freely switch to the states with the most efficient tax burden. This condition provides an opportunity to the Multi National Enterprises (MNEs) to minimize or avoid their corporate income tax by shifting the tax base and investment location with high tax rate to the jurisdiction with low or zero tax rates through transfer pricing. Under that condition, tax competition between countries is more likely to occur, so that it will create worries of a race to the bottom. The pressure of corporate income tax rate is because more independent capital movement which has been sculptured into the tax competition literature.

4.1. Statutory corporate income tax rate

A global statutory corporate income tax rate reduction is an indication of the commencement of tax competition. During 1990 – 2012 as could be seen there was a tendency of reducing corporate income tax rate conducted by ASEAN-6 member states which are assumed to be influenced by Singapore. Singapore tax rate before 1986 was 40%, and then decreased continuously. Since 1993 Singapore corporate tax rate has been the lowest in the ASEAN region, which amounted to 27%. Singapore was regarded as a trigger for the tax rate reduction in the ASEAN region due to repetitive performance to conduct the corporate income tax rate reduction.

Malaysia is also the most reactive country towards the issue of reduction rate conducted by Singapore. During the research period, 1990 - 2012, Malaysia conducted seven times corporate income tax rate reduction. Vietnam is also included as a country that conducts corporate income tax rate reduction. During the research period, Vietnam conducted five times corporate income tax rate reduction. Until 1996, corporate income tax rate in Vietnam is the highest among ASEAN-6 member states, which was amounted to 45%. However, in 1997, 2009 and 2012 Vietnam lowered the income tax rate to 25% in 2012. Even in 2014 Vietnam lowered the corporate income tax rate to 22%. Corporate income tax rate reduction in Vietnam was intended to adjust the condition as in the other countries in order to attract more foreign direct investment.

Since 1995 - 2008 corporate income tax rates in Indonesia were still progressive with the highest rate was 30%. However, in 2009, Indonesia began to lower the corporate income tax rate and changed the progressive rate to be a flat rate with a percentage of 28% and the next one in 2010 which was 25%. Thailand did not conduct the corporate income tax rate reduction which was still applicable with a percentage of 30% from 1980 to 2011. However, since 1 January 2012 Thailand conducted a significant corporate income tax rate reduction which was amounted to 23% and continuously decreased per January 1, 2013 which was amounted to 20% therefore since 2012 the corporate income tax rate was among the lowest applied in Thailand after Singapore. Philippines also intended to lower the tax rate, even if with different intensity and amount. During the research period, 1990 - 2012, Philippines conducted four times corporate income tax rate reduction which the latest applicable rate is 30%.

During the period from 1990 to 2012, the mean point of corporate income tax rate in ASEAN-6 member states showed a decrease, which amounted to 10.33% from 34.5% to 24.17%. This condition indicates that tax rate reduction responded by the other countries, which reflected from the decrease of mean point. This research is also supported by a statement from interviewee who states that the tax rate reduction is intended to harmonize the applicable corporate income tax rate in ASEAN region as well as to attract investment. The phenomenon of corporate income tax rate reduction in the ASEAN region not only known as the global trend that occurred in many countries, but also implies the existence of tax competition between countries to attract foreign direct

investment. In ASEAN, personal income tax rate reduction in Indonesia, for example, mentioned as an act of harmonizing the applicable income tax rate in ASEAN region.

Standard deviation reflects the determination of convergence (grouping) during the period 1990-2012 which approximately from 2.44 to 6.68. The highest standard deviation occurred in 1996 because Philippines and Vietnam did not respond to the tax rate reduction in neighbouring countries. However, in 1997 Vietnam drastically lowered the corporate income tax rate, so that the value of standard deviation also decreased to 3.46. The lowest value of standard deviation occurred in 2000 because tax rates in ASEAN-6 countries were relatively homogeneous, which approximately between 26% - 32%, with an average of 29.75%. The value of standard deviation of corporate income tax rate in ASEAN-6 member states tended to be volatile; there was an increase and decrease, so it did not show a clear trend or pattern. That condition occurred because some countries lowered the tax rate immediately such as: Singapore, Malaysia, and Vietnam, where the other countries were not really responsive to lower the tax rate such as in Indonesia, Philippines, and Thailand.

By paying attention to the corporate income tax rate data in ASEAN-6 member states, it could be concluded that several tax rate reductions conducted by each country as form of responses to the tax rate reduction that conducted by Singapore. As stated earlier since 1993, Singapore has become a country with the lowest corporate income tax rate in the ASEAN region. Singapore subsequently lowered the tax rate and initially followed by Malaysia, and Vietnam. However, since 2009, Indonesia and the Philippines also followed Malaysia and Vietnam. In 2012, Thailand actively responded to follow Singapore by lowering corporate income tax rate significantly which was below the rate of the other ASEAN-6 member states. A tax reduction policy in ASEAN-6 member countries was influenced by Singapore, was not followed by the rate of convergence which could be seen from the range 17% (Singapore) to 30% (Philippines). Therefore it could not be found any sufficient indication of tax competition in the ASEAN region. Indication of tax competition will be further evidenced by other indicators.

4.2 Effective tax rate

4.2.1 Effective marginal tax rate (EMTR)

This research uses a model which developed by Devereux and Griffith's formula in calculating EMTR and EATR. EMTR is effective tax rate that applies to an investment project, which focuses on present value of the accumulated cash flow to be generated by every additional investment with technical calculation which explained by Devereux and Griffith. The formula which is used by Devereux in calculating EMTR is:

$$EMTR = (\tilde{p} - r) / \tilde{p} \tag{1}$$

EMTR calculation is conducted by using variables of Depreciation Rate (δ), Inflation Rate (π), the Real Interest Rate (r) and Statutory Tax Rate (σ). In this research, the depreciation rate is assumed to use the straight line method because it is more common to be use rather than other depreciation methods. The effect of depreciation rate on the value of EMTR is negative. This means that the higher depreciation rate, the lower value of EMTR.

According to the theory of Devereux and Griffith, the value of EMTR is influenced by the inflation rate (π) and the real interest rate (r) which occurred in current year in related country. If a country wants to get lower EMTR rate, then it could be done by keeping the inflation rate low because inflation will affect the real interest rate. The value of low inflation will lead to the higher real interest rate, so could be concluded that a low EMTR value. Besides that, statutory tax rate reduction and depreciation rate reduction also affect the EMTR rate reduction. The average value of EMTR reduction in ASEAN-6 member states is amounted to 14.42% higher than statutory corporate tax rate reduction (10.33%).

Table 1 - Effective marginal tax rate ASEAN-6 Countries

YEAR	IND	MAS	PHI	SIN	THA	VIE	MEAN	STD
1990	40,33	55,24	42,28	59,94	37,98	69,48	50,88	12,64
1991	37,63	52,57	50,33	57,01	36,51	69,17	50,53	12,30
1992	36,66	47,46	41,88	48,27	39,70	69,57	47,26	11,81
1993	41,69	50,02	47,29	59,61	39,34	54,19	48,69	7,61
1994	43,81	50,61	54,65	55,80	44,43	69,73	53,17	9,53
1995	37,06	45,71	48,80	47,46	39,72	69,72	48,08	11,54
1996	35,45	42,01	48,70	38,25	36,92	55,86	42,86	7,94

YEAR	IND	MAS	PHI	SIN	THA	VIE	MEAN	STD
1997	36,80	39,81	43,71	38,85	36,64	47,28	40,52	4,20
1998	23,69	47,44	48,21	30,91	46,04	53,18	41,58	11,55
1999	32,08	33,51	50,83	29,01	33,32	49,24	38,00	9,47
2000	34,34	40,32	49,29	54,91	42,29	52,22	45,56	7,87
2001	49,61	33,67	44,62	31,30	46,02	44,89	41,69	7,38
2002	32,89	49,15	50,07	32,61	43,39	53,93	43,67	9,11
2003	34,38	51,88	46,07	25,95	48,07	62,95	44,88	13,08
2004	44,76	41,31	51,63	64,01	60,89	85,14	57,96	15,97
2005	35,97	40,84	52,46	31,87	72,46	62,50	49,35	15,96
2006	65,87	55,76	55,24	31,45	63,40	55,02	54,46	12,18
2007	60,08	64,61	52,68	24,41	52,92	65,92	53,44	15,28
2008	36,07	35,43	79,74	14,64	55,33	37,63	43,14	22,09
2009	39,87	23,47	43,91	27,93	50,61	39,05	37,47	10,09
2010	37,43	71,13	53,62	15,10	61,85	67,01	51,02	21,26
2011	40,03	33,63	58,70	14,86	58,55	30,95	39,45	17,01
2012	31,37	38,49	51,56	19,39	30,35	47,62	36,46	11,93

During the period of 1990 to 2012, there was a tendency of the average value of EMTR reduction in ASEAN-6 states which amounted to 14.42%, from 50.88% in 1990 to 36.46% in 2012. The standard deviation value during the period (1990 - 2012) is relatively volatile with a range of value between 4.20 to 22.09, indicating that the value of EMTR in the sample countries which observed during the observation period, was not homogeneous. The higher standard deviation, the value of EMTR in those countries will be further away from its average which indicates heterogeneity of the data. Based on data during the research periode it could be seen that only in 1997 that has a tendency for the EMTR value which close to the average or could be concluded that EMTR seen homogeneous in that year. Based on the data during the research period, does not seem any convergence of EMTR value thus there is no enough evidence to declare that the existence of tax competition in ASEAN-6 member countries. Volatility and distribution of EMTR value are affected by applicable statutory tax rate in each country and also macroeconomic factors, such as inflation, real interest rate, discount rate, and the financial rate of return.

4.2.2 Effective Average Tax Rate (EATR)

Forward-looking approach developed by Devereux, besides EMTR, which is EATR. Theoretically, EATR could be calculated as a proportion of the difference between economic profit before and after tax on the rate of pre-tax rate of return. Classically, the EATR is useful to determine the location decision. EATR calculation begins with calculating adjusted statutory corporate tax rate, which is obtained as follows:

$$T = 1 - \gamma(1-\tau)\frac{(1+r)(1+\pi)}{1+\rho}$$

(2)

In the formula T there is notation γ, which reflects tax discrimination between new equity and distribution. Therefore, in this research it is assumed that there is no additional external funding (debt and shares), then the value of γ is considered equal to 1. After calculating the value of T, then the EATR could be calculated with the formula of Devereux and Griffith as follows:

$$EATR = \left(\frac{\tilde{p}}{p}\right)EMTR + \left(1 - \frac{\tilde{p}}{p}\right)T$$

(3)

Notation ~p is Marginal Financial Rate of Return, meanwhile p is the real financial of return on investment. Based on the calculation, the relationship between real rate of return (p) towards EMTR and EATR are negative.

Table 2 - Effective Average Tax Rate ASEAN-6 Countries

YEAR	IND	MAS	PHI	SIN	THA	VIE	MEAN	STD
1990	29,32	35,71	36,48	33,38	25,83	48,01	34,79	7,63
1991	26,66	35,56	39,83	32,48	25,05	49,24	34,80	8,96
1992	26,63	34,40	34,46	27,90	27,09	47,68	33,02	8,01
1993	29,96	33,62	35,65	27,81	27,39	50,40	34,14	8,60
1994	31,54	30,86	39,13	27,41	29,87	47,16	34,33	7,42
1995	25,49	29,38	35,66	25,09	28,70	47,17	31,92	8,38
1996	24,81	28,83	36,14	22,84	27,94	41,77	30,39	7,20
1997	24,56	28,16	34,53	23,89	30,62	32,47	29,04	4,29
1998	23,66	28,61	36,29	22,36	32,56	34,86	29,72	5,83
1999	20,70	24,64	34,74	22,61	25,97	33,44	27,02	5,78
2000	21,39	24,56	33,62	26,63	27,07	32,40	27,61	4,66
2001	31,30	25,73	31,87	22,15	27,83	30,33	28,20	3,75
2002	24,08	27,14	31,64	21,33	27,13	33,15	27,41	4,45
2003	25,36	27,88	30,86	18,04	27,79	35,14	27,51	5,73
2004	29,39	25,77	33,05	25,04	30,68	62,51	34,41	14,09
2005	27,19	25,08	32,81	19,07	36,81	33,37	29,05	6,51
2006	42,87	29,09	35,33	19,36	33,97	30,11	31,79	7,81
2007	35,11	30,17	33,52	16,56	30,11	35,50	30,16	7,06
2008	25,50	22,13	54,09	8,35	30,51	24,25	27,47	15,01
2009	26,91	17,50	27,73	15,88	28,16	23,39	23,26	5,39
2010	24,01	29,50	30,31	10,78	31,07	35,73	26,90	8,74
2011	24,74	21,74	30,37	9,17	31,14	21,19	23,06	8,00
2012	21,72	23,70	28,39	11,28	19,27	28,20	22,09	6,40

The reduction of EATR value for year 1990 - 2012 were the highest which occured in Singapore (22.1%) and the lowest were in Thailand (6.56%). The reduction of EATR in Indonesia and Philippines in the period was also relatively low, which amounted to 7.6% and 8.09%. While Malaysia and Vietnam the rate was relatively high, *i.e* 12.01% and 19.81%. Fluctuation of EATR occured in ASEAN member states could be seen in Tabel 2 and Figure 2. The EATR average value in ASEAN-6 member states during the period 1990 – 2012 decreased by 12.7%, from 34.79% to 22.09%. Standard deviation value EATR in ASEAN-6 member states was fluctuative but the movement was not that significant. This indicates a relatively homogeneous EATR value compared with the EMTR value.

According to the statistics during the period 1990 – 2012, there was EATR average value reduction in ASEAN-6 member states. However, this reduction is volatile and does not show a race to the bottom, so this research states that there is no sufficient evidence of corporate income tax competition among ASEAN-6 member states as could be seen from the aspect of EATR.

4.3 Shifts in tax revenue

The next analysis is regarding the issue of tax revenue shifting in order to recover decreasing of corporate income tax revenue as a backward looking approach. With tax competition, there will be a corporate income tax rate reduction which expected could reduce the corporate income tax revenue, assuming there is no expansion of the tax base. The assumption is in line with the supply-side arithmetic effect theory that tax rate reduction would results a decrease in tax revenue. In tax competition, the research is based on tax reduction, provision of tax facilities, and expansion of tax base. To identify the impact of the tax rate reduction on tax revenue, it is assumed that the tax base is fixed.

Backward looking approach was conducted to see the possibility of shifts in tax revenue which caused by corporate income tax rate reduction to other taxes such as the personal income tax or Good and Services Tax - GST or Value Added Tax - VAT. To examine the existence of tax competition with this approach, the assumption is that the corporate income tax revenue as the percentage of total tax revenue which expected declining, while the personal income tax and Good and Services Tax or Value Added Tax is expected increasing as an effort to close the corporate income tax reduction. To examine the indications of tax competition, need to know that the

proportion of total income tax revenue compared with total tax revenue and Gross Domestic Product (GDP). Corporate income tax revenue as a percentage of total tax revenue to GDP is expected decreasing due to a decrease in corporate income tax rate. However, on the other side the increase of tax revenue is because of the diversion of revenue. Indication of tax competition by backward looking approach is shifts in tax revenue. Theoretically, the corporate income tax rate reduction would result the decrease in revenue. Meanwhile, to remain in compliance with public expenditure, government requires other sources of funding. Therefore, it is assumed there is a transfer of tax burden, as a source of other funding from corporate income tax revenue to Personal Income Tax and Good and Services Tax.

During the research period 1990-2012, a condition that occur in Indonesia, Malaysia, Philippines, Thailand, and Vietnam showed that corporate income tax rate reduction did not affect the decrease of corporate income tax revenue per total tax revenue or per GDP. Meanwhile, Singapore has also been declining ever since the percentage of corporate income tax rate revenue per total tax revenue. On the other hand there was not always an increase of the percentage of Personal Income Tax revenue and Goods and Services Tax (GST) simultaneously and the increase value was not that significant. This condition was contradictive to the assumptions used in the analysis that a tax reduction would lead to the decrease of tax revenue. The condition could be explained by supply-side economics theory and the Laffer curve effect that the tax rate reduction does not necessarily mean that it will reduce tax revenue because there are other factors that influence.

According to backward looking approach, it could be concluded that there is no sufficient evidence to prove that there is a tax competition among the ASEAN-6 member countries, except Singapore which tried to attract FDI with "a beggar thy neighbor policy".

Conclusion

The research concludes that there is no sufficient evidence that indicates tax competition among the ASEAN-6 member states. The conclusions obtained from several aspects, with the results as follows.

During the research period (1990 - 2012), a phenomenon of statutory corporate income tax rate reduction in ASEAN-6 member states. Exceptions apply to Philippines as a country that increased tax rate from 30% to 35% in 2006-2008, even if at the end it decreased and back to normal (30%). However, this rate could not indicate that there was a tax competition among the ASEAN-6 member states because there was no convergence rate and also the higher rate range from 17% (Singapore) to 30% (Philippines).

Based on forward looking approach on EMTR and EATR in Devereux and Griffith formula, obtained the result that the average corporate income tax rate reduction in ASEAN-6 member states was with volatile movement. There was no convergence value, despite a significant decrease. Therefore, based on the calculation of EMTR and EATR during 1990-2012, this research does not find any sufficient evidence that indicates the existence of tax competition between ASEAN-6 member states.

In a backward looking approach, the indication of tax competition could be seen from the transfer of corporate income tax revenue to the other taxes such as Personal Income Tax and Goods and Services Tax, in the context of government revenue recovery. The purpose of revenue recovery is to cover the lacking of tax revenue due to the corporate income tax rate reduction conducted by Singapore by increasing the tax rate on goods and services. In another five member states, the income tax rate is not followed by a tax revenue reduction, so there is no transfer to another tax. In a backward-looking approach, could not be seen any sufficient evidence of tax competition in the ASEAN region.

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Organizational Productivity and Absorptive Capacity: A Conceptual Modeling

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Abstract

This paper aims to design a mathematical model for organizational absorptive capacity, which is both deterministic and directional. Banking on maximization conditions, time duration needed for an organization to shift from exploration to exploitation and vice versa, has been determined. Using simultaneous differential equation matrix, effects of absorptive capacity constituents on marginal productivity of organization have been analyzed. The model depicts relationship of organizational memory, revenue stream, time taken for creating the knowledge base with their respective elasticities with organizational absorptive capacity, and respective productivities of organizational capital and capability alongside organizational absorptive capacity, considering knowledge exploration and exploitation phases.

Keywords: organizational memory, absorptive capacity, optimization, productivity.

JEL Classification: C50, M12, M50.

1. Introduction

While talking about organizational learning and effectiveness, absorptive capacity of the organization plays the major role. Various dimensions of organizational absorptive capacity add to the organizational productivity (Chen and Ching 2004). Organizational learning is a continuous process which works in spiral connectivity with organizational productivity (Carayannis 1999). The ups and downs in the history of organizational productivity add to organizational memory, which in turn adds to the absorptive capacity of the organization (Chou 2005). The process adds to the organizational learning as well. This learning process can occur in two ways depending on the environment: by exploiting the existing knowledge and by exploring new knowledge (Van Den Bosch, Volberda and De Boer 1999). At the nascent level, the organizational environment is turbulent and it goes for exploration. Once the practices are standardized and are in place, it goes for exploiting the existing knowledge. But in both the cases, organizational learning takes place. This will in turn affect the profitability and productivity of the organization.

It is not always possible for a firm to hold a monopoly position in industry. In order to sustain in the competition, the firms must continue innovation. Absorptive capacity provides firm with the capability to acquire, assimilate and transform new knowledge with a view to keep the innovation moving (Cohen and Levinthal 1990). Innovation drives the market power possessed by any firm (Kamien and Schwartz 1975). If we look at the existing body of literature, several studies have been done on the relationship between firm innovation and absorptive capacity. Tsai (2001) discussed about position of business unit in a network with a view to defining capability of a firm in terms of its absorptive capacity and innovation. Argote, McEvily and Reagans (2003) talk about the knowledge transactions for expansion of knowledge base. Exponential temporal growth of organizational memory was discussed by Michael and Palandjian (2004). Price elasticity of end product in driving innovation and absorptive capacity was discussed by Lane and Lubatkin (1998). Revenue generation by the way of innovation driving absorptive capacity was discussed by Stock, Greis and Fischer (2001).

The literature on organizational productivity and absorptive capacity also reflects upon some of the important factors. Girma (2005) discusses about exploitation driver of productivity and the role of absorptive capacity. The relationship between absorptive capacity and dynamic capability building via R&D was discussed by Zahra and George (2002). Participation in knowledge creation and transfer also drives to build up profitable absorptive capacity (Jansen, Van Den Bosch and Volberda 2005). Knowledge exploration and knowledge exploitation are used complementarily in any organization in order to build up capability (Lichtenthaler 2009). Hence for a profitable absorptive capacity building, both the processes must be used in cyclical order. (Uotila *et al*. 2009)

In this paper, we are going to design a mathematical model for absorptive capacity on the basis of the parameters discussed so far. The model is two-fold in nature. In the deterministic part of the model, the absorptive capacity will be designed in terms of the various deterministic factors. On the other hand, directional

part of the model will show the nature of absorptive capacity effect in three different scenarios: knowledge exploration, knowledge exploitation and combination of both. In the first part of the model development, analysis of the aforementioned factors will be discussed. In the second part of the model development, the directional analysis of these factors will be discussed

2. Model development

2.1. Deterministic model

Let us assume the following variables for model development: R_{pt} = Revenue generated by exploitation; R_{pr} = Revenue generated by exploration; R_t = Total revenue generated by firm; P_t = Price of the end product; Q_t = Quantity of the end product; K_t = Capital investment by the firm; r_t = Cost of capital borne by the firm; AC = Absorptive capacity of firm; θ = Organizational memory; C = Price elasticity of demand; N = Position of firm in business network; t = Time of shifting from exploration to exploitation and vice versa; a_0, a_1, a_2, a_3, a_4, a_5, b_0, b_1, b_2, b_3, b_4 = Design variables.

In this section, we will be discussing the profit-based model for absorptive capacity. Zahra and George (2002) give an indication about the organizational profit as a proxy measure for absorptive capacity modelling. The revenue structures for knowledge exploration and exploitation will be formulated first. Then on the basis of these equations, further model will be developed.

For exploration, the revenue structure is going to be U-shaped. According to Rothaermel and Alexandre (2009), assortment of technology and firm productivity are associated in terms of an inverted U-shaped curve. They considered the technology to be exploited throughout the entire period. They undermined the newly fangled technologies. Focusing more on those would have shifted their focus from exploitation to exploration, as well as the technology-firm performance association curve would have been U-shaped. The validation of this statement can be found in the works of Pindyck (1978), who has identified the same in domain of non-renewable resource economics.

$$R_{pr} = a_1 \left(t - a_2 \right)^2 - P_t \, Q_t \tag{1}$$

For exploitation, the revenue structure is going to be linear. Lee, Liang and Liu (2010) derived the liner association between absorptive capacity, R&D investment and sales volume. The associations were significant in all the stages of the development. On the similar note, revenue structure has considered to be linear.

$$R_{pt} = P_t \, Q_t + a_3 \, t \tag{2}$$

Now the combined revenue structure of the firm will be given by:

$$R_t = a_4 \, R_{pr} + a_5 \, R_{pt} \tag{3}$$

Investment in innovation is dependent on income elasticity of consumers, network position of the firm and revenue growth of the firm (Lane, Koko and Pathak 2006). It can be shown in following manner:

$$K_t = b_1 \, R_t + b_2 \, \mathsf{C} + b_3 \, N \tag{4}$$

Hence the profit generated by firm is given by:

$$\pi_t = R_t - r_t \, K_t \tag{5}$$

Combining Eq. (4) and (5), we get:

$$\pi_t = R_t \, (1 - r_t \, b_1) - r_t \, (b_2 \, \mathsf{C} + b_3 \, N) \tag{6}$$

It is a continuous function with respect to time. Hence maximization of this profit will determine the time span or temporal cycle of shifting knowledge exploration and knowledge exploitation. This limiting condition can be achieved by determining first order differentiation of Eq. (6).

$$\frac{d\pi_t}{dt} = \frac{dR_t}{dt} \, (1 - r_t \, b_1) = 0$$

$$t = 2 a_2 - (a_3 a_5) / (a_1 a_4) \tag{7}$$

We have already discussed that organizational memory holds an exponential relationship with graduating time. Michael and Palandjian (2004) describe this seeing that expected alternative of allocation for continued existence is distributed exponentially. The memory-less traits die out with graduation of time and the on the contrary the traits with memory experience a gradually rising exponential distribution.

$$\theta = b_4 \exp (b_5 t) \tag{8}$$

Combining Eq. (7) and (8) we get:

$$\theta = b_4 \exp (2 a_2 b_5 - (a_3 a_5 b_5) / (a_1 a_4)) \tag{9}$$

We have also discussed about spiral relationship that holds between absorptive capacity and organizational memory. Carayannis (1999) discusses about the "Organizational Cognition Spiral". It considers continuous revaluation of a particular state of affair from new perspectives. It is the foundation of the spiral model.

$$AC = a_0 \exp (b_0 \theta) \tag{10}$$

Combining Eq. (9) and (10) we get:

$$\log (AC / a_0) = (b_0 b_4) \exp (2 a_2 b_5 - (a_3 a_5 b_5) / (a_1 a_4)) \tag{11}$$

In view of the relation depicted in Eq. (11), constants gain an importance in terms of their interpretation. These constants can be interpreted in the following manner, in line with literature:

a_0 = Inherent absorptive capacity; (Cockburn and Henderson 1998)
a_1 = Time elasticity of revenue for knowledge exploration; (Hauge 2006)
a_2 = Inherent time required to build up exploration capability; (Keil 2004)
a_3 = Time elasticity of revenue for knowledge exploitation; (Nash 1991)
a_4 = Proportion of revenue earned by knowledge exploration; (Wils 2001)
a_5 = Proportion of revenue earned by knowledge exploitation; (Brennan and Buchanan 1977)
b_0 = Absorptive capacity impact factor;
b_4 = Inherent organizational memory; (Walsh and Ungson 1991)
b_5 = Organizational memory impact factor.

Eq.(11) shows a set of direct and inverse relationship between absorptive capacity and the aforementioned deterministic factors (not mentioning as constants or variables). Changes in one or some will change the value of absorptive capacity in accordance with the relationship depicted in Eq. (11). Those are recorded in Table 1.

Table 1 - Relationship between deterministic factors and absorptive capacity

Deterministic Factor	Relationship with Absorptive Capacity
a_0 = Inherent absorptive capacity	DIRECT
a_1 = Time elasticity of revenue for knowledge exploration	DIRECT
a_2 = Inherent time required to build up exploration capability	DIRECT
a_3 = Time elasticity of revenue for knowledge exploitation	INVERSE
a_4 = Proportion or revenue earned in terms of knowledge exploration	DIRECT
a_5 = Proportion or revenue earned in terms of knowledge exploitation	INVERSE
b_0 = Absorptive capacity impact factor	DIRECT
b_4 = Inherent organizational memory	DIRECT
b_5 = Organizational memory impact factor	INVERSE

Source: Author's own calculations

This model provides with insights about the drivers of organizational productivity linked with absorptive capacity. But specifically this model doesn't provide any insight about the combinational aspects of knowledge exploitation and exploration. This also doesn't provide any insight about marginal temporal productivity of firm and its relation with absorptive capacity. This relationship can be depicted in directional format in the next model.

2.2. Directional model

Let us use the previous notations for this model as well. For designing this model, it is imperative to initiate from Eq. (3) seeing that it symbolizes the complete revenue structure incorporating exploration and exploitation perspectives.

For designing this model, it is needed to modify Eq. (5). A new variable is needed to be introduced in terms of cost component. This component is having certain characteristics. For the exploration and exploitation phase, this component will be time independent (Pindyck 1993). While considering the entire cycle of exploration and exploitation, time dependence of this component will come into picture. In view of this phenomenon, three profit functions emerge considering three scenarios mentioned, along with the cost components C_1, C_2 and C_3. In this case C_3 is only time variant.

$$\pi_1 = R_{pr} - r_t K_t - C_1 \tag{12}$$

$$\pi_2 = R_{pt} - r_t K_t - C_2 \tag{13}$$

$$\pi_3 = R_t - r_t K_t - C_3 \tag{14}$$

Where, π_1, π_2 and π_3 are profit functions for exploration, exploitation and entire cycle respectively.

The equilibrium point of these three equations will be achieved by fully differentiating them with respect to time. Solution of them on an individual basis is not a viable method. Hence a simultaneous equation method has been adopted. A matrix is formed by these equations in the form of AX =Z. The simultaneous differential equation matrix is shown in Eq. (15).

$$\begin{pmatrix} 0 & \dfrac{\delta\pi_1}{\delta R_{pr}} & \dfrac{\delta\pi_1}{\delta K_t} \\[2mm] \dfrac{\delta\pi_2}{\delta R_{pt}} & 0 & \dfrac{\delta\pi_2}{\delta K_t} \\[2mm] \dfrac{\delta\pi_3}{\delta R_{pt}} & \dfrac{\delta\pi_3}{\delta R_{pr}} & \dfrac{\delta\pi_3}{\delta K_t} \end{pmatrix} \begin{pmatrix} \dfrac{dR_{pt}}{dt} \\[2mm] \dfrac{dR_{pr}}{dt} \\[2mm] \dfrac{dK_t}{dt} \end{pmatrix} = \begin{pmatrix} 0 \\[2mm] 0 \\[2mm] C_3 \end{pmatrix} \tag{15}$$

Marginal productivity in terms of revenue growth can be expressed via the Eq. (15). The signs of $\dfrac{dR_{pt}}{dt}$, $\dfrac{dR_{pr}}{dt}$ and $\dfrac{dK_t}{dt}$ will derive the directional relationships between marginal productivity and absorptive capacity. Signs of these terms can be derived by solving the matrix in Eq. (15).

$$\frac{dR_{pt}}{dt} = (1 / |\pi|) \cdot (C_3 \frac{\delta\pi_3}{\delta R_{pt}}) / (\frac{\delta\pi_1}{\delta R_{pr}} \cdot \frac{\delta\pi_2}{\delta K_t}) \tag{16}$$

$$\frac{dR_{pr}}{dt} = (1 / |\pi|) \cdot (C_3 \frac{\delta\pi_3}{\delta R_{pr}}) / (\frac{\delta\pi_2}{\delta R_{pt}} \cdot \frac{\delta\pi_1}{\delta K_t}) \tag{17}$$

$$\frac{dK_t}{dt} = (1 / |\pi|) \cdot (- C_3 \frac{\delta\pi_3}{\delta K_t}) / (\frac{\delta\pi_2}{\delta R_{pt}} \cdot \frac{\delta\pi_1}{\delta R_{pr}}) \tag{18}$$

As this solution is locally stable, $|\pi|$ will be negative. From Eq. (8) and (10), we get that $\dfrac{d(AC)}{dt} > 0$.

Assuming $\dfrac{d(AC)}{dt} = Y$, aforementioned three equations can be rewritten.

$$\frac{dR_{pt}}{d(AC)} = (1 / Y |\pi|) \cdot (C_3 \frac{\delta\pi_3}{\delta R_{pt}}) / (\frac{\delta\pi_1}{\delta R_{pr}} \cdot \frac{\delta\pi_2}{\delta K_t}) \tag{19}$$

$$\frac{d\mathrm{R}_{pr}}{d(AC)} = (1\ /Y\,|\,\pi\,|)\,.\,(\mathrm{C}_3\,\frac{\delta\pi_3}{\delta\mathrm{R}_{pr}})\ /\ (\frac{\delta\pi_2}{\delta\mathrm{R}_{pt}}\,.\,\frac{\delta\pi_1}{\delta\mathrm{K}_t}) \tag{20}$$

$$\frac{d\mathrm{K}_t}{d(AC)} = (1\ /Y\,|\,\pi\,|)\,.\,(-\,\mathrm{C}_3\,\frac{\delta\pi_3}{\delta\mathrm{K}_t})\ /\ (\frac{\delta\pi_2}{\delta\mathrm{R}_{pt}}\,.\,\frac{\delta\pi_1}{\delta\mathrm{R}_{pr}}) \tag{21}$$

Now looking at Eq. (19), (20) and (21), the signs of $\dfrac{d\mathrm{R}_{pt}}{d(AC)}$, $\dfrac{d\mathrm{R}_{pr}}{d(AC)}$ and $\dfrac{d\mathrm{K}_t}{d(AC)}$ can be derived.

a. Sign of $\dfrac{d\mathrm{R}_{pt}}{d(AC)}$: There are three components in Eq. (19). Firstly, $\dfrac{\delta\pi_3}{\delta\mathrm{R}_{pt}} > 0$ under any given

circumstances. For the case of knowledge exploitation, the linear revenue structure will assure $\dfrac{\delta\pi_2}{\delta\mathrm{K}_t} > 0$.

Therefore the U-shaped nature of knowledge exploration will determine the sign of $\dfrac{\delta\pi_1}{\delta\mathrm{R}_{pr}}$, therefore, the sign of

$\dfrac{d\mathrm{R}_{pt}}{d(AC)}$.

When $\dfrac{\delta\pi_1}{\delta\mathrm{R}_{pr}} > 0$, $\dfrac{d\mathrm{R}_{pt}}{d(AC)} < 0$

When $\dfrac{\delta\pi_1}{\delta\mathrm{R}_{pr}} < 0$, $\dfrac{d\mathrm{R}_{pt}}{d(AC)} > 0$

b. Sign of $\dfrac{d\mathrm{R}_{pr}}{d(AC)}$: There are three components in Eq. (20). Firstly, $\dfrac{\delta\pi_1}{\delta\mathrm{K}_t} > 0$ and $\dfrac{\delta\pi_2}{\delta\mathrm{R}_{pt}} > 0$ under any

given circumstances. Therefore the U-shaped nature of knowledge exploration will determine the sign of $\dfrac{\delta\pi_3}{\delta\mathrm{R}_{pr}}$,

therefore, the sign of $\dfrac{d\mathrm{R}_{pr}}{d(AC)}$.

When $\dfrac{\delta\pi_3}{\delta\mathrm{R}_{pr}} > 0$, $\dfrac{d\mathrm{R}_{pr}}{d(AC)} < 0$

When $\dfrac{\delta\pi_3}{\delta\mathrm{R}_{pr}} < 0$, $\dfrac{d\mathrm{R}_{pr}}{d(AC)} > 0$

c. Sign of $\dfrac{d\mathrm{K}_t}{d(AC)}$: There are three components in Eq. (21). Firstly, $\dfrac{\delta\pi_3}{\delta\mathrm{K}_t} > 0$ and $\dfrac{\delta\pi_2}{\delta\mathrm{R}_{pt}} > 0$ under any

given circumstances. Therefore the U-shaped nature of knowledge exploration will determine the sign of $\dfrac{\delta\pi_1}{\delta\mathrm{R}_{pr}}$,

therefore, the sign of $\dfrac{d\mathrm{K}_t}{d(AC)}$.

When $\dfrac{\delta\pi_1}{\delta\mathrm{R}_{pr}} > 0$, $\dfrac{d\mathrm{K}_t}{d(AC)} > 0$

When $\dfrac{\delta\pi_1}{\delta\mathrm{R}_{pr}} < 0$, $\dfrac{d\mathrm{K}_t}{d(AC)} < 0$

Hence combination of the two models provides a deterministic and directional approach towards the profitability of organization, driven by its absorptive capacity. First half of the model provides the factor-based analysis of absorptive capacity, whereas the second half of the model provides a directional analysis of those factors.

3. Findings

Two approaches towards modelling the organizational absorptive capacity provide with a significant sum of insights. The findings will be discussed in accordance with the models.

Looking at the deterministic part of the model, a lot of subject matters gain significance. First, the inherent organizational absorptive capacity is directly proportional with the existential organizational absorptive capacity. It signifies that if any organization has a certain amount of latent absorptive capacity, then it helps the organization to boost up its existential form of absorptive capacity. It helps in building up the spiral knowledge formation in a much faster way. Second, whenever the firm goes for knowledge exploration, the revenue moves proportionately with the time for exploration along the U-shaped curve. The time elasticity of revenue is directly proportional to organizational absorptive capacity. Hence the revenue structure will follow the changes proportionately. Third, it is a critical task for an organization to build up its absorptive capacity. It is carried out with an ample amount of time. In the due course of the time taken for exploration, organization is enriched with higher amount of capabilities, which adds to the absorptive capacity of the organization. In this regard, the absorptive capacity impact factor symbolizes the impact of absorptive capacity on organizational memory. The direct relationship signifies that the rise in absorptive capacity will have a positive impact on organizational memory. Fourth, contrary to knowledge exploration, in the course of knowledge exploitation, organizational absorptive capacity is utilized, not enhanced. Hence the steady linear flow of revenue stream restricts the organization to look beyond obvious and therefore, the organizational absorptive capacity remains constant or goes down. Fifth, in revenue terms, knowledge exploration and exploitation brings forth two divergent dimensions.

Enhanced knowledge base allows the organization to generate superior revenue stream, whereas exploiting the existing knowledge only will in turn make it obsolete and trim down the revenue stream. Hence, relationship of revenue stream generated with absorptive capacity is direct in case of knowledge exploration and inverse for knowledge exploitation. Six, while talking about the impact of organizational memory on absorptive capacity, the results are quite contradicting. At the very beginning stage of an organization, its inherent memory assists in building up its absorptive capacity. But with the graduation of time, when the memory grows bigger and become mature, it is tough to change it. At that point of time, the organizational absorptive capacity declines. At the very beginning stage organization tries to gather knowledge by means of exploration. That results in high absorptive capacity. But as the time graduates, organization tries to exploit the existing knowledge, which results in decline of absorptive capacity.

Subsequently if directional part of the model is looked at, the finding reinstates the findings of the deterministic part of the model. First, when everything goes right, organization is not concerned about investigating the rationale behind that. The escalating profit margin with the same revenue stream makes organization not to break the status quo and exploit the existing knowledge only. As a result of this, organizational absorptive capacity goes down. It is revisited when the same revenue stream generates less amount of profit. When the organization observes that there are possibilities of loopholes in the process or obsolescence of the organizational knowledge, only then they go for exploring fresh and innovative knowledge based processes. This leads to augmentation of organizational absorptive capacity. Similar results emerge when organization goes through a cycle of exploration and exploitation. The cyclic nature of profit decides the extent of the absorptive capacity. Second, the productivity of the capital employed also plays an imperative role in deciding the extent of organizational absorptive capacity. During the knowledge exploration phase, when the revenue stream is able to generate more profit, then it can be stated that the employed capital is productive enough to build up a productive knowledge base for organization, and in turn augmenting organizational absorptive capacity. On the contrary, when the same revenue stream is not able to generate the expected amount of profit, the productivity of the capital can be duly questioned. It is knowledge base and organizational productivity that generates profit. This process is catalyzed by the productivity of the employed capital.

Conclusion

So far the model for absorptive capacity and organizational productivity is developed. Since this kind of model development is new and innovative in the existing body of literature, it has its own implication over existing

empirical and qualitative researches on this area. In terms of quantitative conceptual model development, it is reliable and valid, as it incorporates the predefined parameters which were well discussed by previous researchers. However, this model has some limitations, which in turn poses the scope for future research:

- Probabilistic modelling of knowledge exploration,
- Incorporating time value of money by enabling inflation factor,
- Considering discrete time analysis, and
- Considering real life organizational data with a view to testing the model.

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An Unobserved Components Model Approach to the Relationship between Real Gross Domestic Product and Unemployment for Cyprus

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Abstract

This empirical study employs a bivariate unobserved components model to estimate the permanent and transitory movements in real GDP and the unemployment rate and the relationships between them, using information from observable aggregates for the economy of Cyprus. The main motivation for quantifying this relationship is the absence of any measure for the Okun's law that can be used to evaluate the effects of macroeconomic policy. The results suggest that both the transitory movements in Cypriot output and unemployment rate are critical for explaining overall fluctuations. The estimated Okun's coefficient for transitory movements implies that a 1% change in transitory unemployment causes 1.73% change in transitory real GDP in the opposite direction.

Keywords: unobserved components, business cycle, trend GDP, cyclical unemployment, Cypriot economy.

JEL Classifications: C32, E23, E24, E32.

1. Introduction

Unobserved Components Models (UCM) has been used for an analysis of many macroeconomic time series that can be decomposed into permanent, or trend, movements and transitory movements in the series of various countries. Sinclair (2009) showed that there is an important relationship between the permanent and transitory movements in U.S. output and the unemployment rate, as specified by Okun's law. Okun's law is an empirically observed relationship linking unemployment to losses in a country's production. In Okun's original statement of his law, a 3% increase in output corresponds to a 1% decline in the rate of unemployment; a .5% increase in labor force participation; a .5% increase in hours worked per employee; and a 1% increase in output per hours worked (labor productivity).

From the viewpoint of time series analysis, the estimation of the relationship between the two requires the decomposition of the observed output and unemployment series into the non-stationary permanent and the stationary transitory component. In many studies a variety of detrending techniques is used to carry out the trend-cycle decomposition. In the current study, a bivariate correlated unobserved components model (UCM), used in Sinclair (2009), is employed for decomposing output (measured as real GDP) and the unemployment rate for Cyprus into the permanent and transitory components and investigating the relationships between the two using information from observable aggregates and presents results for the economy of Cyprus. The model was developed by Sinclair (2009) as a two series extension of the correlated UCM as proposed by Morley, Nelson and Zivot (2003). Similar multivariate UCM has been applied to macroeconomic variables for single individual economies such as the US (Morley 2007, Sinclair 2009) and Canada (Basistha 2007) and for groups of countries like Eurozone aggregates (Xiaoshan and Mills 2012).

As Harvey and Jaeger (1993) argue, this class of models provides a useful framework as they "are explicitly based on the stochastic properties of the data". They are based on interpretable and well-defined models for the individual components, are very flexible in accommodating peculiar features of the time series and can be scrutinized by rigorous tests. The correlated UCM can distinguish cross-series correlations driven by the relationships between permanent shocks, caused by real shocks, from those between transitory movements, caused by changes in aggregate demand or monetary shocks. It does not require any prior transformation or detrending of the data and places fewer restrictions among the series than other models. In particular, this approach combines the detrending and correlation estimation into a single stage which improves both the estimates of the trend and cycle as well as the estimates of the correlations. Furthermore, this model nests many of the common detrending methods (Harvey and Trimbur 2003) and is thus more general than selecting a more restrictive model.

The bivariate correlated UCM simultaneously decomposes each series into a permanent component and a stationary transitory component. The permanent component is assumed to be a process of random walk with drift (Stock and Watson 1998) in order to capture the long term potential (or steady-state level) output of the economy. The transitory component, defined as real GDP deviations from the permanent trend, is assumed to be stationary following a second order autoregressive process, or AR (2). In this way the model can identify the correlation of the shocks to permanent and transitory components of each series. This is particularly important for macroeconomic fluctuations of developing countries such as Cyprus, which may not experience typical traditional business cycle fluctuations.

This paper is divided into four sections. Section (2) briefly introduces the relationship between output and unemployment and the unobserved components model (UCM) in time series. Section (3) presents the application of UCM and the empirical results from the first quarter of 2004 to the first quarter of 2013.The final section provides the concluding remarks.

2. The Okun's Law and the Unobserved Components Model

2.1. The Okun's Law

Okun's law (1962) is an empirically observed relationship relating unemployment to losses in a country's production. There are several versions of this rule of thumb but the "difference version" states that a one point increase in the unemployment rate is associated with two percentage points of negative growth in real GDP. The relationship varies depending on the country and time period under consideration.

This version describes the relationship between quarterly changes in unemployment and quarterly changes in real GDP. The stability and usefulness of the law has been disputed. The relationship has been tested by many researchers by regressing GDP growth on change in the unemployment rate and they argued that most of the change in output is actually due to changes in factors other than unemployment, such as capacity utilization and hours worked.

The difference version of Okun's law may be written (Abel & Bernanke, 2005) as:

$$(\bar{y}_t - y_t) / \bar{y}_t = \lambda(u_t - \bar{u}_t) + v_t \tag{1}$$

where $\bar{y}_t$ is potential GDP, y_t is actual output, $\bar{u}_t$ is the natural rate of unemployment, u_t is actual unemployment rate, λ is the factor relating changes in unemployment to changes in output, $(\bar{y}_t - y_t)$ and $(u_t - \bar{u}_t)$ as the transitory components of output and the unemployment rate respectively, and v_t represents a random error. Generally the relationship between output and the unemployment rate is expected to be negative and therefore the estimate of λ must be, accordingly, negative. In particular, it is expected that the transitory components of real GDP and the unemployment rate must be negatively correlated.

2.2. The unobserved components model

The UCM may be considered to be a multiple regression model with time-varying coefficients. (UCM is an alternative to ARIMA models and provides a flexible and formal approach to smoothing and decomposition problems.) It is based on the principles that (i) it is useful to view time series as being decomposable into trend, seasonal, and cycle components and (ii) time series models that give equal weight to both near and far distant observations (as in the deterministic trend model to be discussed later) are often not very useful. With respect to point (i) inefficient and inaccurate forecasting is likely to arise if the salient characteristics of the time series to be forecasted are ignored. With respect to point (ii), in many time series the adjacent observations are more closely correlated with each other than observations that are far apart. As a result, time series models that are "local" in nature and place more weight on recent observations than those in the far past, tend to predict better when applied to economic and business time series than models that treat time series data "globally" as in the deterministic time trend model.

Output (*y*) and the unemployment rate (*u*) can each be represented as the sum of a permanent component and a transitory component. The permanent component (τ) is the steady-state level after removing all temporary movements. The transitory component (*c*) embodies all temporary movements and is assumed to be stationary:

$$y_{it} = \mu_{it} + c_{it}, \quad _{i=y \text{ or } u} \tag{2}$$

Each of the trend components is assumed to be a random walk to allow for permanent movements in the series:

$$\tau_{it} = \mu_i + \tau_{it-1} + \eta_{it} \tag{3}$$

For output, the model allows for a drift (μ_y) in the permanent component, but the drift for the unemployment rate was insignificant and is not included in the reported models.

Following Morley, Nelson, and Zivot (2003), Clark (1987 and 1989), and Watson (1986), each transitory component is modeled as an autoregressive process of order two (AR(2)). Including a third lag does not qualitatively change the results and a likelihood ratio test indicates that a third lag is not significant.

$$c_{it} = \varphi_{1i} c_{it-1} + \varphi_{2i} c_{it-2} + \varepsilon_{it} \tag{4}$$

The correlated unobserved components model assumes the permanent and transitory innovations (η_{it}, and ε_{it}) are jointly normally distributed random variables with mean zero and a general covariance matrix (allowing possible correlation between any of the unobserved innovations). The model can be represented in state-space form so that the Kalman filter can be applied for maximum likelihood estimation of the parameters and the components.

The variance-covariance matrix is:

$$\Sigma = \begin{bmatrix} \sigma_{\eta y}^2 & \sigma_{\eta_y \eta_u} & \sigma_{\eta_y \varepsilon_y} & \sigma_{\eta_y \varepsilon_u} \\ \sigma_{\eta_y \eta_u} & \sigma_{\eta u}^2 & \sigma_{\eta_u \varepsilon_y} & \sigma_{\eta_u \varepsilon_u} \\ \sigma_{\eta_y \varepsilon_y} & \sigma_{\eta_u \varepsilon_y} & \sigma_{\varepsilon y}^2 & \sigma_{\varepsilon_y \varepsilon_u} \\ \sigma_{\eta_y \varepsilon_u} & \sigma_{\eta_u \varepsilon_u} & \sigma_{\varepsilon_y \varepsilon_u} & \sigma_{\varepsilon u}^2 \end{bmatrix} \tag{5}$$

It is well known in the advanced time series literature that UC models can be thought of as being special cases of more general models called Gaussian State Space Models (GSSM). Once the specific UCM has been cast in State Space form the various unobserved components can be estimated using the Kalman Filter for maximum likelihood estimation of the parameters and the components.

3. Data and results

The data used in this study consist of real GDP and unemployment observations of quarterly frequency for Cyprus. The GDP series is represented in (natural) logarithms multiplied by 100 (*y*). The main motivation to work with logarithms, instead of levels, is that they are usually stationary (covariance-stationary) and they represent the behavior of the conditional volatility of the series in a more intuitive manner. All data was obtained from the statistical service's database of Cyprus and span from the first quarter of 2004 to the first quarter of 2013.

Figures 1 and 2 present the estimated permanent and transitory components of real GDP and the unemployment rate respectively along with the observed series. They are produced using the Kalman smoother, which uses all information available in the sample, thus providing a better in-sample fit as compared to the basic Kalman filter which only uses information available at time *t*. In the case of both real GDP and the unemployment rate, using the additional information results in a less variable trend and a more variable transitory component than using the basic filter.

Figure 1 shows the estimate of the permanent and transitory components of the Cypriot real GDP based on the bivariate UCM along with the series itself. It looks like most of the movement in real GDP appears to arise from transitory movements. These estimates suggest that that the transitory movements are substantial. The transitory components appear very similar to the series itself.

The estimated permanent and transitory components of real GDP presented in Figure 1 raise two important points. First, movements in the permanent component for real GDP are relatively stable. Second, innovations to the permanent component are not significantly correlated with innovations to the transitory component. The transitory movements are the difference between the real GDP series and the permanent component. The estimate of the transitory component looks very similar to the real GDP series. This result contradicts the findings of Beveridge-Nelson (1981) decomposition of U.S. real GDP and the ones of Morley,

Nelson and Zivot (2003) and Morley (2007a). They found that the estimated permanent component resembled to a large degree the original U.S. real GDP series.
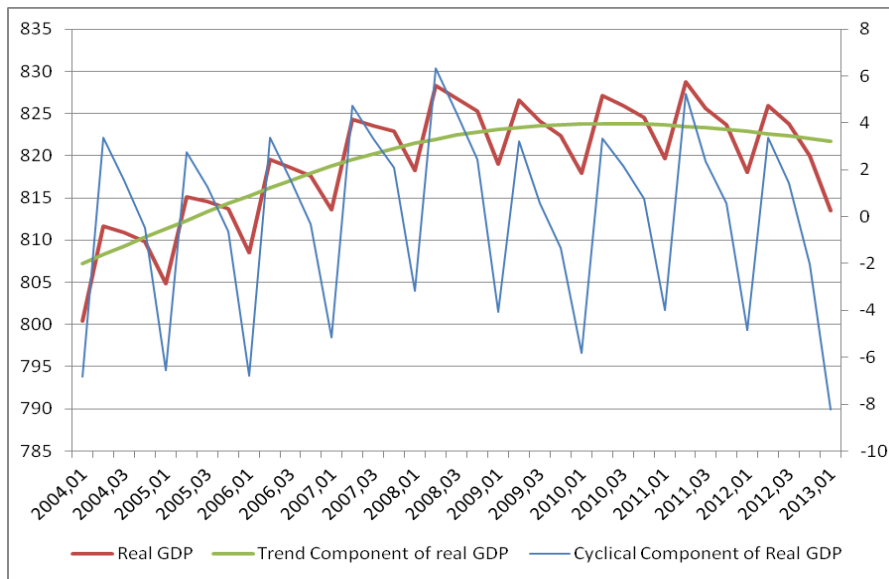

Figure 1- Real GDP and estimated permanent and transitory components.

Figure 2 presents the estimate of the permanent component of the Cypriot unemployment rate along with the unemployment rate series. In this case, however, it appears that most of the movements in the unemployment rate arise from permanent shocks. These estimates suggest that that the transitory movements are small and noisy. Similar to real GDP, the transitory components appear very similar to the series itself.
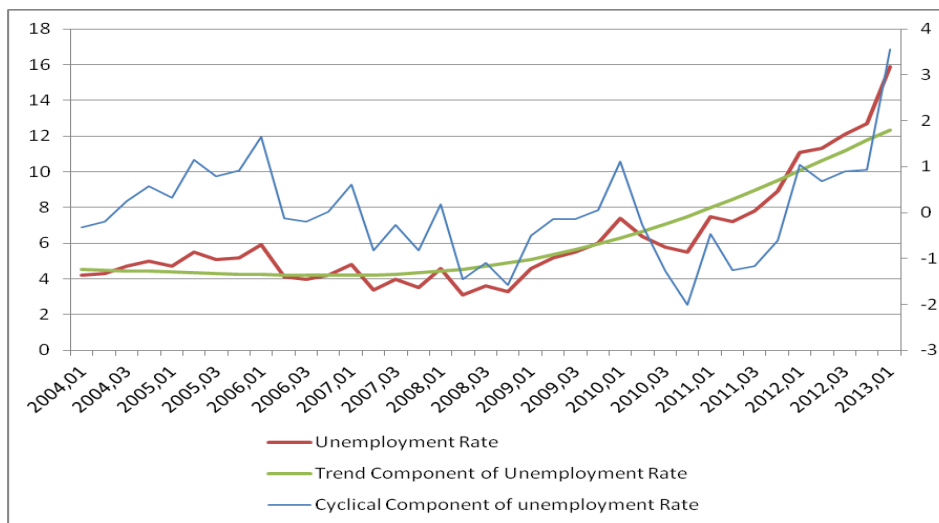

Figure 2 - Unemployment rate and estimated permanent and transitory components

3.1. Correlated unobserved components model parameter estimates

Although the estimates presented in the following tables come from joint estimation, the results for each series are first obtained by estimating the univariate models expecting to produce guess values. (The univariate models end up not helping much, since the two models end up with shocks that are almost perfectly (negatively) correlated, so there's quite a bit of crossvariable information.)

Table 1 reports the parameters of the maximum likelihood estimation of the correlated unobserved components models for the entire sample period. The estimated value of the drift term (μ) is 0.8343 and is statistically significant at the 1% with a p-value less than 0.000. Since the real GDP series is in logs and multiplied by 100, the estimated drift term multiplied by 4 can be interpreted as the average annual growth of the permanent component. According to our estimates, GDP's average permanent real growth rate is 3.34% annually. This

estimate is very close to the estimates reported by IMF, Eurostat, Central Bank of Cyprus, and Finance Ministry of real GDP's average growth of 3.88% annually.

Table 1 - Maximum Likelihood Estimation Results for Real GDP

Description	Parameter	Estimate	Standard Error	p-Value
Log Likelihood Value	*mlv*	-128.6911		
Real GDP				
Real GDP Drift	μ_y	0.8343	0.105	0.000
1st AR parameter	φ_{1y}	-0.0068	0.024	0.779
2nd AR parameter	φ_{2y}	-0.8631	0.045	0.000
The Unemployment Rate				
1st AR parameter	φ_{1u}	-1.3854	0.114	0.000
2nd AR parameter	φ_{2u}	-0.7374	0.106	0.000

The estimated autoregressive coefficients reflect the dynamics of the transitory components. (The transitory components are simply the stationary part of the data.) The estimated first autoregressive coefficients of -0.0068, in the case of real GDP, is statistically insignificant whereas the second one as well as the estimated parameters for the unemployment rate are statistically significant. The sum of the autoregressive coefficients, which provides a measure of persistence of the transitory components, suggests that the unemployment rate series has a persistent transitory component. In addition, the estimates of the autoregressive parameters for real GDP are relatively small, suggesting that most of the persistence of real GDP is captured in the permanent component.

Table 2 presents the standard deviation of permanent and transitory components for both series. The standard deviation of permanent shocks for real GDP is larger than the standard deviation of the transitory shocks whereas the standard deviation of permanent shocks for the unemployment rate is smaller than the standard deviation of the transitory shocks. As a result, this finding suggests that permanent shocks are relatively more important than the transitory shocks for real GDP whereas transitory shocks are relatively more important than the permanent shocks in the case of the unemployment rate. The estimates in Table 2 also suggest that movements in the permanent component for the unemployment rate are highly variable and that movements in the permanent component for real GDP are less variable.

Table 2 - Standard deviations of shocks

Description	Parameter	Estimate	Standard Error	p-Value
S.D. of permanent GDP component	$\sigma_{\eta y}$	2.9746	0.4935	0.000
S.D. of cyclical GDP component	$\sigma_{\varepsilon y}$	-0.0001	1.2626	0.999
S.D. of permanent unemployment component	$\sigma_{\eta u}$	-0.0889	0.1114	0.424
S.D. of cyclical unemployment component	$\sigma_{\varepsilon u}$	0.0000	0.4269	0.999

Table 3 shows the within series correlations between the permanent and transitory components over the entire sample period. The estimates indicate that the correlation between permanent and temporary innovations for the unemployment rate and the correlation between permanent and temporary innovations for real GDP are both positive and insignificantly different from zero.

Table 3 - Within series correlations of shocks

Description	Parameter	Estimate	p-Value
Correlation between real GDP Components	$\rho_{\eta y \varepsilon y}$	.145	.393
Correlation between unemployment Components	$\rho_{\eta e \varepsilon u}$	.268	.109

Positive correlation between permanent and transitory components can be interpreted as due to quick adjustment of the actual output of the economy to the permanent shocks on the output. As explained by Stock and Watson (1988) and Morley, Nelson and Zivot (2003), negative correlation of the permanent components with the transitory ones implies that the economic fluctuations are driven mainly by permanent shocks and while the

permanent shocks immediately shift the long term path of the output, the short run movements may include adjustments toward the shifted trend.

Table 4 presents the results of the cross-series correlation analysis between real GDP components and the unemployment rate components over the entire sample period. As indicated in table 4, the two correlation coefficients of interest (between real GDP and unemployment permanent components and real GDP and unemployment between transitory components) are moderately high and statistically significant at the 1% level. The value of -.585 indicates that the transitory components of real GDP and unemployment are negatively related (as expected) and that the relationship is rather strong. Surprising, the correlation coefficient of .507 shows that the permanent components of real GDP and unemployment are positively related and that the relationship is relatively strong.

3.2. The relationship between the transitory components

The relationship between the transitory components of real GDP and the unemployment rate is of critical interest for understanding the effects of macroeconomic policy. This correlation provides an estimate of the coefficient traditionally associated with the Okun's Law (Okun, 1962) which suggests that an increase in transitory output is accompanied by a decrease in transitory unemployment. Traditionally, Okun's coefficient has been estimated by first estimating the unobserved components and then estimating the correlation between the estimated components. In this paper, however, the correlation is directly estimated within the model. The correlation between the transitory components of real GDP and the unemployment rate is -0.585 and statistically significant at the 1% significant level.

In order to quantify Okun's law, the estimated correlations from Table 4 must be related with the regression coefficient (λ) from Eq. 1. The hypothesis that the autoregressive coefficients are the same for GDP and the unemployment rate cannot be rejected, so eq. 1 is rewritten by substituting in the innovations to transitory real GDP and transitory unemployment (which are denoted ε_{yt} and ε_{ut} respectively):

$$\varepsilon_{yt} = \lambda\varepsilon_{ut} + (1 - \varphi_1 L - \varphi_2 L^2)v_t, \tag{6}$$

where L is the lag operator and where $\varphi_1 \equiv \varphi_{1y} = \varphi_{1u}$ and $\varphi_2 \equiv \varphi_{2y} = \varphi_{2u}$.

Assuming that ε_{yt} and ε_{ut} are jointly normally distributed and that v_t is an independent normal random variable, we find that $\lambda = \rho_{\varepsilon y\varepsilon u}\cdot\sigma_{\varepsilon y}/\sigma_{\varepsilon u} = -1.73$. This estimate implies that a 1% decrease in transitory unemployment corresponds to a 1.73% increase in transitory real GDP. The estimated coefficient of -1.73% is smaller in absolute value than is typically found in other countries. However, it remains within the range of acceptable estimates.

3.3. The relationship between the permanent components

Finally, the correlation between the permanent components of real GDP and the unemployment rate, which is not statistically significant, measures "Okun's coefficient for permanent movements."

Table 4 - Cross series correlations of shocks

Description	Parameter	Estimate	p-Value
Permanent Unemployment/ Permanent GDP	$\rho_{\eta y \eta u}$	.507	.001
Permanent GDP/Transitory Unemployment	$\rho_{\eta y \varepsilon u}$	-.256	.127
Permanent Unemployment/Transitory GDP	$\rho_{\eta u \varepsilon y}$	-.142	.403
Transitory GDP/ Transitory Unemployment	$\rho_{\varepsilon y \varepsilon u}$	-.585	.000

This relationship can be investigated in precisely the same way as the traditional Okun's coefficient. Assuming that β denotes "Okun's coefficient for permanent movements," then $\beta = \rho_{\eta y \eta u}\cdot\sigma_{\eta y}/\sigma_{\eta u}$.

Conclusion

The main motivation for this empirical study is the absence of any numerical measure regarding the relationship between output and the unemployment rate in Cyprus. Knowledge about this relationship is extremely useful in terms of macroeconomic policy. This study jointly estimated the permanent and transitory movements in Cypriot output and the unemployment rate as well as the relationships between them. The estimated components, assuming both series have random walk components, suggest that both real GDP and the unemployment rate have highly variable movements in their permanent components that look similar to the

series themselves. Moreover, due to innovative changes the permanent component and the transitory component are negatively correlated for both output and the unemployment rate. Therefore it would be inappropriate to treat these components as independent. Finally, the negative correlation between the transitory components of to real GDP and the unemployment rate of -1.73 indicates that real GDP and the unemployment rate are even more strongly linked through their transitory movements than through their permanent ones.

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The Development Design of Knowledge Quality Based on Knowledge Networking and Cross-Functional Integration towards SMES' Innovative Performance

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Abstract

This study is based on research gap and business phenomena, such as the big amount and varies knowledge quality concepts, study controversy of cross-functional collaboration relations towards performance. Besides, there is no consistency in cross-functional collaboration relations. The findings of the previous researches show that the innovation of SME is still 'follower'. The findings of this research show that the main priority of the development model of SME innovative performance in Central Java by enhancing the intrinsic knowledge quality with the indicators of accuracy, objectivity, dynamism/update and believability.

1. Introduction

The existence of knowledge economy has required a creation of new generation of organization which should utilize specific knowledge to acquire global competitiveness (Constantine 2013). Carmen Cabello-Medina (2011) states that the importance of human capital for innovation becomes the attention of researches, especially dealing with elements and processes which improve the organizational innovation and performance. The study of Hsu (2007) shows that small industries likely to be unable to achieve innovativeness. Organization with skillful and knowledgeable human resource has higher human capital and more likely to generate knowledge, make right decision, and has better innovativeness. (Hitt *et al.* 2006)

Knowledge is the main resource and value source for an organization. The knowledge quality helps the company to optimize the works, products and services development, decrease the expenses and increase the selling. Then, (Dong 2010) explains that the concept of knowledge quality is plenty and varied. However, the organization is acquired to enhance the knowledge quality by cross-functional collaboration.

Cross-functional collaboration is an important component for the continuity of an organization that aims to win the competition by optimizing the functions within the organization meticulously. The study of Song (2000) concludes that cross-functional collaboration has impact on performance. However, the study of Menon, et al (1999) state that cross-functional collaboration does not impact the performance. Besides, there is no inconsistent on cross-functional collaboration, for instance Tsai (2002) explains that cross-functional collaboration in social interaction, and Lin *et al.* (2010) conceptualize it as communication, problem solving, and satisfying relation.

Therefore, it requires raw understanding about cross-functional collaboration in order to stimulate the enhancement of knowledge quality and innovative performance. Based on the above research gaps and business phenomena, this study examines the development design of knowledge quality based on cross-functional collaboration and knowledge networking towards SMEs' innovative performance.

2. Hypotheses development

2.1. Knowledge networking and cross-functional integration

The existence of environment uncertainty forces the Human Resource (HR) to seek for knowledge owned by people outside the organization (i.e. customers, suppliers, distributors, state institutions, or competitors). Working unit may do not have all of the abilities required for the success of the organization, hence the effective knowledge networking is essential. The study of Dong Kyoon Yoo (2010) explains that knowledge networking is about how far an organization is possible to acquire usable connectivity through activities.

Knowledge networking increases the organization effectiveness, as it can overcome the complex activities. The growth of knowledge networking will facilitate the processes of conveying essential ideas, insight, and other perspectives for the team. (Hoegl *et al.* 2003)

The disclosure and communication among functions is needed in order to give responds to the environment. The problem occurs in a function can be helped to analyze and solve by other functions professionally and conceptually. Likewise in some unsolved problems in one party can be discussed and solved through coordination among other parties within an organization. This step requires to be implemented in the company culture; hence the employees will not do reclusion, afraid of taking initiatives and risks. The consequences then are the open-minded and communication within the organization will impact on the respond giving in the environment. Effective coordination among functions is expected to actively mobilize the participation from every field to achieve the general purposes of the company. Thus, it needs effective supports and powerful leadership in coordinating the cross function, support and participation among functional fields, and reliability among functions.

The study of Song and Dyer (2000) explain that the indications of cross-functional integration are:
- Level of cross-functional involvement dealing with the level of coordination on marketers, R&D, production and finance which analyze the market opportunity as well as potential customers.
- Cross-functional quality relates to the punctuality and information accuracy on every marketer, R&D, production and financial.
- Cross-functional relation harmony dealing with the level of coordination (in the aspects of communication, interaction, and collaboration among the marketers), R&D, production and financial which are responsible, and interaction satisfaction.

The theory of resource based (Grant 1991) explains that productive activities within an organization is essential for the collaboration and coordination among the various resources. The success of the organization is determined by adjusting the process of controlling, coordination, flexibility, and innovation. Failure of an organization is often caused by strategies or silly activities beyond its ability.

The study of Menon *et al.* (1999) concludes that cross-functional integration has impact on strategic creativity. Then, the study of Song (2000) shows that cross-functional integration positively and significantly impacts on the organizational performance. Conclude that:
- Inter-organizational coordination has interaction with intra-organizational coordination;
- Inter-organizational coordination brings effect on planning, efficiency, and performance quality.

Based on these previous studies, it can be concluded that there is a cross-functional integration which has characteristics of effective HR involvement, information quality and is supported by the relational harmonization inter-field. Each functional field is able to recognize the pre-eminence and is able to collaborate to other fields effectively. Through cross-functional and cross-field integration, it can be generated a good process synergy and it is supported by good and positive commitment. This process has potential to become a high quality of strategy and better effects, hence it can analyze situation or served with various unique advantages. However, Menon et al (1999) prove that cross-functional integration brings no impact on organizational learning and organizational performance.

2.2. Knowledge quality

Knowledge quality has become essential issue in creating competitive advantage and relates with rapidly changing business environment (Lee *et al.* 2002). From knowledge use perspective, knowledge can not only be earned but also be integrated by all different resources from special knowledge (Majchrzak *et al.* 2004). HRs is willing to spend their time and energy to seek for knowledge if it is likely to have values and is able to bring benefits (Davenport and Prusak 1998). Defining, explaining, and assessing the knowledge quality is interested for the researcher.

Kulkarni *et al.* (2006-2007) assume that knowledge quality content is assessed by its use. Soo *et al.* (2004) explore knowledge quality by measuring the utility frequency and innovation. Rao and Osei-Bryson (2007) develop conceptual dimension of knowledge quality, such as accuracy, consistence, currency, interpretability data, context level, detail level, interest level, utilization sharing, and volatility. Durcikova and Gray (2009) measure the knowledge quality by accuracy, and meeting needs. This study explores the knowledge quality in single dimension. Knowledge, somehow, is a multidimensional development (Nonaka 1994), and quality which cannot be measured by single dimension. Majchrzak *et al.* (2004) also explain that there are three criteria to use knowledge for innovation, such as credibility, relevance, and adaptation. In this study, knowledge quality is defined as how far the awareness and understanding of idea, logic, relationship, and appropriate circumstance can be used, relevant, valuable to context, and adaptable.

The study of Dong Kyoon Yoo (2010) explains that knowledge quality dimension includes:

▪ *Intrinsic knowledge quality.* This means to what extent HR has knowledge quality. This dimension relates to accuracy, reliability, and punctuality of knowledge. This is the basic of knowledge quality, and gives a wide understanding in the activities and relations. Knowledge is defined as a justified belief which improves an entity capacity for effective action (Nonaka 1994). This means that the members justify the accuracy or reliability of their observation (Erden *et al.* 2008). Even though knowledge is drawn as belief, opinion, insight, and experience (Nonaka 1994, Davenport and Prusak 1998), it should contain fundamental values.

▪ *Contextual knowledge quality.* Intrinsic knowledge quality is a required condition, but still not enough. Knowledge cannot reflect context, and does not have relevance. The same knowledge may have different meaning in different context. Knowledge is specific context Becerra-Fernandez and Sabherwal, 2001; Nonaka and Takeuchi 1995) and the different contexts (i.e. time, space, culture, goal, role, or paradigm) appraise quality with different way. The different context may acquire different knowledge management (Becerra-Fernandez and Sabherwal 2001). Contextual knowledge quality refers to what extent knowledge is considered as duty context. This dimension relates with relevance, appropriateness, and value by understanding the environment where the duty is operated. Contextual understanding should increase the knowledge use efficiency.

▪ The follow-up knowledge quality is an action which should be used to fulfill a purpose (Nonaka and Takeuchi 1995). The follow-up knowledge quality refers to what extent knowledge is spread, adapted, and applicable on duties. Knowledge should be transformed into action in order to realize its use and profitability (Davenport and Prusak 1998). As knowledge quality depends on the actual use of knowledge. This is followed up by knowledge quality which enables the team to flexibly adapt, develop, and easily apply the knowledge so it can increase the effective actions. This dimension helps to deal with uncertainty by adapting their knowledge for flexible, wide, and easy situation.

The resource supplies from outside of new knowledge an understanding are needed in a project. The integration of external resource team allows the team to access the precious knowledge and complement each other skills (Dong Kyoon Yoo 2010). Therefore, the team can develop their knowledge quality by a punctual integration through knowledge networking. Thus, the hypotheses proposed in this study are as follows:

H1: The higher knowledge networking, the higher intrinsic knowledge quality.

H2: The higher knowledge networking, the higher contextual knowledge quality.

H3: The higher knowledge networking, the higher follow-up knowledge quality.

The study of De Dreu (2007) explains that individuals tend to share valuable knowledge in the context of collaboration where the individuals feel the use of collective knowledge in pursuit of mutual interests. However, it is acknowledged that collaboration behavior enhances mutual understanding among individuals which is the prerequisite for knowledge sharing with many innovative characteristics. Thus, it is expected that collaboration context will generate a high quality of knowledge sharing among team members.

The cooperative learning theory emphasizes on the important of collaboration attitude in maximizing the study result of the team members (Stouten and De Cremer 2010). Besides, cooperative communication and the relationship among individuals are believed to be able to improve mutual understanding, convince the individuals to be aware of others' needs; hence it can facilitate various valuable knowledge and understandable (Joshi, Sarker and Sarker 2007). Thus, the hypotheses proposed in this study are as follows:

H4: The higher cross-functionali integration, the higher intrinsic knowledge quality.

H5: the higher cross-functional integration the higher contextual knowledge quality.

H6: the higher cross-functional integration, the higher follow-up knowledge quality.

2.3. Innovative performance

The study of Carmen Cabello-Medina (2011) states that intellectual modal is conceptualized as knowledge and organizational ability understanding, which is one of the most relevant antecedent innovation, that has become the basic of competitive advantage development.

On the other side, the innovation ability of a company is more closely related to intellectual modal rather than the permanent assets. The importance of intellectual modal to innovate has attracted the researcher in determining elements and processes to enhance innovative performance and company performance. Even though the organization can develop three intellectual modal aspects, such as human, social and organizational modal, one of the most substantial ideas dealing with interactional potential among them and how the interaction can increase innovative performance.

The intellectual modal approach considers that human capital can be utilized by other parties to create new knowledge. Although the human capital may be the origin of all knowledge, learning acquires that individuals can do insight sharing, knowledge and mental model, which are the social capital (Senge 2001). Knowing that innovation basically is part of training in collaboration, the social modal plays the key role either increasing the human capital directly or emphasizing the impact through innovation. Therefore, individual knowledge enhancement and sharing condition creation are deserved to be concerned.

Regarding to the close relationship between the company member's knowledge, products and services, it is clear that the company's ability to generate new products and other organizational ability has close relationship with the human resources. The approach of human capital, value, and knowledge uniques are the most relevant fitures for innovation. Value refers to potention to improve the company's efficiency and effectivity, exploit market opportunity and/or netralize the potential thread. Valuable knowledge generates high returns in the market, which enhances the ratio of benefits for the customers towards the costs. Dealing with the innovation, employees with positive and valuable knowledge and abilities relate with innovative performance, because they contribute in identifying the new market opportunities and willing to experiment and implement new procedures. (Label 2002) Subramaniam and Youndt (2005) show that among all people within an organization, there is diversity in abilities. This HR is the most flexible in acquiring new abilities which are able to improve the company's innovation performance.

This unique HR generates a competitive differentiation as it is valuable, besides its ability is competitive parity source (Barney 1991). On the other hand, knowledge contributes for the development of new ideas and products (James 2011). Unique knowledge is the source of innovative activities. Therefore, new knowledge quality of a company is eligible to compete; hence knowledge quality is an intangible resource which can trigger the innovation performance of the company. Thus, the hypotheses proposed in this study are as follows:

H7: The higher intrinsic knowledge quality, the higher innovative performance.

H8: The higher contextual knowledge quality, the higher innovative performance.

H9: The higher follow-up knowledge quality, the higher innovative performance.

The development Model of Knowledge Quality Based on Knowledge Networking and Cross-Functional Integration towards SMEs' Innovative Performance looks as in the following figure:
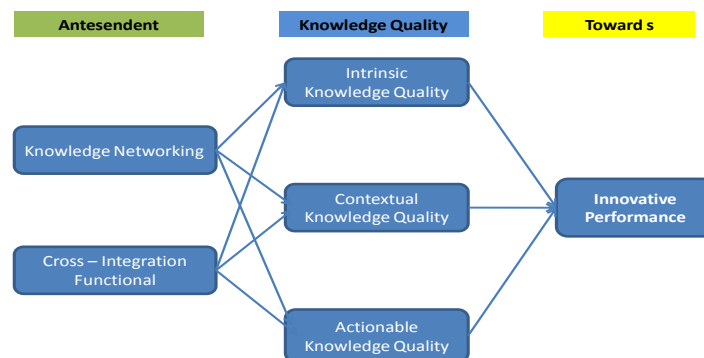

Figure 1 - Empirical Model

3. Method

3.1. Respondent

The population of this study is all small Batik Industries in Central Java-Indonesia which number is 1201. The purposive sampling technique is used as the sampling method, based on population characteristics, such as the area or location. Then, the sample size refers to Hair, et all (1996), who state that the sample size is the indicator multiplied to 5 to 10 or minimum 100 respondents. In order to optimize the generalization, then the sample of this study is as many as 150 respondents.

3.2. Variable and Indicator

The variable in this study covers innovative performance, knowledge networking, cross-functional collaboration, intrinsic knowledge quality, contextual knowledge quality, and follow-up knowledge quality. Then, the indicators of each variable are presented as follows:

Table 1 - Variable and Indicator

No	Variable	Indicator	Source
1	Innovative Performance	▪ Introduction to new product technology which has been developed; ▪ The frequency of products replacement which significantly change; The proportion of new product technology; ▪ Management renewal.	Muammer Zerenler (2008)
2	Knowledge Networking	▪ Easiness in acquiring knowledge; ▪ Easiness in accessing external resource; ▪ Having usable contact; ▪ External feedback.	Dong Kyoon Yoo (2010)
3	Cross-Functional Collaboration	▪ Involvement; ▪ Quality; ▪ Harmony.	Song. M.X. and Dyer, B. (2000)
4	Intrinsic Knowledge Quality	▪ Accurate; ▪ Reliable; ▪ Objective; ▪ Update; ▪ Believable.	Dong Kyoon Yoo (2010)
5	Contextual Knowledge Quality	▪ Adding value for decision making; ▪ Adding value on operational team; ▪ Giving competitive advantage; ▪ Relevant with the duties.	Dong Kyoon Yoo (2010)
6	Follow-Up Knowledge Quality	▪ Adapt; ▪ Improving duties; ▪ Providing capacity to react towards the circumstance.	Dong Kyoon Yoo (2010)

3.3. Analysis Technique

To analyze the data, Structural Equation Modeling (SEM) from AMOS Software 5.0 is used in this research. According to Ferdinand (2000), there are some steps in SEM, such as:
1) theory-based development design,
2) diagram path development,
3) evaluation on Goodness-of-fit criteria,
4) evaluation on design suitability through a review towards various Goodness-of-fit criteria.

4. Result and Discussion

4.1. Validity

In this research, validity is tested using convergent validity. Convergent validity can be seen from Structural Equation Modeling (SEM) by observing every coefficient indicator of every construct which has two times higher value in every standard error. It has shown in Figure 1 that convergent validity can be fulfilled since every indicator that has critical ratio is two times higher than standard error.

4.2. Reliability

Based on the measurement of Table 1, it can be seen that there is no reliability which is smaller than 0.70. So as in variance exact test, there is no value which is lower than 0.50. This result shows that all indicators on the construct are used as observed variable for the construct, or the latent variables are able to describe the construct or the latent variable formed.

Table 2 - Reliability test and variance extract

No	Variable	Construct Reliability	Variance Extract
1	Knowledge Networking	0.82	0.67
2	Cross-Functional Coordination	0.79	0.72
3	Intrinsic Knowledge Quality	0.87	0.75
4	Contextual Knowledge Quality	0.77	0.66
5	Follow-up Knowledge Quality	0.71	0.69
6	Innovative Performance	0.81	0.67

4.3. Full model test of knowledge quality

Based on the analysis through confirmatory factor, each indicator in the suitable model can be used to define the latent construct, so the full model of SEM then is able to be analyzed. The data processing result is presented in Figure 2.
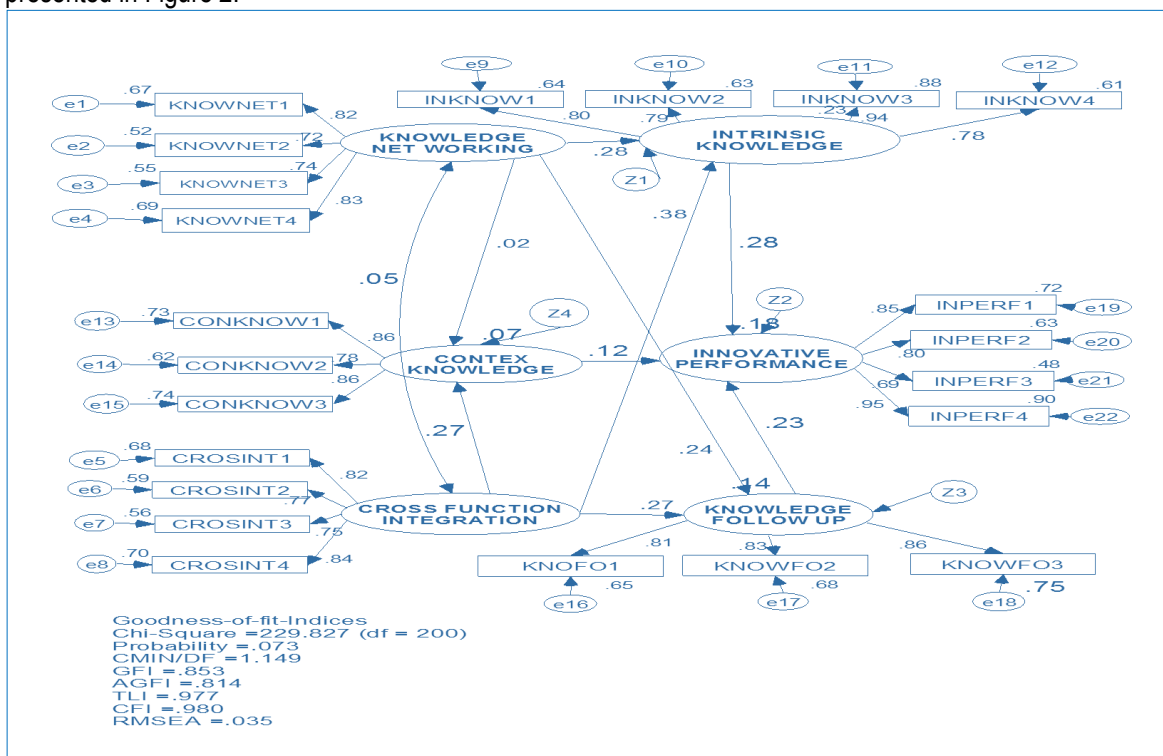

Figure 2 - Full Model Test of Knowledge Quality

Figure 2 shows that this model is suitable to the data used in this research. It proves that Chi-Square, Probability, CMIN/DF, and TLI are in the range of the expected values although GFI and AGFI are marginally accepted.

4.4. Hypotheses testing

Based on the test through confirmatory analysis and structural equation testing model of knowledge quality, this model can be accepted. Then, based on the suitable model, it will be implemented hypotheses testing which were proposed in this research. It is presented in Table 3.

Table 3 - Standard estimate and critical ratio

Hypothesis	Impact	Std. Estimate	Critical Ratio	Explanation
H$_1$	*Knowledge Networking* → *Intrinsic Knowledge*	0.280	2.945	Sign.
H$_2$	*Knowledge Networking* → *Contextual Knowledge*	0.024	0.238	Non.Sign.
H$_3$	*Knowledge Networking* → *Follow-up Knowledge*	0.241	2.396	Sign.
H$_4$	*Cross-Functional Integration* → *Intrinsic Knowledge*	0.377	3.826	Sign.
H$_5$	*Cross-Functional Integration* → *Contextual Knowledge*	0.271	2.610	Sign.
H$_6$	*Cross-Functional Integration* → *Follow-up Knowledge*	0.275	2.710	Sign.
H$_7$	*Intrinsic Knowledge* → *Innovative Performance*	0.281	2.923	Sign.
H$_8$	*Contextual Knowledge* → *Innovative Performance*	0.121	1.280	Non.Sign.
H$_9$	*Follow-up Knowledge* → *Innovative Performance*	0.229	2.364	Sign.

Table 3 shows that in the endogenous and exogenous estimation parameter, the value of CR ≥ 2.00 with the significant value 0.05 (5%). Thus, 2 hypotheses are rejected and 7 of them are accepted.

Hypothesis 1 is the higher knowledge networking, the higher intrinsic knowledge quality. The result indicates that to increase the intrinsic knowledge quality, knowledge networking should be developed. Knowledge networking regards with how far an organization is able to obtain usable connectivity through activities or programs. Knowledge networking improves the organization effectiveness as it can overcome complex activities. The development and growth of knowledge networking will facilitate the processes in order to convey important ideas, insights, and perspectives for the team. Besides, intrinsic knowledge quality describes how far the HR has knowledge quality. This dimension relates to accuracy, reliability, and punctuality of knowledge. The integration of external resource team enables the team to access valuable knowledge and complementary skills. Therefore, the team member can enhance their knowledge quality by punctual integration through knowledge networking.

Then, Hypothesis 2 is the higher knowledge networking, the higher contextual knowledge quality. The result indicates that enhancing the intrinsic knowledge quality is not be affected by knowledge networking. This condition is caused by the dominant networking quality on working routine.

The Hypothesis 4 proposed in this result is the higher cross-functional collaboration, the higher intrinsic knowledge quality. The result indicates that to increase the intrinsic knowledge quality, cross-functional collaboration is built. In general, individuals tend to share their valuable knowledge in the context of collaboration where they feel that using collective knowledge together generates an improvement on mutual understanding among individuals, which is a requirement for knowledge sharing with innovative characteristic. Thus, it is expected that the context of collaboration can result a high quality of knowledge sharing among the team members.

Then, Hypothesis 5 is the higher cross-functional collaboration, the higher contextual knowledge quality. The result indicates that cross-functional collaboration is built to enhance the contextual knowledge quality. The cooperative learning theory emphasizes on the importance of collaboration/cooperation in maximizing the learning result of the team members. Besides, cooperative communication and relationship among individuals are believed in increasing mutual understanding, making the individuals aware of others' needs, hence facilitating knowledge sharing becomes more worthwhile and understandable.

Hypothesis 7 describes that the higher intrinsic knowledge quality, the higher innovative performance. The result indicates that intrinsic knowledge quality is developed to improve the innovative performance. Intellectual modal, such as knowledge and recognizing organization's abilities, is one of the most relevant antecedents of innovation which has become basis to achieve competitive advantage. Unique knowledge is the source of innovative activities. Thus, new knowledge quality of a company can compete. Hence, knowledge quality is an intangible resource which triggers innovative performance of the company.

Hypothesis 8 is the higher contextual knowledge quality, the higher innovative performance. The result indicates that enhancing innovative performance is not effected by contextual knowledge quality. The condition is caused by the operational limit of working unit of each SME.

The Hypothesis 9 is the higher follow-up knowledge quality, the higher innovative performance. The result indicates that follow-up knowledge quality should be built in order to increase the innovative performance. Intellectual modal, such as human, social capital, and organization, is one of the most substantive ideas relating to interaction potential and how interaction can increase innovative performance. Knowledge quality contributes

to ideas and new products development. Unique knowledge is the source of innovative activities. Thus, the quality of new knowledge is able to compete.

Conclusion

Various significant supports from hypotheses testing had answered the research problems which resulted 5 developments of knowledge quality that can realize advanced innovative performance, such as: *First*, steps of the development design of innovative performance were done by enhancing intrinsic knowledge quality with indicators of accuracy, objectivity, dynamics/up-date, and trustable. *Second*, steps of the development design of innovative performance were done by increasing follow-up knowledge quality with indicators of adaptation, applicable to improve duties and provide capacity to react with the circumstances. *Third*, steps of the development design of innovative performance were done by cross-functional integration through knowledge quality (i.e. intrinsic knowledge quality, contextual knowledge quality, and follow-up knowledge quality), with the indicators of cross-functional collaboration involvement, cross-functional collaboration quality, and cross-functional collaboration harmony. *Fourth*, steps of the development design of innovative performance were done by knowledge networking through knowledge quality (i.e. intrinsic knowledge quality, contextual knowledge quality, and follow-up knowledge quality), with the indicators of easiness in acquiring knowledge, easiness to access external resource, having usable contacts and external feedbacks. *Fifth*, steps of the development design of innovative performance were done by enhancing contextual knowledge quality with the indicators of adding value in decision making, adding value in team operation, giving competitive advantage, and relevant with the duties.

Managerial Implication

Based on the findings in this research, the managerial implication priorities of development design of knowledge quality based on cross-functional collaboration and knowledge networking towards SMEs innovative performance is as follows:

▪ *Knowledge Networking.* The indicator 'easiness in acquiring knowledge' has the lowest index among other indicators. Thus, the management develops the networking quality by realizing the quality of communication, trust, and commitment on the consensus. By that process, it will trigger the easiness in acquiring knowledge required.

▪ *Cross-Functional Integration.* The management quality of cross-functional collaboration requires disclosure and communication inter function in an attempt of giving feedback to the environment. Problems exist in a function can be helped to analyze and solve by the other functions professionally and conceptually. So as for unsolved problems of a party can be discussed and solved through coordination among functions within a company. This step needs to be implemented in the company culture, so the employees will not be introvert, afraid of taking initiatives, and afraid of taking risks.

▪ *Knowledge Quality.* Accuracy in knowledge requires a high learning orientation, shown by: a) knowing new things, b) training, c) getting feedback from customers, and d) continually doing development. Learning orientation is used as a self-control strategy which is able to help the development of HR's skills and abilities as well as knowledge that can improve the performance.

▪ *Innovative Performance.* The frequency of product replacement requires transformation of innovation core in the external networking because production network with superior knowledge which transfer mechanism among the users, suppliers, and creators will be able to beat the production networking with less effective knowledge distribution routine. To create new/better products, the company should relocate the resource, combine new resource/existing resource both inside /outside with new ways.

Limitation and future research agenda

The result of full model SEM showed that the model was suitable/ fit with the data used. However, there were 2 suitability testing that marginally accepted, such as Goodness of Fit Index (GFI= 0.853), and Adjusted Goodness of Fit Index (AGFI = 0.814). The result of AMOS Software testing showed that in the leverage of knowledge networking and cross-functional integration towards contextual knowledge quality, the Squared Multiple Correlations was 14%, and then in the leverage of knowledge networking and cross-functional integration towards contextual knowledge quality, the Squared Multiple Correlations was 7.5%. In the innovative performance which is influenced by intrinsic knowledge quality, contextual knowledge quality, and follow-up

knowledge quality, Squared Multiple Correlations was 18. 2 %. The three Squared Multiple Correlations have low qualification.

The Future Research Agenda. Organizational culture is an integrated pattern of human behavior which relates to problems in adaptation and integration of internal and external conditions. Therefore, organizational culture takes role in the development process of knowledge quality in an attempt to enhance innovative performance. Thus, further study about organizational culture in the development process of innovative performance in an interesting research area. Then, based on the limitation of the three Squared Multiple Correlations which have low qualification is a black box and an interesting research area.

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