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Impact of FDI on Economic Development: A Causality Analysis for Singapore, 1976 – 2002

Mete Feridun¹ and Yaya Sissoko²

Abstract

This study examines the relationship between economic growth as measured by GDP per capita and foreign direct investment for Singapore, using the methodology of Granger causality and vector auto regression (VAR). Evidence shows that there is a unidirectional Granger causation from foreign direct investment to economic growth.

Keywords: Granger Causality, Vector Auto Regression, Economic Growth

JEL classification: C22, F21, O47

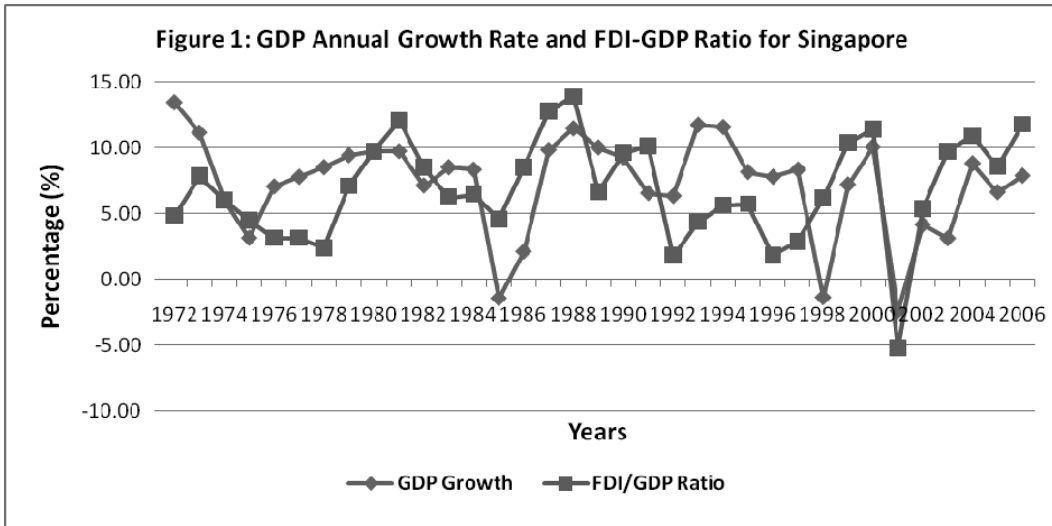
1. Introduction

Singapore, an island between Indonesia and Malaysia, is the smallest country in Southeast Asia. Singapore is one of the world's most prosperous countries with strong international trading links. Gross Domestic Product (GDP) per capita PPP (Purchasing Power Parity) for Singapore was US\$24, 481 in 2003 while real GDP was growing at an average annual rate of 6 percent (Human Development Reports, 2005). This rapid economic growth in Singapore improves the social and economic welfare of the country. Most of this economic growth can be explained by an open trade policy promoting production and export and attracting foreign capital inflow into Singapore. Moreover, the government adopted upon independence in 1965 a pro-foreign investment and export-oriented economic policy to promote growth and development in Singapore.

This paper shows the causal relationship between Foreign Direct Investment (FDI) and economic growth in Singapore. In Figure 1, the annual growth rate of GDP and FDI-GDP ratio move closely together in Singapore with FDI-GDP ratio going down quickly as the growth rate of GDP declines. The decrease in the FDI-GDP ratio was even higher than negative 5% in 2001 when Singapore recorded a negative growth rate of GDP.

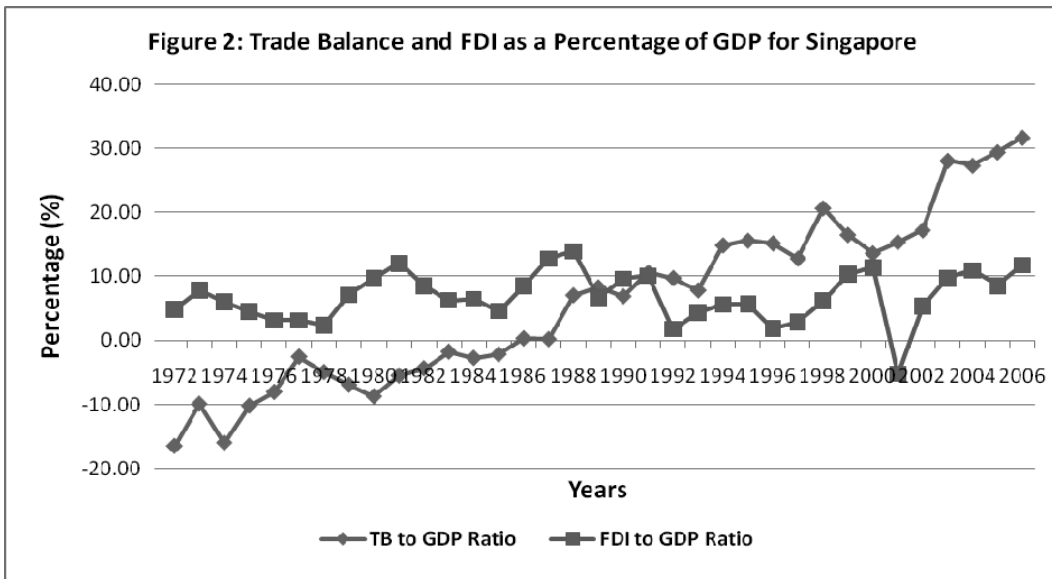
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Moreover, Singapore achieved an average of high needed economic growth rate between 5% and 10% from 1972 to 2006 except in 1985, 1998 and 2001 in which years Singapore had a negative growth rate. The financial market crisis in Asia in 1997 and the 2001 U.S. recession might explain the negative growth rate of GDP recorded by Singapore.

Figure 2 displays the trade balance and FDI as a percentage of GDP for Singapore. In general, the trend for the trade balance and FDI as a ratio to GDP is rising over time with the latter being higher than the former until 1991. The ratio of the trade balance and FDI seems to move together within a 4-7% magnitude range over the 1972-2006 period.



In a survey article, De Mello (1997b) shows that the rate of growth of FDI inflows as a share of GDP in selective countries of Southeast Asia and Latin America has outpaced exports as a share of GDP over the period from 1980 to 1994.

Explosion of growth in FDI over the 1990's, especially in the developing countries, has inspired a stream of literature focusing on the impact of FDI on the dynamics of growth measured by GDP in the recipient country. The direction of the causality between growth rates and FDI may run either way. There are two dimensions with respect to the specification of the model about the causal links between FDI and GDP growth. The model specification establishes the causal link between FDI and the GDP growth rate or FDI and the log level of GDP¹. Therefore, the objective of this study is to examine the presence of interdependence between GDP and FDI for Singapore. This study is relevant to Singapore because Singapore has been able to achieve high and sustainable economic growth since its independence from the U.K. in 1965.

The study is organized as follows. The second section provides a brief summary of the literature review. The third section discusses the material and methods. The fourth section displays the results and discussion and the last section concludes the paper.

2. Recent Literature

In the literature on the link between FDI and economic growth, Carkovic and Levine (2002) find no robust positive impact from FDI and the GDP growth rate. Further, they change the model specification to find no robust positive link between FDI and the log level of GDP. Moreover, Hansen and Rand (2006) improve the model specification of Carkovic and Levine by including country-specific trends in addition to country-specific level. They find a strong causal link between the FDI-to-GDP ratio (FDI ratio, for short) and the log level of GDP and that GDP Granger-causes FDI with no bi-directional causality. Their sample includes 31 countries with 10 countries in Asia (including Singapore), 11 countries in Latin America and the remaining 10 are African countries. Chakraborty and Basu (2002) examine the causality between FDI and output growth in India. Utilizing annual data from 1974-1996, they find that the real GDP in India is not Granger-caused by FDI and the causality runs more from real GDP to FDI.

Wang (2002) explores what kinds of FDI are most likely to contribute significantly to economic growth. Using data from 12 Asian economies over the period of 1987-1997, she finds that only FDI in the manufacturing sector has a significant and positive impact on economic growth and attributes this positive contribution to FDI's spillover effects. Borensztein et al. (1998) find that FDI, as an important vehicle for the transfer of technology with a minimum threshold of human capital stock in the host country,

¹ De Mello (1997b) provides a survey of studies establishing the causal link between FDI-to-GDP either via the log level of GDP (e.g., Bajonbio and Sosvilla-Revero (1994); O'Sullivan (1993); Lee and Mansfield (1996); Braunerhjelm and Svenson (1996); Wand and Swain (1995)) or through GDP growth (e.g., Wand and Swain (1995)).

contributes relatively more to economic growth than domestic investment. Blomstrom et al. (1994) argue that FDI has a positive growth effect when a country is sufficiently rich in terms of per capita income.

Ericsson and Irandoust (2001) examine the causal effects between FDI growth and output growth for four OECD countries applying a multi-country framework to data from Denmark, Finland, Norway and Sweden. The authors fail to detect any causal relationship between FDI and output growth for Denmark and Finland. They suggest that the specific dynamics and nature of FDI entering these countries could be responsible for these no-causality results.

De Mello (1999) attempts to find support for an FDI-led growth hypothesis when time series analysis and panel data estimation for a sample of 32 OECD and non- OECD countries covering the period 1970-1990 were made. He estimates the impact of FDI on capital accumulation and output growth in the recipient economy.

Liu, Burrige and Sinclair (2002) test the existence of a long-run relationship among economic growth, foreign direct investment and trade in China. Using a cointegration framework with quarterly data for exports, imports, FDI and growth from 1981 to 1997, the research finds the existence of a bi-directional causal relationship among FDI, growth, and exports. It is beyond the scope of the present study to review the literature on the FDI-GDP relationship. The interested reader should refer to de Mello (1997, 1999) for a comprehensive survey of the nexus between FDI and growth as well as for further evidence on the FDI growth relationship.

3. Materials and Methods

The econometric methodology firstly examines the stationarity properties of the univariate time series. The present study uses the Augmented Dickey-Fuller (ADF) (1979) unit root test to examine the stationarity of the data series. It consists of running a regression of the first difference of the series against the series lagged once, lagged difference terms, and optionally, a constant and a time trend. This can be expressed as:

$$\Delta y_t = \beta_1 y_{t-1} + \beta_2 \Delta y_{t-1} + \beta_3 \Delta y_{t-2} + \beta_4 + \beta_5 t \quad (1)$$

The test for a unit root is conducted on the coefficient of y_{t-1} in the regression. If the coefficient is significantly different from zero then the hypothesis that y contains a unit root is rejected. Rejection of the null hypothesis implies stationarity.

Secondly, time series have to be examined for cointegration. Cointegration analysis helps to identify long-run economic relationships between two or several variables and to avoid the risk of spurious regression. Cointegration analysis is important because if two non-stationary variables are cointegrated, a VAR model in the first difference is misspecified due to the effect of a common trend. If a cointegration relationship is identified, the model should include residuals from the vectors (lagged one period) in the

dynamic Vector Error Correcting Mechanism (VECM) system. In this stage, the Johansen (1988) cointegration test is used to identify a cointegrating relationship among the variables. Within the Johansen multivariate cointegrating framework, the following system is estimated:

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + \dots + \Gamma_{k-1} \Delta z_{t-k+1} + \Pi z_{t-1} + \mu + \varepsilon_t; \quad t=1, \dots, T \quad (2)$$

where Δ is the first difference operator, z denotes a vector of variables, $\varepsilon_t \sim \text{niid}(0, \Sigma)$, μ is a drift parameter, and Π is a $(p \times p)$ matrix of the form $\Pi = \alpha\beta'$, where α and β are both $(p \times r)$ matrices of full rank, with β containing the r cointegrating relationships and α carrying the corresponding adjustment coefficients in each of the r vectors. The Johansen approach can be used to carry out Granger causality tests as well. In the Johansen framework, the first step is the estimation of an unrestricted, closed p -th order VAR in k variables. Johansen (1988) suggested two tests statistics to determine the cointegration rank. The first of these is known as the trace statistic

$$N \left\{ \text{trace}(r_0 / k) = -T \sum_{i=r_0+1}^k \ln(1 - \hat{\lambda}_i) \right. \quad (3)$$

where, $\hat{\lambda}_i$ are the estimated eigenvalues $\lambda_1 > \lambda_2 > \lambda_3 > \dots > \lambda_k$ and r_0 ranges from 0 to $k-1$ depending upon the stage in the sequence. This is the relevant test statistic for the null hypothesis $r \leq r_0$ against the alternative $r \geq r_0 + 1$. The second test statistic is the maximum eigenvalue test known as λ_{\max} ; we denote it as $\lambda_{\max}(r_0)$. This is closely related to the trace statistic, but arises from changing the alternative hypothesis from $r \geq r_0 + 1$ to $r = r_0 + 1$. The idea is to try and improve the power of the test by limiting the alternative to a cointegration rank which is just one more than under the null hypothesis. The λ_{\max} test statistic is:

$$\lambda_{\max}(r_0) = -T \ln(1 - \lambda_i) \text{ for } i = r_0 + 1 \quad (4)$$

The null hypothesis is that there are r cointegrating vectors, against the alternative of $r + 1$ cointegrating vectors. Johansen and Juselius (1990) indicated that the trace test might lack power relative to the maximum eigenvalue test. Based on the power of the test, the maximum eigenvalue test statistic is often preferred. According to Granger (1969), Y is said to “Granger-cause” X if and only if X is better predicted by using the past values of Y than by not doing so with the past values of X being used in either case. In short, if a scalar Y can help to forecast another scalar X , then we say that Y Granger-causes X . If Y causes X and X does not cause Y , it is said that unidirectional causality exists from Y to X . If Y does not cause X and X does not cause Y , then X and Y are statistically

independent. If Y causes X and X causes Y, it is said that feedback exists between X and Y. Essentially, Granger's definition of causality is framed in terms of predictability.

To implement the Granger test, a particular autoregressive lag length k (or p) is assumed and Equations (5) and (6) are estimated by OLS:

$$X_t = \lambda_1 + \sum_{i=1}^k a_{1i} X_{t-i} + \sum_{j=1}^k b_{1j} Y_{t-j} + \mu_{1t} \quad (5)$$

$$Y_t = \lambda_2 + \sum_{i=1}^p a_{2i} X_{t-i} + \sum_{j=1}^p b_{2j} Y_{t-j} + \mu_{2t} \quad (6)$$

An F-test is carried out for the null hypothesis of no Granger causality $H_0 : b_{i1} = b_{i2} = \dots = b_{ik} = 0, i = 1, 2$. $H_0 : b_{i1} = b_{i2} = b_{ik} = 0, i = 1, 2$ where, the F statistic is the Wald statistic for the null hypothesis. If the F statistic is greater than a certain critical value for an F distribution, then we reject the null hypothesis that Y does not Granger-cause X (equation (1)), which means Y Granger-causes X.

A time series with a stable mean value and standard deviation is called a stationary series. If d differences have to be made to produce a stationary process, then it can be defined as integrated of order d. Engle and Granger (1987) state that if several variables are all I(d) series, their linear combination may be cointegrated, that is, their linear combination may be stationary. Although the variables may drift away from equilibrium for a while, economic forces may be expected to act so as to restore equilibrium. Thus, they tend to move together in the long run irrespective of short run dynamics. The definition of Granger causality is based on the hypothesis that X and Y are stationary or I(0) time series. Therefore, the fundamental Granger method for variables of I(1) cannot be applied. In the absence of a cointegration vector, with I(1) series, valid results in Granger causality testing are obtained by simply first differentiating the VAR model. With cointegration variables, Granger causality will further require inclusion of an error term in the stationary model in order to capture the short term deviations of series from their long-term equilibrium path. Hassapis et al. (1999) show that in the absence of cointegration, the direction of causality can be decided upon via standard F-tests in the first differenced VAR. The VAR in the first difference can be written as:

$$N \left\{ \Delta X_t = \lambda_1 + \sum_{i=1}^k a_{1i} \Delta X_{t-i} + \sum_{j=1}^k b_{1j} \Delta Y_{t-j} + \mu_{1t} \right. \quad (7)$$

$$N \left\{ \Delta Y_t = \lambda_2 + \sum_{i=1}^p a_{2i} \Delta X_{t-i} + \sum_{j=1}^p b_{2j} \Delta Y_{t-j} + \mu_{2t} \right. \quad (8)$$

4. Results and Discussion

The present study employs data that consists of annual observations spanning the period between 1976 and 2002. All data are obtained from the World Bank WDI database and are transformed into logarithmic returns in order to achieve mean-reverting relationships, and to make econometric testing procedures valid. FDI is net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series (FDI) shows net inflows in the reporting economy. Data are in current U.S. dollars. GDP per capita, on the other hand, is Gross Domestic Product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars. Table 1 shows the descriptive statistics.

Table 1: Descriptive Statistics

	GDP	FDI
Mean	1.545022	7.961727
Median	2.215338	9.213
Maximum	4.932729	11.1
Minimum	-2.67133	1.998
Std. Dev.	2.813073	3.15993
Skewness	-0.55246	-0.79574
Kurtosis	1.924972	2.388918
Jarque-Bera	1.319233	1.411518
Probability	0.612694	0.587747
Sum Sq. Dev.	71.29173	89.95642

Table 2 shows the results of the ADF unit root tests in levels and in first differences of the data. Strong evidence emerges that all the time series are I (1) at the 1% and 5% significance levels.

Table 2: Augmented Dickey-Fuller Unit Root Test Results

	<u>Test with an intercept</u>		<u>Test with an intercept and trend</u>		<u>Test with no intercept or trend</u>	
	<u>Levels</u>	<u>1st differences</u>	<u>Levels</u>	<u>1st differences</u>	<u>Levels</u>	<u>1st differences</u>
FDI	2.498277	-10.8764	1.345764	-6.70895	1.135974	-7.38527
GDP	2.590962	-7.4864	0.506604	-12.9129	3.047283	-10.4731
CV* (1%)	-4.2816	-4.35153	-5.07437	-5.18126	-2.99667	-3.01643
CV (5%)	-3.37473	-3.40271	-4.09679	-4.14363	-2.17715	-2.18048

* McKinnon Critical Value

The lag length was determined using Schwartz Information Criteria (SIC)

Table 3 presents the results from the Johansen cointegration test among the data sets. Neither the maximum eigenvalue nor the trace tests rejects the null hypothesis of no cointegration at the 5% level.

Table 3: Johansen Cointegration Test Results

Null hypothesis	Trace statistic	5% critical value	Maximum eigenvalue statistic	5% critical value
$r = 0$	32.7112	40.44	20.7220	28.6228
$r \leq 1$	12.568	23.93	9.7811	22.3411

r is the number of cointegrating vectors under the null hypothesis.

The outcome of the Granger causality tests is shown in Table 4. Results of the Granger-causality test show that the null hypotheses of FDI does not Granger-cause GDP per capita is rejected in 1 and 2 year lags, at the 5% and the 10% levels, respectively. On the other hand, the null hypotheses of GDP does not Granger-cause FDI is not rejected. This leads us to the conclusion that there is only a one-way causality running from FDI to GDP.

Table 4: Granger Causality Test Results

<u>Null hypothesis</u>	F - Statistics			
	<u>Lag 1</u>	<u>Lag 2</u>	<u>Lag 3</u>	<u>Lag 4</u>
FDI does not Granger-cause GDP per capita	10.4221**	6.1223*	0.0021	0.5225
GDP per capita does not Granger-cause FDI	0.142271	0.9212	1.8272	0.3996

* Reject the null hypothesis at the 10% level.

** Reject the null hypothesis at the 5% level.

*** Reject the null hypothesis at the 1% level.

5. Conclusion

This study examines the relationship between FDI and GDP per capita in the economy of Singapore, using the methodology of Granger causality and vector auto regression (VAR). Strong evidence emerges that the economic growth as measured by GDP in Singapore is Granger-caused by the FDI. This means that there is a uni-directional causality running from FDI to GDP. There is no evidence that the causality link between FDI and GDP is bi-directional in Singapore. Results further suggest that Singapore's capacity, including but not limited to free trade zones, trade regime, tax incentives, infrastructure quality, the human capital base and the transfer of technology, to progress in economic development will depend on the country's performance in attracting foreign capital. Trade and financial restrictions can indeed impede the inflow of foreign funds into host countries.

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Evaluation of the Effectiveness of Internal Audit in Greek Hotel Business

Theofanis Karagiorgos¹, George Drogalas² and Nikolaos Giovanis³

Abstract

There is currently considerable interest in the topic of internal audit and its contribution to exact management of any business economic resources. Within this framework of extremely fluid business environment, the research tested the hypothesis about the role of internal auditing for the business success. The main purpose of the present paper is not only to examine the issue in a theoretical level, but also to present empirical evidence for the interaction between components of internal control system and performance of internal auditing in Greek hotel business. According to up-to-date theoretical and empirical literature, the results point out that all components of internal audit are vital for the effectiveness of internal audit and consequently in the business survival and success.

Keywords: Internal auditing, Internal Auditing, Accounting, Management, Hotel

JEL Classification: M40, M41, M10.

1. Introduction

The globalization of economy, technological advancements, complexity of business and allegations of fraudulent financial reporting have recently sharpened the ever-increasing attention to internal controls and internal auditing (Karagiorgos et al., 2009). This developing role of the internal auditing is also reflected in its current definition, i.e. “internal auditing is an independent, objective assurance and consulting activity designed to add value and improve a company’s operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to

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evaluate and improve the effectiveness of risk management, control and governance processes” (Savcuk, 2007).

In accordance with the above, today businesses face considerable difficulties and problems when they try to identify their strengths, assess their risk and manage uncertainties. These difficulties are more obvious in particular business sectors, such as the hospitality sector, which is one of the most growing sectors worldwide (Politis et al., 2009). The Greek hotel industry provides the context for this research as it constitutes the basic factor of Greece’s economic growth and has important contribution in the overall balance of exterior transactions. Tourism is one of Greece’s three biggest industries, along with construction and shipping. The Greek tourism sector is a growth market and represents 18 per cent of the country’s Gross Domestic Product (GDP), with annual arrivals projected at 20 million by 2010 (Pavlatos and Paggios, 2009).

Despite the aforementioned perspectives of the researchers regarding the crucial role of internal auditing for the business success and the growing importance of hotel sector in Greece, there is no such a study examining the factors that improve internal audit performance in hotel businesses. According to Priporas and colleagues (Priporas and Poimenids, 2008; Priporas and Mylona, 2008; Priporas et al, 2005) a research topic constitutes a desirable one when is generally a new research area at international level and on a national basis in Greece. Due to the fact that only a limited number of studies exist especially in services, where hospitality is considered a significant part of this sector (Kamenidou et al, 2009), this makes the theme a desirable for research. In this context, the purpose of this paper is to highlight the interaction between elements of internal audit and effectiveness of internal auditing in Greek hotel business, in particular. To accomplish its goal, the study uses survey data from chief internal auditors from 52 hotel businesses, which are listed as the biggest ones in terms of Greece. Consistent with the predictions, the results indicate that the success of internal auditing is associated with the five elements of internal control system (Messier, 1997; Candreva, 2006): Control environment, Risk assessment, Control activities, Information and communication and Monitoring.

The remainder of the paper is organized as follows. The next section reviews the related literature and provides the focus of the study by examining the conceptual framework of internal auditing and its effectiveness. The third section presents the research design by providing information on the sample, the development of the survey and the methodology for data analysis. The results of the study are reported and discussed in the fourth section. Then, the fifth section summarizes the paper, presents major findings of the study and forwards the ensuing conclusions. Finally, the paper concludes by limitations of the study and future research directions.

2. Literature Review

2.1 Theoretical Framework of Internal Auditing

In order to determine internal audit efficiency evaluation principles it is important to analyze the concept of internal audit (Savcuk, 2007). Undoubtedly, the large amount of definitions that is given by many researchers depicts the great importance of internal auditing. More specifically, the Institute of Internal Auditors, (IIA, 1991; Taylor and Glezen, 1991; IIA, 1995, Konrath, 1996) defined internal auditing as “an independent appraisal function, established within an organization to examine and evaluate its activities as a service to the organization”. By measuring and evaluating the effectiveness of organizational controls, internal auditing, itself, becomes an important managerial control device (Carmichael et al., 1996), which is directly linked to the organizational structure and the general rules of the business (Cai, 1997).

In the same period, the Committee of Sponsoring Organization’s (COSO) model developed by the American Institute of Certified Public Accountants, the American Accounting Association, the Financial Executives Institute, the Institute of Internal Auditors, and the Institute of Management Accountants has been adopted as the generally accepted framework for internal control and is widely recognized as the definitive standard to assess the effectiveness of internal control system. In this context, the COSO model defines internal control as follows: “Internal control is a process, effected by an entity’s board of directors, management and other personnel designed to provide reasonable assurance of the achievement of objectives in the following categories: effectiveness and efficiency of operations, reliability of financial reporting and compliance with applicable laws and regulations” (Drogalas et al., 2005).

Similarly, the U.S. Government Accountability Office noted that internal auditing is “an integral component of an organization’s management that provides reasonable assurance that the following objectives are being achieved: effectiveness and efficiency of operations, reliability of financial reporting, and compliance with applicable laws and regulations” (GAO, 1999).

A more specific definition is given by Sawyer (2003) who stated that internal auditing is “a systematic, objective appraisal by internal auditors of the diverse operations and controls within an organization to determine whether (1) financial and operating information is accurate and reliable, (2) risks to the enterprise are identified and minimized, (3) external regulations and acceptable internal policies and procedures are followed, (4) satisfactory operating criteria are met, (5) resources are used efficiently and economically and (6) the organization ’s objectives are effectively achieved – all for the purpose of consulting with management and for assisting members of the organization in the effective discharge of their governance responsibilities”.

2.2 Effectiveness of Internal Auditing

The growing importance of internal auditing as an economic factor has led to systematic research into the factors that improve the performance of internal auditing. In line with this, Albercht et al. (1988) investigated a theoretical framework in regard with the effectiveness of internal audit. Basic output was the existence of four areas that the directors of internal audit departments could develop to enhance effectiveness: an appropriate corporate environment, top management support, high quality internal audit staff and high quality internal audit work.

Hence, Asairy (1993) evaluated the effectiveness of internal audit in Saudi joint stock companies. The researcher used a questionnaire, which he sent to the directors of internal audit departments, senior company management and external auditors from 38 companies. The author argued that internal audit was affected by the support they received by the external auditors. Regarding the effectiveness of internal audit, Asairy stated that education, training, experience and professional qualifications of internal auditors influenced the effectiveness of internal audit.

Unlike the aforementioned researchers, Dittenhofer (2001) assessed the effectiveness of internal audit via a new technique, which is named “results examination”. This method involves identifying the auditee’s objectives, establishing the criteria that could signify their achievement and using the established criteria to determine whether and to what degree the auditee’s actions have resulted in the achievement of objectives. Despite the fact that this approach is more results-oriented, its success depends on the measurability and subjectivity of the criteria chosen (Balzan and Baldacchino, 2007).

Moreover, a four-step internal audit evaluation program developed by Cangemi and Singleton (2003). This evaluation method is based in compliance with the department, corporate and professional internal audit standards. For example, this evaluation program involves making a summarised review of all internal audit assignments, a detailed review of randomly selected assignments, an annual self-assessment conducted by the quality assurance coordinator and a tri-annual external review.

In the same period, Papastathis (2003) investigated the factors that led to internal audit success. In his comprehensive review, the author concluded that the effectiveness of internal control system is determined by the activities, their complexity, the specialisation of personnel and the will of Administration.

Similar to other studies, Van Gansberghe (2005) also examined the effectiveness of internal audit. According to his perspective, perceptions and ownership, organization and governance framework, legislation, improved professionalism, conceptual framework and resources are revealed as basic factors influencing internal audit effectiveness.

In contrast to previous findings, Mihret and Yismaw (2007) attempted to introduce a new approach for the evaluation of the internal audit effectiveness by identifying factors within an organization that has an impact on audit effectiveness. As a result, the model considered four potential factors – internal audit quality, management support,

organizational setting, and auditee attributes to describe audit effectiveness, and revealed the way the interaction of these factors improves audit effectiveness.

More recently, Boța-Avram and Palfi (2009) examined the efficiency and the effectiveness of internal audit. The main output from their research was the fact that there is a large amount of methods and instruments that could combine qualitative with quantitative elements. However, the researcher stated, “the choice of used method depends on the settlement of the main objective of trying to obtain the best reflection of internal audit’s relevancy and efficiency, in order to obtain a good developing of internal audit department”.

To be more comprehensive, Table 1 depicts a short review of the literature by presenting the authors, the scopes and the basic outputs of the aforementioned studies.

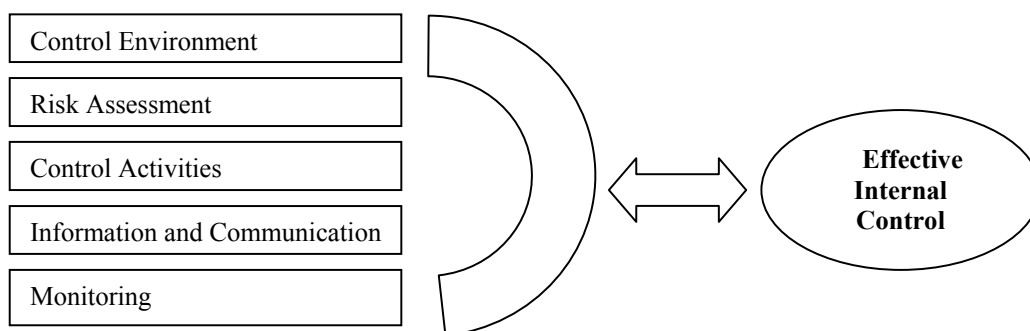
Table 1: Short Review of the Literature

Authors	Scope	Basic Output
Albercht <i>et al.</i> (1988)	Effectiveness of internal audit	There are four areas that the directors of internal audit could develop to enhance effectiveness:
Asairy (1993)	Effectiveness of internal audit in Saudi joint stock companies	education, training, experience and professional qualifications of internal auditors influenced the effectiveness of internal audit
Dittenhofer (2001)	Assessment of the effectiveness of internal audit	A new technique, which is named “results examination” assess internal audit effectiveness
Cangemi and Singleton (2003)	Evaluation of internal audit	A four-step internal audit evaluation program was developed
Papastathis (2003)	Success of internal audit	The activities, the specialisation of personnel and the will of Administration affects the success of internal audit.
Van Gansberghe (2005)	Effectiveness of internal audit	Basic factors that influence the effectiveness of internal audit are presented
Mihret and Yismaw (2007)	Effectiveness of internal audit	Four potential factors attributes to describe audit effectiveness
Boța-Avram and Palfi (2009)	Effectiveness of internal audit	There is a large amount of methods and instruments that could combine qualitative with quantitative elements

Based on the institutional environment, just described, one can conclude that many standards can be used in order to assess the effectiveness of internal auditing. This paper extends the above studies by presenting empirical evidence that highlight the counteraction between the components (as described by the COSO Report) of internal auditing and its efficacy. In line with the above, the five interrelated components (or criteria) are the following: (Rezaee, 1995; Yang and Guan, 2004):

- ✓ Control Environment,
- ✓ Risk Assessment,
- ✓ Control Activities,
- ✓ Information and Communication and
- ✓ Monitoring.

Figure 1: Five Components of Internal Control System



Specifically, control environment is a major part of managing an organization. In other words, control environment reflects the attitude and the policies of management in regard with the importance of internal audit in the economic unit. On the one hand, control environment is influenced by the history and the culture of economic unit, on the other hand it has a pervasive influence on the way business activities are structured that sets a positive and supportive attitude toward internal control and conscientious management (Aldridge and Colbert, 1994). In accordance with the above, the control environment can be evaluated based on the following factors: Integrity and Ethical Values, Board and Audit Committee, Management Philosophy and Organizational Structure.

In regard with risk assessment, it can be claimed that it is the identification and analysis of relevant risks associated with achieving the business objectives (Karagiorgos et al., 2009). In this context, management must determine how much risk is to be prudently accepted, and strive to maintain risk within these levels. Therefore, the risk assessment component of control can be evaluated based upon the following factors: Process-Level Objectives and Risk Identification.

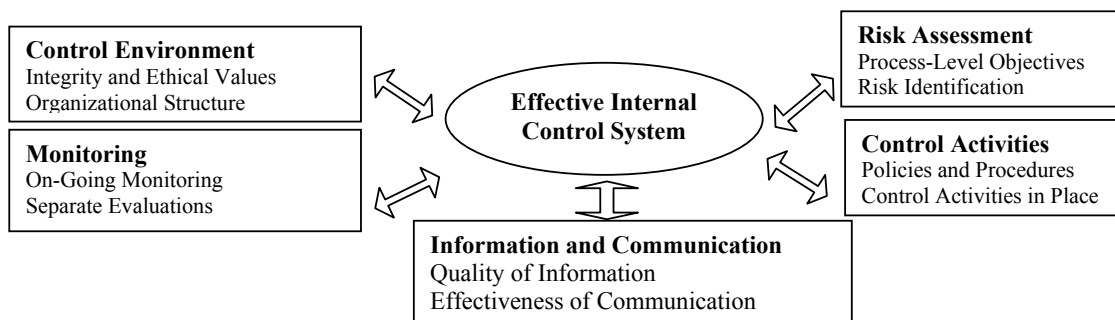
Hence, control activities are the policies, procedures and mechanisms that enforce management's directives (Hevesi, 2005). Indeed, control activities occur throughout the organization, at all levels and in all functions. To evaluate the control activities component of control the following factors are used: Policies and Procedures and Control Activities in Place.

In line with the above, on the one hand the information and communication component refers to the identification, capture, and communication of pertinent information in an appropriate form and timeframe to accomplish the financial reporting objectives (Aldridge and Colbert, 1994). On the other hand, effective communications should occur in a broad sense with information flowing down, across, and up the organization. To assess the information and communication component the following factors are used: Quality of Information and Effectiveness of Communication.

Finally, it is commonly acceptable that internal control systems need to be monitored in order to assess the quality of the system's performance over time. Hence by monitoring, it is ensured that the findings of audits and other reviews are promptly resolved (Rezaee et al., 2001). In this respect, the monitoring component of control is evaluated based upon the following factors: On-Going Monitoring and Separate Evaluations.

From the aforementioned factors that are used, in order to assess the effectiveness of the five components (of internal control), the researchers selected two for each component of internal control. The final selection of the factors is illustrated graphically in Figure 2.

Figure 2: Factors that are selected to evaluate the five components of internal control system



3. Research Design

3.1 Sample

To describe more realistically the importance of internal audit in the hotel enterprises, the sample of research was selected with multiple criteria. From the author's point of view, it is important to mention that internal audit as service that offers added value has also a high cost of operation (Karagiorgos et al., 2009). This implies that internal auditing is used only in "big" hotel business. To avoid confounding effects, the sample was judgmental and the basic criteria that characterize "big" hotel enterprise are: Net Turnover (sales), Net Results (profit), Grand Total Assets, Total Capital and Reserves and Number of employees. For each criterion and its year from 2005 to 2009 the first one hundred hotels were selected. Therefore twenty groups were generated. From these groups the hotels which were at least in eight groups were chosen and constitute the final sample.

3.2 Survey Development

To achieve its objective the research uses the exploratory research methods of research questionnaires. This method of data collection was considered appropriate because the information sought is not publicly available and internal auditors are in a good position to know the answers to the questions asked. To enhance the survey response rate preliminary contact was made with potential respondents ahead of sending the questionnaire. This preliminary contact served to establish whether or not the hotel business had an internal audit department. After identifying those companies not having an internal audit department, the questionnaires were sent to the remaining sample of 85 hotel businesses where it was thought an internal audit department existed. For each of the selected hotel, copies of the survey instrument were sent to: the director of internal audit and the chief finance officer. Cover letters and surveys, along with postage paid return envelopes, were mailed directly to each of the business executives at each of the 85 hotel businesses. Hence, correspondence was personalized as far as possible; cover letters were hand signed and envelopes were individually addressed with the name and title of the business executive. Additionally, respondents were guaranteed anonymity. Approximately three weeks after the initial mailing a second mailing was made to all business executives in the sample. The research was conducted in the period from May to October 2010.

3.3 Methodology for Data Analysis

Respondents were asked to indicate their degree of agreement or disagreement with each of the ten statements on a five-point Likert response scale (Likert, 1932) that ranged from "strongly agree" (scored as 5) to "strongly disagree" (scored as 1). A large amount

of researchers use this methodology, because it is relatively easy for respondents to use, and responses from such a scale are likely to be reliable (Nunnally, 1978; Myers and Gramling; 1997, Balzan and Baldacchino, 2007; Lam and Kolic, 2008). For all ten statements, mean responses are obtained from the full sample. A positive mean response more than 2,5 suggests agreement with the statement, a positive mean response less than 2,5 implies disagreement and a mean response close to 2,5 indicates indecision or offsetting differences. All of the statements are coded in such a way that a positive mean response more than 2,5 displays that this component of internal control system influences positively the effectiveness of internal auditing, while a positive mean response less than 2,5 reveals that this component of Internal Control System does not influence positively the effectiveness of internal auditing.

4. Results

Finally, out of the 85 questionnaires distributed, 52 completed usable questionnaires were returned for a response rate of 61.1 percent. As mentioned, in this study the effectiveness of internal auditing is assessed via the five criteria that are provided by COSO report (COSO, 1992; Roth and Espersen, 2002; Bowrin, 2004). Hence, for the estimation of each characteristic are used data that comes from two questions. To evaluate each component of internal control, the calculation of coefficient “Cronbach a” is needed (Norusis, 1990). The results of “Cronbach a” are shown in Table 2: «Reliability Statistics «Cronbach a» in regard with components of Internal Audit.

Table 2: Reliability Statistics «Cronbach a» in regard with Components of Internal Control System

	Cronbach's Alpha	N of Items
Evaluation.Control Environment	,835	2
Evaluation.Risk Assessment	,858	2
Evaluation.Control Activities	,911	2
Evaluation. Information Communication	,703	2
Evaluation.Monitoring	,886	2

Coefficient alpha estimates the reliability of this type of scale by determining the internal consistency of the test or the average correlation of items within the test (Cronbach 1951; Dafermos, 2005). From the Table 2, it appears that prices of coefficient «Cronbach a» are accepted (Norusis, 1990; Carver and Nash, 2000). Then from the questions that concern the evaluation of each component of Internal Control, a new variable is exported that combines the answers of the two questions (of each component).

Table 3: Descriptives Statistics

	N	Range	Min	Max	Mean	Std. Deviation
Evaluation.Control Environment	52	3,00	2,00	5,00	4,0385	,85661
Evaluation.Risk Assessment	52	3,00	2,00	5,00	3,7692	,77625
Evaluation.Control Activities	52	3,00	2,00	5,00	3,9904	,88279
Evaluation.Information Communication	52	2,50	2,50	5,00	3,9904	,68949
Evaluation.Monitoring	52	3,50	1,50	5,00	3,7019	,95106

Table 3 shows the descriptive statistics of the entire sample of 52 hotel businesses. Regarding the Control Environment component of internal control system, it appears that the mean is 4,03, while the standard deviation is 0,85. From the above results, it can be concluded that management recognise the decisive role of internal auditing in the business environment. In regard with the Risk Assessment component of internal control system, the mean is 3,76, while the standard deviation is 0,77. These results also imply that risk assessment plays significant role in the efficient functioning of hotel business. The results for Control Activities component are depicted in line 3. More specifically, the mean is 3,99, while the standard deviation is 0,88. These statistics show that control activities are implemented by internal control system to a large degree. Similar to the above findings, the mean is 3,99, while the standard deviation is 0,68 for Information-Communication component of internal control system. These results affirm that pertinent information and effective communications occur at a large degree in hotel businesses. Finally, regarding the Monitoring component of internal control system, it appears that the mean is 3,70, while the standard deviation is 0,95. These results indicate that internal control system of hotel business is monitored in order to assess the quality of the system's performance over time.

5. Conclusions

In response to recent corporate scandals and breakdowns in financial reporting, internal auditing is attracting increasing attention in economic literature (Rittenberg, 2006). In the light of this theoretical and empirical literature, it is observed the growing importance of internal auditing in business success. Within this environment, significant amount of research has been conducted on the effectiveness of internal audit. Unfortunately, there is no such a study for the case of Greece and in particular for the hotel business which is of great importance in Greece (Sigala, 2003). Overall, from the results, it is important to mention that all the components of internal control system are highly rated. More precisely, the Control Environment component of internal control system is the most highly rated item with a mean of 4.03 while Monitoring is the least

rated item with a mean of 4.12. Overall, the results stress the efficient functioning of all components of internal control system and their decisive role in the efficient functioning and consequently success of Greek hotel business.

As with other studies, the findings of this study should be viewed taking into account its limitations. The sampling area of the study was limited to the Greek hotel businesses due to time constraints. Moreover, due to the fact that internal auditing has a high cost of operation, internal auditing is used only in “big” hotel business. Consequently, ton-random selection had to be the choice in this study. A further limitation in carrying out this study, to be taken into account particularly if one is to compare these results to those that may be found in other countries, is the small number of respondents on which the study was necessarily based. Hence, this study provides useful insights on the effectiveness of internal auditing in Greek hotel business, although only the perceptions of management were obtained.

Concluding, this research did not have the intention of concluding the discussions over this matter; however, it is expected to be one more element to help the formation of opinions and to diffuse other discussions on the subject. While we find a number of interactions between components of internal control system and effectiveness of internal auditing, it is important to mention that these results are only descriptive. They do not indicate specific mechanisms to enhance the effectiveness of internal auditing. However, they provide a basis for further experimental and archival research that may lead toward a better understanding of how the components of internal control system can improve the performance of internal auditing.

This study contributes in an area that has received relatively little research attention. On the one hand, internal audit is crucial for the business success. On the other hand, the Greek hotel industry constitutes the basic factor of Greek’s economic growth as tourism is one of Greece’s three biggest industries. Despite the aforementioned perspectives of the researchers, there is no such a study examining the factors that improve internal audit performance in hotel businesses. Thus, this makes the theme a desirable for research. Hence, as mentioned in previous sections unlike the other researchers who examined factors that affect the performance of internal auditing, the authors of this study extend the present literature by highlighting via empirical evidence the interaction between the components of internal control system (as described by the COSO Report) and internal audit quality. For this reason it is recommended further research by examining the matters reported in this paper in different areas of industry or via different methodologies. Furthermore, maybe future research can expand the geographical areas of study. Moreover, survey data for this research need to be confirmed with detailed interviews with a variety of practitioners in all countries. In line with the above, perhaps, a future study could be undertaken to explore the perception of other parties such as employees or external auditors on the performance of internal auditing in Greek hotel units. Undoubtedly, it is clear that internal audit will see its great improvement in many management fields (Power, 2004). As the saying goes, “the future is bright, but the road ahead is tortuous”.

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Appendix

Table 4: Questionnaire

Evaluate the following proposals marking X In the light of internal audit function:	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
	1. Management frequently and clearly communicates the importance of integrity and ethical behavior				
2. The organizational structure provides the framework within which the segregation of duties is determined					
3. The objectives are clear and readily understood by all the personnel taking actions and responsibility for their achievement					
4. Mechanisms are used in order to estimate the obstacles regarding the achievement of business objectives					
5. Appropriate policies and procedures have been developed and implemented for each of your function's major processes					
6. The personnel periodically review the functioning and overall effectiveness of controls					
7. Mechanisms exist for identifying emerging information needs					
8. Information is communicated effectively both up and down within your function and across to other functions.					
9. Management has established performance measures for processes in your function					
10. Evaluations of the entire internal control system are performed					

Figure 3: Histogram for the variable «Evaluation.Control_Environment»

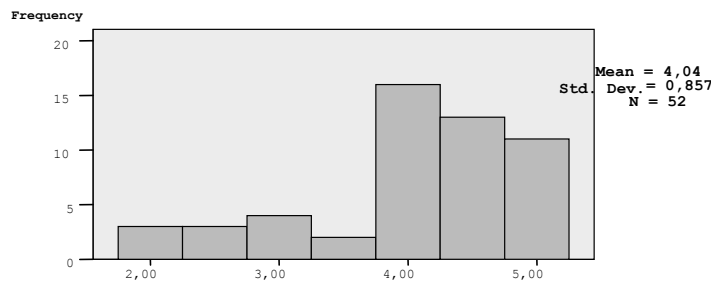


Figure 4: Histogram for the variable «Evaluation.Risk_Assessment»

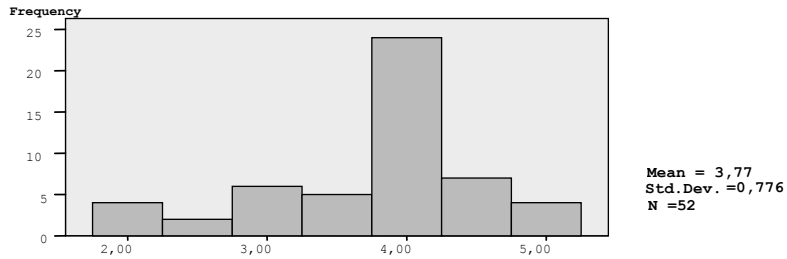


Figure 5: Histogram for the variable «Evaluation.Control_Activities»

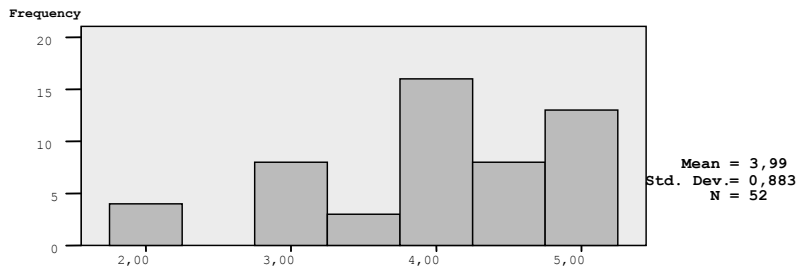


Figure 6: Histogram for the variable «Evaluation.Information_Communication»

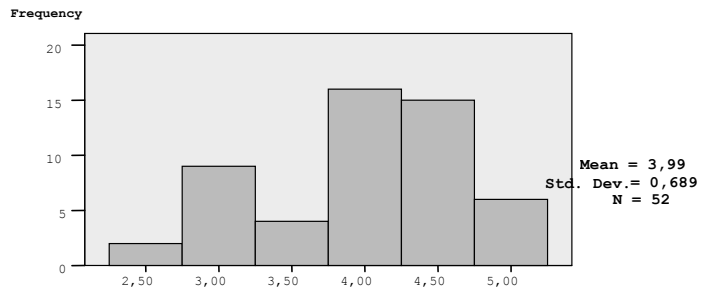
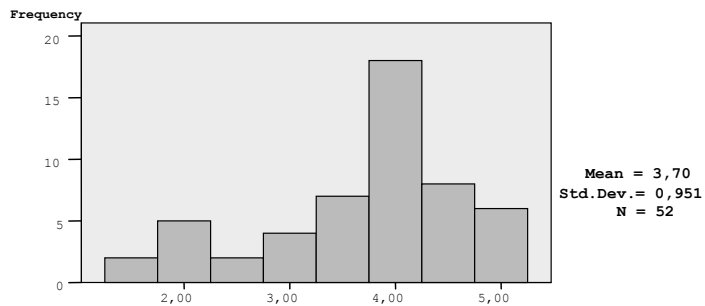


Figure 7: Histogram for the variable «Evaluation.Monitoring»



Lifestyle production: Transformation from manufacturing to knowledge based production using innovation

Mogens Dilling-Hansen¹ and Susanne Jensen²

Abstract

During the last decades, traditional manufacturing firms in Western economies have undergone a rapid transformation. Two effects of the globalised economy prompting firms to outsource labour intensive production to low wage areas are the increased market size and the competition. Innovation is a prerequisite for a successful transformation process and this paper analyses this process within four Danish lifestyle production industries: textile and clothing and wood product and furniture, which are being developed from being traditional production-oriented industries to becoming much more oriented towards knowledge intensive production in the form of design and marketing aspects.

The analysis shows that the industries have experienced a decline in employment and a positive development in productivity while maintaining a significant contribution to export. A 2008 survey of Danish SMEs reveals that about two thirds of the firms carry out innovative activities. The decision to innovate is influenced by networking activities, access to financial resources, firm strategy, export orientation, growth potentials and age of the firm while a traditional characteristic like size does not influence the decision to innovate; innovation is a prerequisite for firm survival in the four industries.

Keywords: Transformation, Lifestyle production, Innovation

JEL Classification: O3, L60

1. Introduction

The industrial development in Western Europe has been notable during the last years. Many traditional manufacturing firms have outsourced their production to East European countries and the former Soviet nations in the first instance and later on to the

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East and the South Asian countries. In spite of this development, some firms succeeded in surviving and even expanding their activities.

The industrial change has been particularly pronounced within the textile and clothing industries and the wood product and furniture industries on account of the fact that the relatively labour intensive production of these four industries faces obvious challenges due to the globalisation; especially the traditional production within the wood product and furniture industries is subjected to increased competition from countries with a lower wage level. On the other hand, the globalisation seems to facilitate the cultivation of knowledge assets related to high knowledge activities such as design, commercialisation, marketing, branding, logistic and after sales services (Mudambi, 2008). This implies that the innovative process focuses less on the primary production technology, i.e. process innovation, to improve the middle stream activities in the value chain whereas innovation in both downstream and upstream activities becomes increasingly important. Value added is generated by enhancing the value of the extra and more intangible features of a product; therefore, we introduce 'lifestyle production' as a common denominator for production based on adding extra value by primarily designing, but also by branding and developing new materials, new sustainable production methods, etc. Thus, lifestyle industries replace traditional production and manufacturing industries. With extra spotlight on creating new and commercially valuable activities designed to develop the capabilities of the firm, knowledge becomes important and the innovativeness of the firm becomes particularly important.

The purpose of this paper is twofold. First, the objective is to describe and discuss the transformation of the main lifestyle production industries using Denmark as an example: The industrial structure is dominated by small and medium-sized enterprises (SMEs) and focus is on textile and clothing and wood product and furniture industries; all relatively labour intensive industries with a high level of outsourcing activities. At the same time, the four industries have a long tradition of focusing on craftsmanship and design and the works of some of the most well-known Danish designers date back to the 1950s and 1960s (among others, Arne Jacobsen, Hans Wegner and Werner Panton). Even though some of these designs are still in production, new streams of designers are continuously emerging and surveys conducted by the Danish Enterprise and Construction Authority (Erhvervsstyrelsen 2008; 2007; 2003) document an increased design focus among Danish firms and an increase in both internal and external use of designers. Second, the increased focus on a more knowledge intensive production model makes innovation an important driver for sustaining future competitiveness. Thus, by analysing whether or not firms innovate and which factors affect the innovative activities, this study may suggest areas which present challenges to the four industries if the transformation continues or even accelerates.

Measuring innovation by some of the classical and well-proven definitions, such as number of patents granted or Research and Development (R&D) investments, seems unsuitable for the purpose of this study because of the shift from a traditional production-oriented industry to an industry focusing more on lifestyle and the various aspects of

design. Instead, in this study, innovation is measured by indicators advanced in the Oslo Manual (OECD 1996; 2005) which to some extent shifts the focus from the input (R&D) to the output of inventive activities (OECD, 2001). According to the Oslo Manual, innovation is defined as the introduction of new or improved products and processes, new or improved marketing methods or as a substantial organisational change. This study includes all four types of innovation (see, section 3 for a more thorough discussion of the definition of innovation). Furthermore, the novelty degree of the innovation used in the paper is defined as “new to the firm”.

The analysis of what determines the innovation activities in the lifestyle industries takes as its point of departure the resource-based view of the firm focusing on the importance of internal resources and capabilities (Barney, 2001; Lockett and Thompson, 2001). The study, however, also includes elements from the network literature and highlights the importance of external resources available through the firms’ network (Zaheer and Bell, 2005). The analysis includes traditional arguments found in the total productivity models, see Nickell (1996), firm-specific determinants like governance, ownership and internal resources, industry-specific factors like export orientation and competition as well as network determinants like cooperation with public authorities and knowledge institutions. Furthermore, specific attention is given to whether firms’ view on themselves as either production-oriented or design-oriented has an influence on their innovativeness.

The paper is structured as follows: Section 2 discusses the transformation from traditional production to design within the four industries: textile, clothing, wood product and furniture. Section 3 provides a definition of innovation and discusses how innovation can be measured and which determinants are important for innovation activities resulting in a number of hypotheses. In section 4, the method and data of the 2008 survey conducted in the four industries in Denmark are described while section 5 presents and discusses the empirical results. The sixth and final section provides the conclusion and implications of the study.

2. The transformation from traditional production to ‘life style’ design

In this section, the transformation from traditional production to design in the period since 1995 is discussed based on aggregated industry level data. Table 1 provides information on employment and Table 2 shows the productivity defined as the relation between turnover and number of employees, while Table 3 illustrates the absolute and relative importance of export and import. In the last decades, the overall development in Denmark indicates that despite great changes in the industrial development, the textile and clothing industries and the wood product and furniture industries are still relatively important economic activities, especially when measured by the value of export.

Table 1 shows that almost 38,000 people were employed in the four industries in 2006; a decline of almost 18,000 employees since 1995. This reduction of about 32% is equivalent to a decrease of 2.9% per year and compared to the overall development in the

manufacturing industries, the speed of labour reduction has more than doubled. However, the decline in employees is not isolated to the four industries but is a common phenomenon within manufacturing in Denmark. In contrast, the number of employees within private service has increased dramatically (nearly 500%). The development in the number of employees also shows that the four industries have reduced their percentage of the total employment in the private sector from 7.9% in 1995 to 2.8% in 2006. Among the four industries, the decline in employees has been most distinct within the textile and clothing industries (49% and 73% respectively) and less so in the wood product industry (9%).

Table 1: Employment in the private urban sector, full-time equivalent, 1995-2006

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Textile	10234	9186	8775	8635	7930	7827	7491	6979	6341	5921	5552	5196
Clothing	7462	6571	5699	5197	4526	4124	3687	3199	2898	2585	2098	2049
Wood product	14576	13956	14515	15005	14433	14733	14081	13180	12829	13051	13125	13280
Furniture	22991	22677	22984	23366	22049	22924	21875	20167	19010	18161	17337	17078
All 4 industries	55263	52390	51973	52203	48938	49608	47134	43525	41078	39718	38112	37603
All 4 industries % of all	7.9	7.4	7.3	6.0	4.0	3.9	3.6	3.3	3.2	3.1	2.9	2.8
Manufacturing	432035	430325	424068	423936	415439	414336	411736	402652	388240	373652	363765	365108
Service	135142	136719	142740	295649	652953	683648	751415	750666	740122	754964	770424	796995
All firms	702180	705381	715867	869574	1220468	1262050	1323939	1307586	1280381	1283733	1298562	1338269

Note: 'Industrial accounts statistics in the private urban sectors'. The statement is based on firms in the secondary and tertiary industries (NACE code over 150000). A few sectors have not published information due to confidentiality issues. The number of employees is defined as 'the number of full-time equivalent employees'. Absolute numbers of employees from 1998 to 1999 at an aggregated level must be interpreted with care due to changes in the statistics.

Source: Statistics Denmark and www.statistikbanken.dk.

This leaves us with an impression of a generally weakened manufacturing industry; however, analysing the related development in turnover (figures not shown here) softens the blow. For the four industries in the study, turnover has increased slightly from 43.8 billion Danish kroner in 1995 to 50.2 billion Danish kroner in 2006.¹ Although experiencing a decline in employment and a slowdown in turnover, the four industries have managed to perform better in respect of productivity than the rest of the

¹ The Danish currency is closely related to the EURO and the exchange value is approx. 1 € to 7.5 DKK.

manufacturing industries and they have almost managed to keep pace with the productivity of the service industries, see Table 2. Thus, the traditional manufacturing industries and especially the lifestyle industries have managed to stay competitive and keep export at a high level, see Table 3. This point is confirmed by results from two European Commission reports on development in, among others, the textile, clothing and furniture industries (Clutier 2007a; 2007b). The analysis shows that measures of the Danish productivity in an international perspective are very good; Denmark is actually the most productive nation within textile and, together with Sweden, it is the most productive country within clothing.

Table 2: Productivity growth in the private urban sector, index (1995=100), 1995-2006

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Textile	100	104.7	110.6	117.6	129.2	138.3	134.8	139.3	145.2	151.8	165.3	180.4
Clothing	100	115.5	124.7	139.9	154.4	164.3	180.5	187.2	183.8	195.2	204.1	213.6
Wood product	100	100.1	106.1	109.1	112.1	118.5	119.6	123.8	131.1	134.6	142.7	152.6
Furniture	100	100.4	104.4	111.6	120.9	128.8	141.4	138.3	143.4	155.0	166.0	173.1
All 4 industries	100	102.9	108.0	114.6	122.6	129.9	136.5	137.4	142.4	150.0	159.6	168.7
Manufacturing	100	101.6	107.9	111.2	115.8	122.0	131.1	136.8	133.0	138.9	150.4	163.7
Service	100	100.1	98.6	187.0	142.8	146.2	145.3	149.1	152.9	157.2	168.1	179.1

Note: 'Industrial accounts statistics in the private urban sectors'. The statement is based on firms in the secondary and tertiary industries (NACE code over 150000). A few sectors have not published information due to confidentiality issues.

Source: Statistics Denmark and www.statistikbanken.dk.

Table 3 provides information about the development in export and import. The figures show that the value of export in the four industries has increased from 18.6 billion Danish kroner in 1988 to 47.4 billion Danish kroner in 2006 while import has increased with a similar amount. The four industries' percentage of the overall import has been quite stable while there has been a relatively small decrease in the percentage of overall export. Thus, even though employment has declined and the increase in turnover has been modest, the four industries have managed to maintain their importance to Danish export. Looking separately at the four industries, clothing is the only one that has managed to improve its position. This seems to be followed by an increase in import which suggests that the increase is not a result of increased production in Denmark but based on resale of imported items (intra-industry trade).

Table 3: Import and export, 1988 and 2006, Value in DKK

		<i>Import</i>		<i>Export</i>	
		<i>1988</i>	<i>2006</i>	<i>1988</i>	<i>2006</i>
<i>Wood products</i>	<i>Value</i>	2.6	5.8	2.3	5.2
	<i>billion</i>	27	29	28	31
	<i>Rank</i>	1.4%	1.1%	1.2%	1.0%
		<i>Percentage</i>			
<i>Furniture</i>	<i>Value</i>	1.8	8.2	7.0	16.0
	<i>billion</i>	37	21	6	12
	<i>Rank</i>	1.0%	1.6%	3.7%	2.9%
		<i>Percentage</i>			
<i>Textile</i>	<i>Value</i>	5.9	8.1	4.2	6.9
	<i>billion</i>	11	22	17	26
	<i>Rank</i>	3.3%	1.6%	2.2%	1.3%
		<i>Percentage</i>			
<i>Clothing</i>	<i>Value</i>	6.5	22.8	5.1	19.3
	<i>billion</i>	10	6	11	8
	<i>Rank</i>	3.6%	4.5%	2.6%	3.6%
		<i>Percentage</i>			
<i>All 4 sectors</i>	<i>Value</i>	16.8	44.9	18.6	47.4
	<i>billion</i>				
		<i>Percentage</i>			
<i>Denmark</i>	<i>Value</i>	181.8	506.5	191.6	543.8
	<i>billion</i>				
		<i>Percentage</i>			
		100%	100%	100%	100%

Note: The first row shows the value of import and export in billion Danish kroner. 1 DKK equals 0.13 €. The centre row shows the relative rank in terms of significance (for instance, the value 27 means that the wood product industry is ranked 27 out of 66 with regard to import). The last row is the sectors' percentage of the overall import and export. The value of import and export is measured in current prices. SITC main groups (66 groups).

Source: www.statistikbanken.dk.

This resale aspect actually pinpoints a problem in the making of the statistics and the industrial codes. Tables 1, 2 and 3 are based only on the numbers from the manufacturing parts of the four industries while firms solely focusing on wholesale do not form part of this specific statistic. A part of the development within the four industries may be prompted by the fact that firms have become wholesalers and the statistics may thus describe a more severe decline than is actually the case owing to the fact that firms move from one industrial code in the statistics to another. In the official figures from Statistics Denmark, it is not possible to identify wholesale within textile, clothing, wood products and furniture; only more general categories are identifiable. The two relevant categories are wholesale of textiles and household goods and wholesale of wood and construction materials. For wholesale of textiles and household goods, there has been an

increase in employment from 30,000 in 1998 to 35,800 in 2006 (19% or on average 2.4% per year) and a 50% increase in turnover (from 10.5 billion Danish kroner to 15.6 billion Danish kroner). For the wholesale of wood and construction materials, employment has increased from 12,000 in 1998 to 16,000 in 2006 (34% or 4.2% per year) while turnover has increased by 58% (from 43.1 billion Danish kroner to 68.2 billion Danish kroner). These figures can be compared with a decline in employees per year in the textile, clothing, wood product and furniture industries ranging from 0.8% to 6.6% and an even lower development in turnover. Although the numbers for wholesale include elements that obviously do not form part of textile, clothing, wood products or furniture, these numbers indicate that there has been a more positive development than seen when solely focusing on the manufacturing parts of the four industries. In the survey presented in Section 4, not only manufacturing firms are included but also wholesale traders within the area.

3. Innovation as an instrument for staying competitive

As shown in Section 2, the industrial structure in the textile and clothing industries and the wood product and furniture industries has undergone substantial changes in the last 10 years. For firms trying to meet the pressure from globalisation on the one side and ever faster changes in customer needs on the other, a focus on innovation is necessary (Tidd and Bessant, 2009). Thus, the innovative effort may in the long run be what distinguishes competitive firms from other firms. Consequently, it becomes important for the industries in general and for the individual firm in particular to ask the questions: Do we have the necessary focus on innovation and what are the factors that may influence our innovative activities? To answer these questions from an industry perspective, a survey was conducted among firms in the four investigated industries. Before turning to the analysis of the survey, the next subsections include a discussion of which determinants are important for innovation activities from a theoretical point of view. The discussion results in a number of hypotheses. The subsections, however, are preceded by a definition of innovation and a discussion of how innovation can be measured.

3.1. Defining and measuring innovation

As stated in the introduction, measuring innovation by means of some of the classical definitions of innovation, like the number of patents granted or R&D investments, seems unsuitable because of the transition from a traditional production-oriented industry to an industry focusing much more on lifestyle and design. Instead, the innovation concept should reflect these changes and include the output of inventive activities like new products or processes. Thus, this will shift the focus from the input side (R&D) to the output of inventive activities (OECD, 2001; Greenhalgh and Rogers, 2010). Fittingly, the Oslo Manual makes a virtue of measuring innovation as an output of inventive activities and this is the approach to innovation that has been used for collecting data to this study. In the Oslo Manual, innovation is defined as “*the implementation of a new or significantly improved product (good or service), or process, a new marketing*

method or a new organisational method in business practice, workplace organisation or external relations” (OECD, 2005). The guidelines in the Oslo Manual have been used in the Community Innovation Surveys (CIS) conducted on a regular basis since the mid-1990s in most European countries, Canada (Therrien and Mohnen, 2003), Japan, Australia and a number of other countries (OECD, 2009) – in terms of the EU countries, 2008 saw the sixth CIS round. For the first many years, focus was mainly on technological products and processes (reflected in the second edition of the Manual from 1996 (OECD, 1996) but in the latest edition, marketing and organisational innovation have been included as well and focus is not only on technological products and processes but all types of product and process innovations. Innovation implies change which makes it natural to talk about the degree of novelty of the innovation. The Oslo Manual uses ‘new to the firm’ as the minimum definition of innovation novelty and this is also the definition used in this paper although it may make firms seem overly innovative (Greenhalgh and Rogers, 2010).

Even though many studies employ the Oslo Manual definition of innovation, the focus is still mainly on product and process innovations. Some recent research, however, has contributed with a broader use of the definition (Nielsen et al., 2008; OECD, 2009; Smith, 2005). The present study also includes all four types of innovation.

3.2. Determinants of innovation

As mentioned in the introduction, one of the objectives of the study is to analyse which factors determine innovation activities in the lifestyle industries. This discussion takes as its point of departure the resource-based view of the firm focusing on the importance of internal resources and capabilities (Barney, 2001; Lockett and Thompson, 2001). However, it also includes elements from the network literature and highlights the importance of external resources available through the firms’ network (Zaheer and Bell, 2005; Ouimet, Landry, and Amara, 2004; Powell and Grodal, 2005). The following subsections advance a number of hypotheses to be tested in the empirical section.

3.2.1. Resource-based determinants of innovation

In the resource-based view of the firm, the importance of internal resources and capabilities is the focal point. In this study of the determinants of the innovative activities in a firm, the following three types of resource-based explanations are included:

- i. General characteristics of a firm (age, size etc.)
- ii. Corporate governance
- iii. Level of competition in the industry, approach to the market

Looking at the general characteristics of a firm, the literature continuously debates which is the most innovative; the mature or the new entrepreneurial firm (Timmons and Spinelli, 2007). It is argued that as firms grow older, their focus shifts to be more on

consolidation and expansion within existing markets with existing products than on contriving new innovations. On the other hand, new firms may lack resources and experience difficulties in accessing the necessary financial, human or social resources; this may cause them to innovate in a less systematic, organised and rational way than older firms (Greenhalgh and Rogers, 2010).

In a 2001 study based on CIS data, Mairesse and Mohnen found that firm size (among a number of other factors) influences innovativeness positively (Mairesse and Mohnen, 2001; OECD, 2001). The scale argument (measured by size) is also supported by Crepon, Duguet and Kabla (1996), while Tidd, Bessant and Pavitt (2005) argue that innovativeness in small firms depends on the product and technology; in other words, it is dependent on the industry not the size. Thus, both age and size may influence the innovativeness of firms and according to Audretsch and Thurik (2001), entrepreneurial firms – young in age and small in size – may play an increasingly important role in today's knowledge-based economy. Accordingly, it is hypothesised that:

Hypothesis 1: Younger firms innovate more than older firms.

Hypothesis 2: Small firms innovate more than medium-sized or large firms.

The ability to govern a firm properly may be important for the innovative activities. One aspect of governance is whether managers and leaders are committed to and support innovation. This may be reflected in whether the firm places emphasis on strategic considerations in general and on innovation strategies in particular (Tidd, Bessant, and Pavitt, 2005; Lazonick, 2004). For Teece, Pisano and Shuen (1997), attaching great importance to the strategic aspect reflects a long-term commitment to competency development necessary for innovation.

Another aspect of governance is the ownership structure. The ownership structure is important because it may reflect to what extent firms are managed in a good and professional manner. Indicators of ownership are whether the firm is part of a group, ownership concentration² and type of owner (for instance whether the firm is family-owned, family-managed or foreign-owned). Mairesse and Mohnen (2001), for instance, find that belonging to a group is positively correlated to firm innovativeness.

Access to financial resources may also be a prerequisite for undertaking innovation. This could be either internal financial resources in the form of equities or external resources in the form of bank loans, venture capital, money from other private investors, etc. Thus, in the present study, variables measuring owner concentration, whether the firm has strategy plans and whether the firm has access to financial support are included. Accordingly, it is hypothesised that:

Hypothesis 3: Concentration of ownership diminishes firm innovativeness.

Hypothesis 4: Having a strategy plan enhances firm innovativeness.

Hypothesis 5: Access to external financial support enhances firm innovativeness.

² To what extent ownership is concentrated in one owner.

Regarding the level of competition in the industry and the approach to the market, two dimensions are included. In terms of approach to the market, this paper claims that the textile and clothing industries and the wood product and furniture industries have developed from being predominantly traditional production-oriented into becoming more lifestyle and design-oriented; i.e. into employing the upstream and downstream value chain knowledge activities to create value (Mudambi, 2008). Thus, differentiation from competitors and reacting to ever faster changing user demands (either businesses or customers) by boosting innovation within intangible assets like design or other special features become essential to the firms and this entails that being innovative is even more urgent than before. Therefore, the study also includes an analysis of whether or not design-orientation affects the innovative performance. Accordingly:

Hypothesis 6: Being design-oriented enhances firm innovativeness.

Finally, in an increasingly globalised world, firms are subjected to competition not only from local competitors but also from global markets. This may especially be the case for firms which aim at exporting their products and services. Thus, firms that are export-oriented are expected to focus more on innovation as a means to stay competitive. For instance, the results from Mairesse and Mohnen's 2001 study support this correlation and found that the export to sales ratio influences firm innovativeness positively (Mairesse and Mohnen, 2001). Therefore, firms' export intensity is included in this study resulting in the following hypothesis:

Hypothesis 7: Being exposed to competition at the export markets enhances firm innovativeness.

3.2.2. Network determinants

As stated earlier, not only the internal capabilities of a firm are important for its innovativeness but also its access to external capabilities. This is reflected in the extensive body of literature on the relationship between networking and innovation (see for instance Powell and Grodal (2005), Tidd and Bessant (2009)) but the role played by networking in terms of innovation is also reflected in the innovation system approach where systems made up of components, relationships and attributes work towards the common objective of innovation (Carlsson et al., 2002; Edquist, 2005). Recently, the role of external networking has been emphasised in the concept of open innovation developed by Chesbrough (2003; 2006). Through networking, firms gain access to valuable financial, human or social resources. The forms of collaboration and networking and the types of actors involved may be very different from situation to situation (Tidd, Bessant, and Pavitt, 2005). Firms may gain access to valuable external resources through collaboration with actors who form part of their supply chain, i.e. suppliers, customers etc., but also collaboration with competitors, public authorities, knowledge institutions, etc. may play a part in the firms' ability to undertake innovative activities. The Oslo Manual emphasises that innovation activity investigations should incorporate questions about the influence of networking on innovation (OECD, 2005). In this study, an analysis

of whether firms' cooperation with external partners has contributed to the firms' innovativeness has been included. Thus, it is hypothesised that:

Hypothesis 8: Network activities with external organisations enhance the firm innovativeness.

4. Empirical approach and data

The empirical analysis is based on a mail based survey conducted in the textile and clothing industries and the wood product and furniture industries in Denmark in 2008. Information on firm performance and innovative activities are available at the micro-level (e.g. CIS data for Denmark), but the survey is incentivised by the need for more qualitative information about governance structure, strategy implementation, networking activity, etc. In order to include the dynamic aspects of innovation, firms also provide information about past performance and their expectations for future developments.

The relevant population includes 929 firms with 5 or more employees – for firms that are solely wholesale traders, the limit was 20 employees. The delimitation of employee number reflects delimitations used in other studies; for instance, CIS normally target firms with more than 10 employees and the Danish Centre for Studies in Research and Research Policy uses 6 employees as the minimum threshold in their innovation statistics. As indicated in Table 4, 222 firms answered the questionnaire equalling a response rate of 24%. The response rate was somewhat higher in the clothing and furniture industry but a χ^2 -test reveals that the distribution of the respondents is comparable to the distribution of the population.

Table 4: Population, respondents, response rate and type of industry

Industry	Population N	Population %	Responden ts N	Responden ts %	Response rate
Textile	157	16.9	32	14.4	20.4
Clothing	193	20.7	51	23.0	26.4
Wood product	282	30.4	62	27.9	22.0
Furniture	297	32.0	77	34.7	25.9
Total	929	100.0	222	100.0	23.9

Notes: Textile is defined as a NACE 2007 code 1300, 4641; Clothing is defined as NACE 1400, 4642; Wood product is defined as NACE 1600; Furniture is defined as NACE 3100, 4647, 4665, 4666. The survey includes firms with 5 or more employees and for firms which are solely wholesale traders, only firms with more than 20 employees are included. Firms can be registered with more than one NACE code. The population is based on information from Experian.

Based on the results found in Table 4 and several tests for stability of the results, it is concluded that the sample is a representative sample of the four industries.

Data was collected by means of a questionnaire sent to the firms in May 2008 and the data collection was concluded in August 2008. The questionnaire included four main groups of questions: Background information, governance structure and resources, collaboration or networking activities and innovation.

4.1. The innovative firm

According to the definition of innovation in the Oslo Manual (see, discussion in a previous section), the innovative activities of a firm are divided into four categories: Product (product or service), process, marketing or organisational. A firm is considered product innovative if it has introduced a new or significantly improved product or service within the last 2 years and process innovative if it has introduced a new production process. A firm has embarked on marketing innovation if it has implemented new marketing strategies targeting new groups of customers or new market segments within the last 2 years. Finally, a firm implementing a new organisational method in the firm's business practices, for instance by using new methods for organising routines and procedures for the conduct of work, is considered innovative in the organisational field. The level of innovation and the connection between the four types are shown in Table 5 using a simple test for partial correlation between the types of innovation. Innovative firms are defined as firms having innovative activities within at least two of the four types of innovation and according to Table 5 this implies that about two thirds of all firms in the 4 industries are innovative. The relative share of innovative firms is in keeping with the findings in several OECD reports, e.g. 47% of all Danish firms have engaged in either product or process innovation and 63% of all firms have introduced a non-technological (marketing or organisational) innovation (OECD, 2009).

Table 5 indicates that product innovation is the dominant type of innovation and the answers to the questionnaire leave us with the general impression that product innovation is also the type of innovation which is most easily grasped. Even though the overall innovative level is relatively high, it is evident that there is a trade-off between the types.

Table 5: Share of innovative firms and correlation between types

<i>Type of Innovation</i>	Share %	Product/ service	Process	Marketing	Organisational
<i>Product/ service</i>	62.2	1.00	0.26	0.17	0.21
<i>Process</i>	60.4		1.00	0.27	0.28
<i>Marketing</i>	50.5			1.00	0.28
<i>Organisational</i>	47.7				1.00
<i>Innovation</i>	66.7	0.59	0.56	0.58	0.41

Notes: Correlation is based on partial correlation (Pearson). All correlations are significant at a 1% level. Minor differences between the results in this table and the following tables may occur due to missing observations in the disaggregated data on innovation.

The relation between product innovation and process innovation illustrates this point. The correlation (0.26) is shown in detail in Table 6. Almost the same number of firms (134 and 138) is active in the field of the two types of innovation but not the same firms are active in the two categories: 41 out of 138 (or 30%) active product innovators are not active in process innovation. However, the overall picture is dominated by the relatively large number of firms in the diagonal of the correlation matrix and the test for independence between the four types of innovation is highly significant.

Table 6: Relation between product/service innovation and process innovation

	<i>No process</i>	<i>Process</i>	Total
<i>No product/service</i>	47 (33.3)	37 (50.7)	84
<i>Product/service</i>	41 (54.7)	97 (83.3)	138
<i>Total</i>	88	134	222

Notes: The numbers indicated in brackets are expected numbers given independency between product/service innovation and process innovation. A formal chi-square test of independency rejects independency: $P(\chi^2(1)=15.03) < 0.0001$.

4.2. Data definitions and descriptive statistics

The theoretical background for explaining the innovative behaviour was discussed in section 3 which also advances the hypotheses to be tested. The explanatory variables are defined below along with a presentation of some descriptive statistics (Table 7).

As mentioned in the previous subsection, innovative firms are defined as firms with innovative activities within at least two of the four types of innovation; however, the results presented in the following sections are not dependent on this definition as other definitions have been tested.

In terms of *firm characteristics*, two measures are used: firm size and age. “Firm size” is measured by the number of full-time employees and the variable is log-transformed in the analysis. Other types of transformations have also been tested (dummy-implementation, quadratic expressions with and without log-transformation) but the results remain unaffected by these changes.

“Firm age” is measured by the time elapsed since the legal formation of the firm and it has not been possible to correct for any type of mergers and acquisitions. The age is also log-transformed based on the same arguments as for transforming firm size.

Table 7: Descriptive statistics

<i>Variable</i>	<i>All firms</i>	<i>Innovative firms</i>	<i>Non-innovative firms</i>
<i>Percentage of innovative firms</i>	66.7	100.0	0.0
<u><i>Firm characteristics</i></u>			
<i>Firm size – number of employees</i>	86.6	105.4	47.9
<i>Firm age (years)</i>	41.3	43.4	36.9
<u><i>Corporate governance</i></u>			
<i>Percentage of firms with foreign owner</i>	4.1	4.7	2.7
<i>Percentage of family run and owner concentrated firms</i>	84.2	85.1	82.4
<i>Percentage of firms with strategy plan</i>	70.0	79.5	50.7
<i>Percentage of firms with need for skills</i>	54.1	58.8	44.6
<i>Percentage of firms with external financing</i>	31.5	39.2	16.2
<i>Percentage of firms with growth potential</i>	55.4	62.2	41.9
<u><i>Competition, market</i></u>			
<i>Percentage of export-oriented firms</i>	73.9	79.7	62.2
<i>Percentage of lifestyle firms</i>	57.7	60.1	52.7
<i>Percentage of firms in textile & clothing industries</i>	37.4	39.2	33.8
<u><i>External resources</i></u>			
<i>Percentage of firms with networking activities</i>	49.1	59.2	28.6
<i>Number of firms</i>	222	148	74

Corporate governance includes 6 explanatory variables: “Foreign ownership” encompasses firms with a non-Danish owner and “family run or owner concentrated firms (50%)” are firms with either family-owned (private firms) or a concentrated (more than 50%) ownership structure (Ltds). “Firms with strategy plan” is an indicator for the use of a formal strategy plan and, as is evident from Table 7, only 50.7% of the non-innovative firms are actually using a strategy plan while 79.5% of innovative firms do so. The “need for skills” category comprises firms that have specified a lack of knowledge such as lack of skilled labour force, need for technological progress or need for better

market insight. “External financing” identifies the firms that have used external funding for their innovative activities during the previous two years. “Growth potential” identifies those firms that expect a general increase in growth of the firm.

Competition and market includes 3 variables which focus on the approach to the market, market potential and the level of competition: “Export orientation” designates firms with export activities (at least 5% of annual turnover) and thus firms exposed to globalised competition. The market approach in terms of whether firms are design-oriented or not may be measured in several ways: One is based on the NACE codes defining the furniture and clothing industries as “lifestyle production” while another is based on firms describing themselves as design-oriented. Both definitions have been tested with the same results. An industry dummy for “firms in textiles and clothing” may be seen as a measure of differences in competition and market potential.

Finally, *external resources* in the form of “network activities” are comprised of firms which have collaborated with other firms or organisations during the last two years. Here, collaboration does not include traditional transactions with firms in the value chain but is restricted to relations established for the purpose of creating innovation.

The summary statistics in Table 7 show that innovative firms score higher within all dimensions and as reported earlier, this is in keeping with the general findings in other industries; see, OECD (2009).

5. Empirical results

The results are presented in Table 8. The innovation variable is binary scaled and accordingly, the models estimated in Table 8 are based on logistic regression. The models are estimated by STATA using a robust estimator of the variance. The first and third columns present the estimated models and the second and fourth columns depict the *average marginal effect (partial effect)* of the variables. Instead of estimating the marginal effects using the means of the explanatory variables, the average marginal effects reported in the paper can be interpreted as the explanatory variables’ relative importance to innovation.

The first column represents the full model and as it appears, firm size has a very limited impact on the decision to innovate. Several linear as well as non-linear formulations of firm size have been tested but the hypothesis of a positive relation between size and innovation is rejected; the relation remains very weak and only the dummy representing small firms (less than 10 employees) and large firms (more than 100 employees) is stable and negative albeit insignificant; interpretation of this result is somewhat contra-intuitive because the concepts of innovation and new venture are closely related. However, there are very few large firms in the lifestyle industries and the argument for the negative relation may be found in the fact that a younger firm is much more focused on short-term problems (survival) than activities with a longer time horizon. Among the large firms in the sample are a number of traditional wood industry firms, e.g. sawmills, and these firms are in general less innovative.

Older firms are more innovative than younger firms and this relation is strong and significant; once more, this finding is not the expected outcome but again, the explanation is to be found in the industries investigated. The established firms in the lifestyle segment are able to devote themselves to design free of the survival focus which younger firms are compelled to employ. Furthermore, older firms are in general financially consolidated and aware of the important bearing that innovation has on survival.

Resources in general and financial resources in particular are a prerequisite for conducting innovative activities and these findings correlate with the theory. These conclusions also apply to the corporate governance dimension; that is, firms with external monitoring (foreign ownership), firms with ownership control (low ownership concentration), firms with a specified strategy plan and firms with high market potentials are in general more innovative.

Only the dummy for lifestyle production fails to be significant but this result is primarily ascribable to two factors. The first is the simple fact that the categorisation of traditional and design-oriented industries is inexpedient (NACE codes are not reliable at this sub-level). The second is that firms in the selected industries represent two types of firms; one type focusing on optimising production of traditional goods and one type specifically focusing on design. The firm's self-concept (perceiving itself as either a design firm or a production firm) will affect the probability of future survival but the results do not offer support to the expected positive relation between innovation and design orientation.

As expected when looking at the effect of the market, a more positive relation is found among the firms operating on markets with a higher level of competition (measured by export intensity) than among firms operating primarily on home markets. Similarly, innovation is performed in close contact with external agents entailing a clearly positive and significant networking variable coefficient.

Table 8: Determinants for innovative activities, logistic regression

	(1) Full Model	Average marginal effect	(2) Reduced model	Average marginal effect
<i><u>Firm characteristics</u></i>				
Firm age (log-transformed)	0.540*** (0.210)	0.083	0.461** (0.194)	0.075
Small firms (< 10 employees)	-0.264 (0.529)	-0.041		
Large firms (> 100 employees)	-0.704 (0.521)	-0.108		
<i><u>Corporate governance</u></i>				
Foreign ownership	1.471** (0.740)	0.226		
Family run or owner concentrated firms (50%)	-0.391 (0.521)	-0.060		

*Lifestyle production: Transformation from manufacturing
to knowledge based production using innovation*

Firms with strategy plan	1.187 ^{***} (0.377)	0.182	1.029 ^{***} (0.356)	0.166
Need for skills	0.672 [*] (0.372)	0.103		
External financing	1.504 ^{***} (0.557)	0.231	1.486 ^{***} (0.519)	0.240
Growth potential	0.791 ^{**} (0.392)	0.121	0.813 ^{**} (0.370)	0.131
<i>Competition, market</i>				
Export orientation	0.911 ^{**} (0.422)	0.140	0.906 ^{**} (0.386)	0.146
Lifestyle production	0.197 (0.381)	0.030		
Textile or clothing industries	0.649 [*] (0.375)	0.100		
<i>External resources</i>				
Network activity	1.127 ^{***} (0.404)	0.173	1.000 ^{***} (0.371)	0.162
N	204		204	
Pseudo R ²	25.0%		21.6%	
P(Log-LR)	< 0.0001		< 0.0001	

*Notes: Standard errors are presented in brackets. * indicates significance at a 10% level, ** at a 5% level and *** at a 1% level. Intercept is not shown.*

The reduced model is identified as a model with robust, stable and significant factors influencing innovation. The model (2) shows the main results with the average marginal effects presented in the last column. A high marginal effect is interpreted as a substantial increase in the probability of being innovative given an increase of one unit of the explanatory variable. The net impact from firm age is relatively uninteresting seen from a policy perspective; however, better financial support, increased networking activities with other firms and organisations and a positive strategy formulation positively affect the decision to innovate. Several models with interaction between financial support, networking and strategy formulation have been tested but no significant interaction effect is found, i.e. there is no evidence of any interdependency between the three types of resources. Finally, it is demonstrated that firms operating on competitive markets are forced to use innovation to maintain competitiveness.

6. Conclusion

Despite the considerable changes in the Danish industrial development in the last 10 years, the textile and clothing industries and the wood product and furniture industries have managed to successfully maintain a high level of productivity and importance with

regard to economic activities; at least when looking at the value of export. This implies that traditional production-oriented industries have become increasingly oriented towards various aspects of knowledge activities such as design, marketing, branding, etc., as for example upstream and downstream value chain activities. An effect of this transformation may also be that firms should intensify their focus on innovation.

The paper also analysed and discussed the innovative effort in the four lifestyle production industries in Denmark. Measuring innovation in accordance with the guidelines in the Oslo Manual, the paper found that two thirds of the firms carried out innovative activities. The overall conclusion of the estimated models is that it is possible to explain innovative activities by factors representing firm resources in the lifestyle industry. Tangible resources, i.e. suitable financial resources, influence the innovative activities positively. The positive result is also found for firms with a formal strategy plan. Finally, even though the interaction with agents in the markets (suppliers, competitors and customers) is normally considered a rough indicator for information seeking, the positive effect is significant and the coefficient is similar to that for financial resources. The expected negative relation between age and innovation cannot be verified, nor can a significant relation between size and innovation.

The analysis also included a variable for measuring whether design-oriented firms in contrast to production-oriented firms are more focused on innovation. This effect, however, failed to prove significant. A possible explanation for the lack of significance may be that the manner in which innovation is measured at present does not take into account the new forms of innovation that the focus on design may represent. Thus, conducting investigations into the innovation processes and what innovation is about in those firms may be a highly relevant issue for future research.

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The Determinants of Cash Flows in Greek Bond Mutual Funds

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Abstract

This paper examines the factors that affect inflows – outflows of capital in bond mutual funds that operated in the Greek market during the period 1997-2005. Investors in bond mutual funds do not seek for high gross returns in order to determine their investment decisions in contrast with investors in the stock market. The risk weighted returns however represent a crucial factor in investment decision making. Bond mutual funds that invest primarily in government bonds, appear to be more affected by commissions charged by mutual fund managers, since investors avoid mutual funds charging high commissions, while on the other hand investors that prefer corporate bonds show reduced sensitivity in the commissions charged by mutual funds. Investors in government bonds increase their investment positions when stock markets experience small or negative returns, a clue that shows they seek for safe heavens for their investments. This phenomenon is more evident when investors face a temporary period of low stock market returns and is not as strong when low returns in the stock markets are extended to a period of years. In these cases investment positions in bond mutual funds appear to be part of a more permanent investment policy where bond investments are considered to be an integral part of a diversified portfolio.

Keywords: bond mutual funds, commissions, fund flows

JEL Classification: G15, G11, G12

1. Introduction and literature review

The evaluation of the returns characteristics of investments in bond mutual funds is a topic of increasing interest when taking into account the size of the invested funds in this investment category.

There are a number of factors that render the research presented in this paper important. The first and most apparent one is the size of this market in Greece, given that it exceeded the 5 billion euros margin during the period under consideration, constituting approximately 3 percent of Greek GDP, and 30 percent of the total of funds invested in

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mutual funds in Greece. The majority of capital flows in the Greek market are invested in the bond market. The bond mutual funds market offers the opportunity to small and medium size investment portfolios as well as large portfolios to have equal opportunities in high quality professional investment services. Investments in bonds are treated by investments professionals, CFOs and individual investors alike, as an integral part of their investments with an at least 50 percent overall weighting in their total investment portfolio. International research has shown though that even within this investment category, that is considered of minimum or zero risk, there exist anomalies and alternative investment opportunities that could potentially offer to investors above market average returns (Dritsakis et al., 2006).

It is evident therefore that the analysis of the returns of bond funds in the Greek market is of major importance to investors, market professionals and the academic community. Especially during the period under examination the Greek stock market experienced fluctuations including a long lasting period of continuous losses that had driven a significant part of investment funds to the bond market, hence rendering the present analysis of cash flows determinants of great importance both for market participants and academics. Moreover, the cyclical behaviour of stock returns is a further factor that brings about the important role of bond investments as an integral part of every diversified investment strategy (Papadamou and Siriopoulos, 2003).

This paper aims at analyzing the factors that influence inflows-outflows of capital in these investment portfolios. We study the impact of a number of selected factors in determining flows of capital in bond mutual funds, both when analyzing the whole sample of bond mutual funds that operated in the Greek market, as well as those that have similar investment characteristics based on a categorization that we performed. On the whole, results showed smaller sensitivity of Greek investors in bond mutual funds, when compared to international evidence, towards almost all of the selected factors, that can potentially be attributed to the limited maturity of the market, lack of available data and specialized information to investors. It is estimated therefore that the average investor shows reduced sensitivity to specific quantitative and qualitative attributes of the mutual fund that they invest.

The international literature regarding bond funds focuses on their performance issues (Blake et al., 1993). Other papers focus on specific categories of bond funds, still shedding light on performance issues (Cornell and Green, 1991; Detzler, 1999; Kihn, 1996). Papers by McLeod and Malhotra (1996) and LaPlante (2001) investigate expense ratio issues while window dressing in bond funds is addressed by Morey and O'Neal (2006).

The factors that affect flows of capital in mutual funds have been in the centre of academic interest for years, but with the focus being on equity funds. Many of the factors investigated in these papers could have an impact on bond mutual funds flows as indicated by Elton et al., (1995). According to Gruber (1996), investors in stocks look for a positive historical track record of the fund they consider investing in. Similar

conclusions are drawn by Chevalier and Ellison (1997) and Sirri and Tufano (1998), that add to that the lack of linearity in the returns-flows relation. This can be interpreted as a tendency of investors in equity portfolios to increase their positions in mutual funds with a good recent track record but not to withdraw their capital from mutual funds with a bad track record.

According to Sirri and Tufano (1996) investors in equity portfolios are more sensitive with commissions for entry-withdrawal from mutual funds, given that mutual funds with high commissions seem to experience reduced inflows of capital compared to mutual funds with similar returns and characteristics, but smaller commissions charged. Barber et al., (2005) investigate the different categories of commissions charged by fund managers to investors. They find that commissions charged when entering a mutual fund are negatively related with inflows of capital, while no significant relation is found when examining management fees and flows of capital. Wilcox (2003) reaches the same conclusions, while Ivkovic (2002) and Nanda et al., (2004) study spillover effects, that is mutual funds that have significant inflows because they belong to an investment category that attracts funds as a result of high mean returns irrespective of individual fund returns. Other factors investigated by other papers, including Jain and Wu (2000), Bergstresser and Poterba (2002), Del Guercio and Tkac (2002), James and Karceski (2002), are previous fund flows, the turnover ratio, overall risks undertaken, fund age.

Greek research upon bond mutual funds issues is limited to performance evaluation issues (Milonas, 1999; Philippas, 2000), analysing the collective returns of bond mutual funds, but not factors that influence fund flows. Dritsakis et al., (2006) evaluate returns using conditional and unconditional models, finding that bond mutual funds in Greece on average do not manage to exceed the risk weighted returns of the benchmark index.

This paper attempts to move research, regarding the Greek bond mutual funds market, forward by investigating fund flows issues, which will be very useful, given that the Greek market is amongst the developed markets, a fact that attracts increased flows of funds into Greek bonds in general. This is questionable naturally during this period given that the debt crisis in Greece has reduced dramatically the size of the capital that the Greek government raises from the markets. According to Greek officials though this is only temporary and it should be considered very probable that the Greek government will resume lending from the international markets very soon. These market changes render even more interesting the analysis of the factors affecting flows in bond mutual funds because after government lending resumes we should be able to explain the factors that affect investor decisions. In the meantime, bond mutual funds continue to hold Greek government bonds in their portfolios, and the current analysis could give further insights to academics and market participants as to what their investment policy is expected to be bearing in mind the factors that influenced them in the near past.

2. Factors affecting capital flows

As indicated above, investments in bond funds incorporate high commissions when compared especially with the average risk weighted returns achieved by bond mutual fund managers, while their operation is quite complex for non professionals. For these reasons, among others, potential investors confront unsurpassable difficulties when attempting to create diversified bond portfolios without the expertise of professionals. Thus, bond mutual funds are the sole viable alternative for those wishing to invest in bonds. The Greek Institutional Investors Association reported that inflows into bond mutual funds exceeded 1.5 billion euros during the period 2001-2003, summing up to 5.5 billion euros at the end of 2003, five fold up compared to the funds invested in equity mutual funds. Despite the increasing attention drawn to bond funds by investors, the related research is very limited and especially with regard to the factors that influence inflows-outflows of capital and whether these are mainly influenced by the track record of each fund or from the commissions charged or other factors. Even though a large part of the pertinent research investigates the factors influencing flows into equity mutual funds, the factors affecting flows in bond funds are believed to be different. This can be attributed to the different profile and investment targets of investors in bond funds. Therefore, in this paper there is an attempt to interpret this different behaviour of investors in bond funds and especially in a small developed market.

The paper investigates the factors determining cash flows in the Greek bond mutual funds market. For the purpose of the analysis bond mutual funds are divided into different subcategories depending on the composition of each bond mutual fund and the weights attributed to government bonds, other fixed interest securities, corporate bonds and term deposits, Greek and foreign. Apart from analyzing the factors affecting the flows of capital, the paper divides bond mutual funds depending on their specific investment characteristics. The sample of Greek bond mutual funds is divided into those that a) invest above 90 percent of the funds under management in Greek bonds of various maturities, b) invest 10-30 percent of their assets in corporate bonds, Greek and foreign, c) invest 30-50 percent of their assets in corporate bonds, Greek and foreign and d) invest over 50 percent in foreign corporate and government bonds. By categorizing bond mutual funds according to the composition of their invested assets, it is made possible to investigate the nature of the influence of the selected factors both for the sample as a whole and for each independent category as outlined above.

The paper finds a negative relation between assets under management in bond mutual funds and flows of capital. Following the work of Del Guercio and Tkac (2002) it is found that in contrast with equity mutual funds, investors in bond funds do not prefer to invest in funds with a positive recent returns history. The returns, weighted by the incorporated risk, play an important role though. Also, investors in all different categories of bond funds consider commissions to be an important factor determining investment decisions. This means that investors avoid bond funds that charge high commissions and

are attracted respectively by those that are relatively “cheaper” both when entering-exiting as well as from the management fees perspective. Also investors in bond funds with a significant portion of corporate bonds in their invested assets, seem to be more sensitive with risk issues. Of extreme interest is also the fact that investors view bond funds as an alternative to equity investments especially during times when stock markets have entered bear market periods.

For the purpose of the analysis monthly data for the period 1997-2005 were utilized, including in the sample the 42 bond mutual funds that operated in the Greek market during that period, as well as another 33 mutual funds that had significant assets invested in foreign bonds, mainly corporate. The period chosen is believed to be appropriate for the purpose of the analysis for two reasons. The first is the fact that during this period an important number of bond mutual funds operated in the Greek market, whereas the second one is that during this 8 year period important events took place in the domestic and international market, the impact of which is expected to be found in the results.

Amongst the data set, the available information includes the title of each mutual fund, the company operating it, the initiation date as well as the termination date if it applies, the period of operation in months, the assets under management, total shares available, while the commissions for entry and exit as well as management expenses charged by fund managers to investors are also calculated.

The paper utilises the collective experience from previous papers and especially the methodology followed by Zhao (2005), and includes further factors that might explain flows of capital in bond mutual funds, namely the category of investments where each mutual fund in the data set belongs, and the investment objectives of each mutual fund. Therefore, in this paper the impact of alternative investment opportunities offered to an investor within the same investment management firm in the form of different mutual funds of all possible types offered is examined. This means that possibly the existence of further investment opportunities within a particular investment firm could be a factor with a statistically significant impact, since this would offer investors in bond mutual funds with investment alternatives within the same company during periods when an investor considers appropriate to perform a redistribution of his invested capital, increasing/decreasing overall risk in periods of bull/bear equity markets. Following Sirri and Tufano (1998), in trying to measure the returns relative to other portfolios with similar investment objectives during the same period, influencing capital flows is also included as a factor, the weighted gross average return of the total mutual funds with the same investment objective, attempting to capture investors’ quest for absolute returns.

Most papers in the related literature examine the impact of capital flows with regard to the percentage change in assets under management of each mutual fund, instead of the absolute inflows – outflows of capital in a mutual fund and the corresponding changes in the total assets managed. This is performed because it is natural to speculate that larger mutual funds should have bigger absolute money inflows – outflows compared

to a small or newly founded mutual fund. Absolute flows of capital though appear to be a factor affecting inflows – outflows of capital. Therefore, following Del Guercio and Tkac (2002) absolute flows of capital are used as a dependent variable in a multiple regression when trying to capture the impact of the size of a mutual fund in inflows – outflows of capital.

So, we follow the international practice of calculating flows of capital as the difference in total money assets under management, excluding possible profits or losses achieved by the mutual fund manager. We also exclude new money assets as a result of mergers or acquisitions, so that we only depict inflows – outflows originating from investors only:

$$FLOW_{i,t} = ASSET_{i,t} - ASSET_{i,t-1}(1 + R_{i,t}) - FASSET_{i,t} \quad (1)$$

Where $ASSET_{i,t}$ represents total assets of portfolio i at the end of every 3-month period t , $R_{i,t}$ represents the profits achieved by the portfolio during the 3-month period t and $FASSET_{i,t}$ represents possible new assets arising from mergers-acquisitions during the 3-month period t .

As we mentioned above we also calculate percentage flows, as the percentage increase/decrease of assets under management as a result of inflows/outflows of capital, for comparison reasons:

$$PFLOW_{i,t} = FLOW_{i,t} / ASSET_{i,t-1} \quad (2)$$

When using $PELOW_{i,t}$ variable as a dependent variable we also use the $LASSET_{i,t}$ as an independent variable that is calculated as the logarithm of $ASSET_{i,t}$ as a measure of the size of the bond mutual fund.

We also calculate the returns of each portfolio relative to other portfolios with similar investment objectives utilizing the variable $POSITION_{i,t}$, that depicts the returns of each portfolio in the context of the average returns of the other portfolios with similar investment objectives. As a result, we construct three different variables based on this categorization as those that are in the lower percentile of returns, mean percentile of returns and high percentile of returns as follows:

$$LOWP_{i,t} = \min[POSITION_{i,t}, 0.2] \quad (3)$$

$$MIDP_{i,t} = \min[POSITION_{i,t} - LOWP_{i,t}, 0.6] \quad (4)$$

$$HIGHP_{i,t} = \min[POSITION_{i,t} - LOWP_{i,t} - MIDP_{i,t}, 0.2] \quad (5)$$

The variables analysed above measure the relative returns of each portfolio with regard to the investment objective. For this reason another variable, measuring the

weighted average of the returns of all the portfolios with the same investment objectives, namely $VARET_{i,t}$, is included. The goal is to test whether investors look for absolute returns. As a measure of the risk incorporated in each bond portfolio we include the variable $SDRET$, that measures the standard deviation of the monthly returns of each portfolio in the previous 12 months. We also calculate the risk weighted returns of each portfolio using the Sharpe Ratio, calculated as follows:

$$SRATIO = \frac{\bar{R}_i - \bar{R}_f}{SDRET_i} \quad (6)$$

where \bar{R}_i and \bar{R}_f are the mean monthly returns of each portfolio and the risk free return respectively, while $SDRET_i$ measures the standard deviation of the monthly returns of each portfolio in the previous 12 months. We then construct similar to the variables above using the Sharpe Ratio:

$$LOWSRATIO_{i,t} = \min[POSITION_{i,t}, 0, 2] \quad (7)$$

$$MIDSRATIO_{i,t} = \min[POSITION_{i,t} - LOWSRATIO_{i,t}, 0, 6] \quad (8)$$

$$HIGHSRATIO_{i,t} = \min[POSITION_{i,t} - LOWSRATIO_{i,t} - MIDSRATIO_{i,t}, 0, 2] \quad (9)$$

Utilising previous experience by Blake et al., (1993) and Zhao (2005) we calculated three more variables based on the Sharpe Ratio using monthly returns data for the last 24 months as follows.

$$R_{i,t} = a_i + \beta_{it} BONDDEX_t + \varepsilon_{it} \quad (10)$$

where R_{it} is the return of the bond portfolio above the monthly risk free rate, and $BONDDEX$ is the difference in the returns of the bond portfolio relative to the Bondex index that is considered to be a good proxy of average returns of a bond portfolio since the index contains a series of bonds of different maturities.

The Bondex index was an index containing a portfolio of bonds of various maturities that was used by bond fund managers as a measure of average bond market returns until 2005, which covers the period that we use in our data set. After 2005 the BONDDEX index was substituted by most fund managers by the MSCI Greek Bond index. For this reason we concluded that it represents the only trustworthy measure using which we could categorize, in different average returns categories, bond mutual funds that operated in the Greek market during the period 1997-2005.

The above regression model offers different values of a for each bond portfolio and the above mentioned variables are modified as follows:

$$LOWA_{i,t} = \min[POSITION_{i,t}, 0, 2] \quad (11)$$

$$MIDA_{i,t} = \min[POSITION_{i,t} - LOWA_{i,t}, 0, 6] \quad (12)$$

$$HIGHA_{i,t} = \min[POSITION_{i,t} - LOWA_{i,t} - MIDA_{i,t}, 0, 2] \quad (13)$$

We also include variables, for the age of the bond mutual fund, meaning the time that elapsed since it was initially set up (*AGE*), a variable for the potential movements between alternative mutual funds with similar characteristics (*TURNRATIO*), a dummy variable for the commissions charged by mutual funds (*CDUMMY*), and finally a variable that depicts the potential movements between other mutual funds offered within the same fund management firm (*OBJECTIVES*), so that we capture these movements and how they influence inflows-outflows of capital. The *OBJECTIVES* variable plays an important role in our model because we expect to find an influence in fund flows because Greek investors are believed to switch between different mutual funds within the same investment firm, especially since this is offered at no cost in many cases. Therefore, this alternative for investors is expected to have a positive influence on flows.

We calculate the arithmetic averages of attributes of bond mutual funds with different portfolio composition and investment goals and the results are presented in Table 1.

Table 1: Collective statistical data of bond mutual funds with different investment objectives

Attributes of the bond mutual funds	Total sample	Category 1	Category 2	Category 3	Category 4
ASSET (in million euros)	4,850	2,542	895	830	748
RAW (%)	4,164	3,297	3,584	4,510	3,982
SDRET (%)	1,339	1,231	1,349	1,328	1,512
SRATIO (%)	4,719	9,367	6,287	4,287	2,380
FLOW (in million euros)	281	359	127	456	267
PFLOW (%)	0,126	0,153	0,026	0,189	0,078
TURNRATIO (%)	92,57	95,46	80,27	83,03	102,78
AGE (in months)	41	54	46	36	29

Notes: Category 1 bond mutual funds are the ones that invest above 90% of their assets in government bonds, Category 2 bond mutual funds are those that invest 10-30% of their assets in corporate bonds, Category 3 bond mutual funds invest 30-50% in corporate bonds, while Category 4 bond mutual funds invest over 50% of the managed assets in corporate bonds, Greek and foreign. The *ASSET* variable measures the assets under management in each bond funds category, the *SDRET* gives the standard deviation of monthly returns collectively in each category. *RAW* depicts the gross 3-monthly returns in each category, *SRATIO* is the weighted returns variable depending on the incurred risk, *FLOW* depicts the mean flows of capital in million euros, *PFLOW* is the mean percentage flows, as a measure of the increase/decrease in managed assets, while *TURNRATIO* measures the turnover ratio and *AGE* the mean age of the funds in each category.

Bond mutual funds that invest heavily in government bonds and not more than 10 percent in corporate bonds have the highest mean of assets under management (2.54 billion euros), while the lowest mean assets under management are found in Category 4 bond mutual funds (748 million euros) that are the relatively newest, thus having the lowest mean. Highest mean returns are found in Category 3 bond mutual funds that take comparatively modest risks above zero risk investments (4.5%), and second in our calculations end up Category 4 bond mutual funds (4%) that invest large part of their assets in corporate bonds, Greek and foreign. The smallest returns arise from those bond mutual funds that invest primarily in Greek government bonds of various maturities (3.3%). On the other hand, the highest commissions are charged by Category 1 bond mutual funds while Category 4 charge the lowest, evidently in their quest to increase their assets. Category 4 mutual funds show also the highest volatility as measured by the SDRET variable, whereas the lowest respectively is found in those that invest over 90% of their assets in government bonds. Category 2 bond funds keep apace. Also expectable is the fact that lowest SRATIO rates are found in Category 1 funds and highest in Category 4 bond funds. Category 3 bond mutual funds appear to have the highest mean flows and percentage flows, probably due to the increase in assets under management that they experienced after 1999 when the bear market in the Greek stock market began.

In Table A1 in the Appendix, the correlations between variables included in the models are presented. The results explain the relation connecting the variables and the inflows/outflows of capital. Flows of capital are among others, positively related with returns, and negatively with other variables such as commissions and turnover ratios.

In order to determine the nature and magnitude of the influence of the above mentioned variables we estimate the following model, including in our data set all mutual funds that operated in the Greek market during the period 1997-2005:

$$\begin{aligned}
 FLOW_{i,t} = & \alpha + \beta_1 ASSET_{i,t-1} + \beta_2 FLOW_{i,t-1} + \beta_3 FLOW_{i,t-2} + \beta_4 FLOW_{i,t-3} \\
 & + \beta_5 LOWP_{i,t-1} + \beta_6 MIDP_{i,t-1} + \beta_7 HIGHP_{i,t-1} + \beta_8 AGE_{i,t-1} + \beta_9 TURNRATIO_{i,t-1} \\
 & + \beta_{10} SDRET_{i,t-1} + \beta_{11} OBJECTIVES_{i,t-1} + \beta_{12} WARET_{i,t-1} + \beta_{13} CDUMMY_{i,t-1} + u_i + \varepsilon_{i,t}
 \end{aligned}
 \tag{14}$$

where u_i is the random disturbance term and is stable. We also include the flows of capital variable with two and three time lags to capture the AR(3) process that total flows follow, as it has also been documented by Warther (1995).

When we use the variable for the percentage change of flows ($PFLOW_{i,t}$) in the model (13) we use the logarithm of the assets variable ($LASSET_{i,t-1}$) with one time lag as well as the percentage flow variable with one-two and three time lags:

$$\begin{aligned}
 PFLOW_{i,t} = & \alpha + \beta_1 LASSET_{i,t-1} + \beta_2 PFLOW_{i,t-1} + \beta_3 PFLOW_{i,t-2} + \beta_4 PFLOW_{i,t-3} \\
 & + \beta_5 LOWP_{i,t-1} + \beta_6 MIDP_{i,t-1} + \beta_7 HIGHP_{i,t-1} + \beta_8 AGE_{i,t-1} + \beta_9 TURNRATIO_{i,t-1} \\
 & + \beta_{10} SDRET_{i,t-1} + \beta_{11} OBJECTIVES_{i,t-1} + \beta_{12} WARET_{i,t-1} + \beta_{13} CDUMMY_{i,t-1} + u_i + \varepsilon_{i,t}
 \end{aligned}
 \tag{15}$$

We estimate in separate regressions the Sharpe Ratio variables (*LOWSRATIO*, *MIDSRatio* and *HIGHSRATIO*), and the BONDEX returns variables (*LOWA*, *MIDA* and *HIGHA*) instead of *LOWP*, *MIDP* and *HIGHP* that were included in (15):

$$\begin{aligned}
 FLOW_{i,t} = & \alpha + \beta_1 ASSET_{i,t-1} + \beta_2 FLOW_{i,t-1} + \beta_3 FLOW_{i,t-2} + \beta_4 FLOW_{i,t-3} \\
 & + \beta_5 LOWSRATIO_{i,t-1} + \beta_6 MIDSRatio_{i,t-1} + \beta_7 HIGHSRATIO_{i,t-1} + \beta_8 AGE_{i,t-1} \\
 & + \beta_9 TURNRATIO_{i,t-1} + \beta_{10} SDRET_{i,t-1} + \beta_{11} OBJECTIVES_{i,t-1} + \beta_{12} WARET_{i,t-1} \\
 & + \beta_{13} CDUMMY_{i,t-1} + u_i + \varepsilon_{i,t}
 \end{aligned}
 \tag{16}$$

$$\begin{aligned}
 FLOW_{i,t} = & \alpha + \beta_1 ASSET_{i,t-1} + \beta_2 FLOW_{i,t-1} + \beta_3 FLOW_{i,t-2} + \beta_4 FLOW_{i,t-3} \\
 & + \beta_5 LOWA_{i,t-1} + \beta_6 MIDA_{i,t-1} + \beta_7 HIGHA_{i,t-1} + \beta_8 AGE_{i,t-1} + \beta_9 TURNRATIO_{i,t-1} \\
 & + \beta_{10} SDRET_{i,t-1} + \beta_{11} OBJECTIVES_{i,t-1} + \beta_{12} WARET_{i,t-1} + \beta_{13} CDUMMY_{i,t-1} + u_i + \varepsilon_{i,t}
 \end{aligned}
 \tag{17}$$

After the preceding analysis, our basic hypotheses are the following:

a). Find a strong and positive relation between the dependent variable and the ASSET variable, assuming that funds with significant funds under management should attract inflows of capital.

b). Determine a positive relation with HIGHP, HIGHA, HIGHSRATIO variable and possibly MIDP, MIDA, MIDSRatio in an attempt to determine whether investors in bond mutual funds seek for high historical returns, in line with previous evidence from investors in equity mutual funds (Gruber, 1996).

c). We expect to find outflows of capital for bond mutual funds that incorporate more risk in their overall portfolio as indicated by the SDRET variable.

d). It is expectable to capture a negative relation between commissions charged for entry/withdrawal from bond mutual funds as indicated by the CDUMMY variable. This tendency should be stronger for bond mutual funds investing a significant part of the assets under management in corporate bonds. Blake et al., (1993) and Elton et al., (1995) find that an increase in commissions has an equally negative impact in the returns of the bond mutual fund. Therefore investors that resort to bond mutual funds should normally choose bond mutual funds with low commissions. In contrast, investors in equity mutual funds show limited dependence from commissions issues.

e). We should find a positive relation between the OBJECTIVES variable and flows of capital since the existence of a variety of investment alternatives should influence inflows/outflows of capital.

In Table A2 in the Appendix, the collective results of all models estimated above (14 – 15 – 16 - 17) are presented, while using the whole available data set.

With regard to the hypotheses as outlined above, the first interesting finding is that the estimators regarding the size of the bond mutual fund (ASSET) are negative and statistically significant irrespective of the model that we use. This finding is in line with the correlation results shown in Table A1, and is in contrast with the widespread belief, that led us into using percentage flows, which claims that investors are positively affected by the size of the bond fund they invest. Consequently, this result diminishes the importance of percentage flows in the study and we focus on absolute money flows.

Previous research has shown that previous returns of a bond mutual fund are not indicative of the future expected returns (Dritsakis et al., 2006). It is found that investors are affected by absolute returns, since they prefer mutual funds with high mean returns, but solely in the middle of the distribution of returns since the MIDP variable has a positive and statistically significant estimator. According to our findings, it should be noted that an increase in mean returns of 1 percent (100 basis points) results in an increase in flows of capital of approximately 500 th. euros in a bond mutual fund. On the contrary, the estimators for the LOWP and HIGHP variables are not statistically significant. Also, in line with similar findings in stock mutual funds markets (Ivkovic, 2002), it seems that investors do not “punish” mutual funds with a returns history worse than the mean market returns, since no significant outflow of capital is found. An interesting finding is also the fact that investors in bond mutual funds invest equally in the bond mutual funds that have the best returns and that belong to all the different categories of bond mutual funds that we identified. Similar conclusions are reached in the equity mutual funds as indicated by previous research on developed markets (Wilcox, 2003).

There are a number of clues indicating that the risk involved in each bond mutual fund is an important factor influencing inflows/outflows of capital. The first is the SDRET variable, that incorporates the risk inherent in a mutual fund, which has a marginally negative estimator. The importance applied to risk factors is also evident from the estimated results for the Sharpe ratio variables and the alpha coefficient variables. Models 16 and 17 show a positive relationship between flows and weighted returns, based on the criteria we imposed when calculating the weighted returns, with the exception of those mutual funds that are at the end of the distribution of returns. Overall, the weighted returns have an important role in the inflows/outflows of capital, underlying the basic role of risk related factors in investment decisions.

When investigating the influence of commissions in inflows/outflows of capital it is found that they have a significant impact in flows and returns. Previous evidence (McLeod and Malhotra, 1996) shows that in the US market a one percent change in the commissions charged by bond mutual funds could result in a 1 million dollars outflow of

capital. It is also shown that investors are positively affected by the so called 12b-1 charges, which correspond to promotion expenses performed by bond mutual funds. This is probably due to the fact that investors view positively such expenses as they attract new flows of capital and they show proactive action on the part of the fund managers. These results make evident the need to study the impact of buying/selling commissions as well as operating and promotion expenses separately. These data though, apart from the buying/selling commissions, are not readily available by data banks.

There is further evidence that emphasizes the influence of commissions on investment decisions. Bond mutual funds that invest 30-50 percent of their assets in corporate bonds have significant outflows of capital when they charge higher commissions than bond mutual funds that invest mainly in government bonds. Commissions and risk issues in general, appear to be important factors in the investment decisions of investors in bond mutual funds given the fact that the upside potential of bond funds is small compared to equity mutual funds. Therefore, especially for big investment portfolios, differences in commissions determine flows, since even small changes can affect decisively overall returns of a category of investments that on average offers single figure returns to investors.

The OBJECTIVES variable has a positive influence on inflows/outflows of capital since the ability to switch between funds belonging to the same fund management company, is an alternative that is valued highly, especially during periods of continuous changes in money markets. This is indicative of the fact that investors view investments in mutual funds in general as part of a diversified investment strategy, where the ability to switch between funds of different investment objectives with no or limited cost is important. Flows of capital show autocorrelation since flows of capital with time lags are statistically significant and positive factors in the flows of capital. Autocorrelation is smaller the further back we move, as the estimators with two and three time lags are significantly smaller than the ones with one time lag.

It should also be noted that the above mentioned conclusions do not apply for the total data set. This is because our data set was tested, on different regressions, relative to the four different categories of bond funds identified previously, depending on the weighting of different categories of bonds in their portfolio.

The hypothesis is that some factors that have statistically significant results for the total sample might not have equally as important results when estimating the different categories of bond mutual funds. More specifically, bond mutual funds that invest heavily in corporate bonds have stronger risk-returns characteristics since investors especially in this category of bond funds are more risk loving at least compared to investors in bond funds with a strong government bond portfolio who are more risk averse.

Previous work, by Goetzmann et al., (2003) as well as Agnew and Balduzzi (2003), among others, concludes that investors in bond funds often make investment adjustments between different investments as it was also found in our results indicated by the positive estimators of the OBJECTIVES variable. Extending their findings it is speculated that

stock market returns could be a statistically significant explanatory factor of inflows/outflows of capital in bond funds. It is attempted to capture this influence by including in the model a variable referring to the Greek stock market returns, separately for each one of the four categories of bond portfolios, that was identified previously. We use a time series of returns data from the Athens Stock Exchange General Index as the most suitable measure of stock market returns in Greece. Using three monthly returns data of the Greek General Index during the previous 8 quarters the GGI8QT variable is constructed. This variable is included in the 15 – 16 - 17 models. In Tables 2, 3 and 4 the results of these models are presented, when using the risk weighted returns, the Sharpe ratio returns and the BONDEX index returns respectively (see below).

With regard to the hypotheses outlined above, the impact of equity market returns in inflows/outflows of capital is statistically significant and negative. This applies for all categories except for Category 4, namely the bond mutual funds that invest heavily in foreign, government and corporate, bonds. The above mentioned finding is indicative of the fact that investors treat investments in bond mutual funds as an alternative to equity investments during periods when equity returns are negative or stock markets experience fluctuations. When extending our analysis to stock market returns in the previous quarter solely and not in the previous eight quarters of stock market returns, it is found that this negative relation still applies only for the bond mutual funds that invest over 90% of their portfolio in government bonds. This is characteristic of the fact that only this category of bond funds is considered to be an alternative to equity market investments when equity returns are marginal or present losses.

Some factors appear to affect all categories of bond mutual funds. More specifically, flows of capital with time lag influence positively flows of capital in all models. Risk weighed returns have a strong impact on flows of capital in all models as well. The LOWP and HIGHP variables are not statistically significant irrespective of the category of bond funds that we estimate, indicative of the fact that investors are neither lured by high returns funds nor punish though low returns portfolios.

Certain variables have a steady influence on the flows of capital in all but one category of bond portfolios. Investors are positively affected by absolute returns except when using the sample of the Category 4 bond portfolios that invest over 50% in foreign bonds, where the influence of absolute returns is minimal and non significant. The magnitude of the assets under management has a negative influence on the flows of capital in all categories but Category 4 bond portfolios where it appears to be positive and statistically significant. This probably happens because especially for Greek investors the alternative of investing into foreign bonds, government and corporate, is a relatively new opportunity and also because of the limited historical data. Hence, investors feel more secure when investing in the major players in the market, that hold the most significant portfolios.

Table 2: Factors determining cash flows in bond mutual funds, based on their investment objectives

Variables	Category 1	Category 2	Category 3	Category 4
ASSET (t-1)	-6,142*** (0,000)	-11,256*** (0,000)	-5,129*** (0,000)	3,481*** (0,000)
FLOW (t-1)	0,312*** (0,000)	0,254*** (0,000)	0,303*** (0,000)	0,397*** (0,000)
FLOW (t-2)	0,212*** (0,000)	0,184*** (0,000)	0,195*** (0,000)	0,249*** (0,000)
FLOW (t-3)	0,157*** (0,000)	0,126*** (0,000)	0,083*** (0,000)	0,199*** (0,000)
LOWP (t-1)	-0,025 (0,204)	0,085 (0,352)	-0,056 (0,185)	0,048 (0,367)
MIDP (t-1)	0,024* (0,045)	0,036* (0,039)	0,125 (0,087)	0,088 (0,109)
HIGHP (t-1)	-0,036 (0,307)	0,113 (0,119)	-0,047 (0,128)	0,049 (0,098)
AGE (t-1)	-0,012*** (0,000)	0,026** (0,015)	-0,027* (0,039)	0,018* (0,042)
TURNRATIO (t-1)	0,009*** (0,002)	0,002** (0,012)	0,058 (0,179)	0,043 (0,218)
SDRET (t-1)	0,125 (0,364)	0,119 (0,284)	-0,187 (0,099)	-2,236*** (0,000)
OBJECTIVES (t-1)	0,125 (0,249)	0,167** (0,015)	0,218* (0,037)	0,187 (0,369)
WASET (t-1)	0,928*** (0,0001)	1,116*** (0,000)	0,855*** (0,001)	0,740*** (0,000)
GGI8QT (t-1)	-0,087** (0,015)	-0,075** (0,019)	-0,055** (0,026)	-0,026* (0,046)
CDUMMY	-0,139*** (0,000)	-0,149*** (0,000)	-0,089* (0,039)	-0,123 (0,161)
INTERCEPT	-0,919 (0,318)	1,215 (0,455)	-1,857 (0,377)	-0,761 (0,197)
Overall R²	0,2783	0,3254	0,3379	0,3980

Notes: Apart from the variables referred previously the table depicts the estimated results for the GGI8QR variable that represents the Athens Stock Exchange returns during the previous eight quarters. The rest of the estimated variables were analysed in Tables A1 and A2. Category 1 includes mutual funds that invest over 90% of their managed assets in government bonds, Category 2 for those that invest 10-30% in corporate bonds, Category 3 for bond mutual funds investing 30-50% in corporate bonds and Category 4 for those investing over 50% of their assets in corporate bonds of foreign origin mainly. p statistics are given in brackets. ***, ** and * are indicative of results with 1, 5 and 10 percent statistical significance respectively.

Table 3: Factors determining cash flows in bond mutual funds, using the Sharpe ratio

Variables	Category 1	Category 2	Category 3	Category 4
ASSET (t-1)	-6,356*** (0,000)	-10,268*** (0,000)	-5,849*** (0,000)	4,502*** (0,000)
FLOW (t-1)	0,311*** (0,000)	0,250*** (0,000)	0,302*** (0,000)	0,394*** (0,000)
FLOW (t-2)	0,213*** (0,000)	0,184*** (0,000)	0,194*** (0,000)	0,247*** (0,000)
FLOW (t-3)	0,155*** (0,000)	0,126*** (0,000)	0,081*** (0,000)	0,200*** (0,000)
LOWSRATIO (t-1)	0,036* (0,055)	0,032** (0,021)	-0,026* (0,045)	0,022** (0,019)
MIDSRATIO (t-1)	0,034* (0,042)	0,029* (0,039)	-0,127 (0,149)	0,038 (0,119)
HIGHSRATIO (t-1)	0,031* (0,020)	0,015** (0,017)	-0,021* (0,039)	0,019* (0,028)
AGE (t-1)	-0,015*** (0,000)	0,025** (0,013)	-0,024* (0,045)	0,015* (0,042)
TURNRATIO (t-1)	0,011*** (0,001)	0,005** (0,016)	-0,033 (0,134)	-0,054 (0,211)
OBJECTIVES (t-1)	0,124 (0,233)	0,165** (0,014)	0,214* (0,035)	0,193 (0,381)
WARET (t-1)	0,931*** (0,0000)	1,115*** (0,000)	0,854*** (0,000)	0,742*** (0,000)
GGI8QT (t-1)	-0,077** (0,015)	-0,065* (0,014)	-0,049** (0,016)	-0,035* (0,041)
CDUMMY	-0,130*** (0,000)	-0,122*** (0,000)	-0,085** (0,017)	-0,112 (0,110)
INTERCEPT	-0,854 (0,303)	1,195 (0,449)	-1,131 (0,472)	-0,545 (0,143)
Overall R²	0,2789	0,3248	0,3381	0,3988

Notes: The estimated variables were analysed in Tables A1 and A2. Category 1 includes mutual funds that invest over 90% of their managed assets in government bonds, Category 2, those that invest 10-30% in corporate bonds, Category 3 the bond mutual funds investing 30-50% in corporate bonds and Category 4 those investing over 50% of their assets in corporate bonds, of foreign origin mainly. p statistics are given in brackets. ***, ** and * are indicative of results with 1, 5 and 10 percent statistical significance respectively.

Table 4: Factors determining cash flows in bond mutual funds, using the a coefficient

Variables	Category 1	Category 2	Category 3	Category 4
ASSET (t-1)	-6,230*** (0,000)	-10,271*** (0,000)	-5,482*** (0,000)	3,959*** (0,000)
FLOW (t-1)	0,313*** (0,000)	0,252*** (0,000)	0,301*** (0,000)	0,395*** (0,000)
FLOW (t-2)	0,210*** (0,000)	0,183*** (0,000)	0,194*** (0,000)	0,250*** (0,000)
FLOW (t-3)	0,158*** (0,000)	0,127*** (0,000)	0,083*** (0,000)	0,198*** (0,000)
LOWA (t-1)	0,033* (0,051)	0,024** (0,019)	-0,022* (0,048)	0,021** (0,014)
MIDA (t-1)	0,032* (0,047)	0,029* (0,033)	-0,139 (0,150)	0,052 (0,166)
HIGHA (t-1)	0,028* (0,045)	0,016** (0,018)	-0,019* (0,036)	0,018** (0,024)
AGE (t-1)	-0,010*** (0,001)	0,023** (0,013)	-0,025* (0,035)	0,021* (0,047)
TURNRATIO (t-1)	0,005*** (0,000)	0,001*** (0,002)	-0,039 (0,203)	-0,055 (0,299)
OBJECTIVES (t-1)	0,123 (0,250)	0,161** (0,016)	0,217* (0,037)	0,191 (0,312)
WARET (t-1)	0,925*** (0,0001)	1,113*** (0,000)	0,854*** (0,000)	0,741*** (0,000)
GGI8QT (t-1)	-0,101*** (0,003)	-0,072** (0,015)	-0,067** (0,021)	-0,041** (0,013)
CDUMMY	-0,127*** (0,000)	-0,123*** (0,000)	-0,082* (0,033)	-0,082 (0,159)
INTERCEPT	-0,313 (0,412)	1,323 (0,298)	-1,627 (0,307)	-0,790 (0,186)
Overall R²	0,2784	0,3257	0,3378	0,3984

Notes: The estimated variables were analysed in Tables A1 and A2. Category 1 includes mutual funds that invest over 90% of their managed assets in government bonds, Category 2 for those that invest 10-30% in corporate bonds, Category 3 for bond mutual funds investing 30-50% in corporate bonds and Category 4 for those investing over 50% of their assets in corporate bonds, of foreign origin mainly. p statistics are given in brackets. ***, ** and * are indicative of results with 1, 5 and 10 percent statistical significance respectively.

The importance of each variable and the nature of its influence on the flows of capital varies depending on the different categories of bond mutual funds, underlying the importance of investigating each model – variable and category of bond mutual funds separately in order to draw definite conclusions useful to academics and market participants alike.

Flows of capital are positively influenced by high mean gross returns as indicated by the positive MIDP variable, although this is not the case in Category 3 and 4 bond mutual funds. In these categories gross returns do not appear to influence flows. Yet, Category 1 and 2 bond mutual funds hold bond portfolios with more similar characteristics, making gross returns a more easy to estimate measure of the fund managers abilities, hence gross returns being a statistically significant factor. Categories 1 and 2 of bond mutual funds are also the ones which are most influenced by the commissions variable. This happens because the homogeneity of the bond portfolios in these categories makes more evident the possible differences in returns arising from different commissions charged. Commissions play a crucial role in flows of capital into bond mutual funds in Category 4 as well, which might be attributed to the fact that these funds have high operating costs and commissions when buying/selling shares in the fund. Hence, investors find differences in costs that affects their investment decisions.

Investors in Category 4 bond mutual funds are not affected by absolute returns, whereas risk weighted returns play an important role due to the volatility in this category of bond investments. It is comprehensible therefore that these markets, experiencing volatility due to the existence of corporate bonds in their portfolio as well as high risk government bonds among others, are prone to potential defaults and hence differences in returns from year to year. Past returns therefore are not considered indicative of future returns, the risk therefore being the basic factor that determines investment decisions of shareholders.

Another important diversification factor between the identified categories of bond funds is the potential opportunities for switching between funds of different investment objectives within the same investment management firm, as measured by the OBJECTIVES variable. Investors in Categories 1 and 2 appreciate highly the capability to make portfolio reallocations within the same management firm since especially these low risk categories of investments, are usually treated as part of a diversified portfolio that bears investment weightings depending on the conditions in the market. Therefore, when conditions in equity markets or other high risk investment categories are positive, investors are tempted to have a larger weighting in these high risk investments in their overall investment portfolio. In contrast, they increase their weighting in fixed or low income investments, like Category 1 and 2 bond mutual funds, when high risk investments are at their peak risk conditions. Investors in Categories 3 and 4, however, which have a larger proportion of corporate bonds, that inherently have larger risks, view these investments as a potentially more specialized investment strategy, where it is more unlikely that they might be interested in making frequent switches between funds within

the same investment management firm. It is also true though that this finding can be attributed to the fact that the invested capital in Categories 3 and 4 is considerably smaller compared to Categories 1 and 2, which makes it more rational that a bond fund shareholder might not be eager to make portfolio reallocations depending on the market conditions, exactly because his invested capital is small with regard to the total portfolio that he holds.

3. Conclusion

To sum up, there was an investigation of the factors that influence inflows/outflows of capital in bond mutual funds, both when using the whole sample of bond mutual funds that operated in the Greek market within the period 1997-2005, as well as for the sub-samples of bond funds belonging to each one of the four categories that were identified, depending on their portfolio structure of government bonds, Greek and foreign and corporate bonds.

Investors in bond mutual funds do not consider high mean returns as an important factor driving their investment decisions, which is a major difference in the determinants of flows of capital between bond and equity markets. However, the risk weighted returns are an important determinant of cash flows. Flows in mutual funds investing heavily in government bonds are affected by commissions charged by fund managers, avoiding those bond funds that charge high commissions. On the contrary, investors in bond funds that have a large proportion of corporate bonds, are not affected by commissions and operating costs. Investors also direct their capital to bond funds with small assets under management, in spite of the common belief that only large funds attract inflows of capital, with the exception of bond funds that invest in corporate bonds, where the size of the potential fund appears to be an important factor determining investment decisions.

Greater attention to risk issues is demonstrated by those that invest in corporate and foreign bonds, since all the alternative measures of weighted returns are statistically important, while it is also found that those investing mainly in government bonds regard this investment as part of an integral and diversified investment strategy, where reallocations are not scarce. Investors in government bonds increase their positions when equity markets experience losses, resorting to investment safe havens. This is more evident during periods that the markets experience short term losses and not as intense when this is extended into longer periods of time. In the latter cases positions in bond funds appear to be part of a long term investment strategy.

Overall, after the detailed analysis in this paper, we claim that bond mutual funds in small developed markets represent an investment category that should be further analysed, both because of the size of assets under management as well as of the potential differences in investment behaviour as depicted in our findings. The latter is found when analyzing the whole sample of Greek bond mutual funds but also when estimating the

four different categories of bond mutual funds as identified, depending on the weightings in government and corporate bonds, Greek and foreign.

Useful extensions of this research should include the composition of expenses charged to shareholders in bond mutual funds, whether they refer to commissions for entrance/exit in mutual funds, management or/and promotion expenses. This remains of extreme importance due to the fact that returns on average are relatively small compared to investments in equity, rendering the expenses issue very significant, since they reduce net returns. In more advanced markets, like the US market, this information is readily available to investors and academics, therefore being able to determine the reasons that affect net returns more easily, thus enabling market transparency and equal information opportunities to market participants.

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Appendix

Table A1: Correlations of the variables affecting flows of capital in bond mutual funds

	FLOW	PFLOW	ASSET	RAW	SRATIO	AGE	TURNRA TIO	SDRET	OBJECTIVES
PFLOW	0,132*** (0,000)								
ASSET	-0,175*** (0,000)	-0,075*** (0,000)							
RAW	0,045*** (0,000)	0,037*** (0,000)	0,015*** (0,000)						
SRATIO	0,128*** (0,000)	0,112*** (0,000)	0,084*** (0,000)	0,358*** (0,000)					
AGE	-0,138*** (0,000)	-0,196*** (0,000)	0,481*** (0,000)	0,009 (0,284)	0,015** (0,045)				
TURNRATIO	-0,013** (0,034)	0,068*** (0,000)	-0,049*** (0,000)	0,018*** (0,000)	0,048*** (0,000)	-0,014*** (0,000)			
SDRET	-0,011** (0,029)	0,024 (0,589)	-0,004** (0,039)	0,089*** (0,000)	-0,028*** (0,000)	-0,058*** (0,000)	0,084*** (0,000)		
OBJECTIVES	-0,045*** (0,000)	-0,067*** (0,000)	0,185*** (0,000)	-0,026*** (0,000)	-0,069*** (0,000)	0,095*** (0,000)	-0,067*** (0,000)	0,028*** (0,000)	
WARET	0,068*** (0,000)	0,039*** (0,000)	0,006 (0,782)	0,426*** (0,000)	0,364*** (0,000)	0,016** (0,029)	0,018 (0,089)	-0,063*** (0,000)	-0,035*** (0,000)

Notes: ASSET is the total assets under management of each portfolio. RAW is the gross 3-month return of each portfolio. SDRET depicts the standard deviation of monthly returns of each portfolio in the context of the last 12 months. SRATIO is the Sharpe Ratio result as a measure of the returns above the risk free rate on a monthly basis divided by the standard deviation of returns. FLOW measures the flows of capital in absolute figures, calculated as the difference in total assets beyond possible profits/losses or capital raised as a result of mergers/acquisitions. PFLOW measures percentage flows and is calculated as the rate of increase in assets as a result of inflows/outflows of capital. TURNRATIO which measures the movement between mutual funds of similar characteristics. AGE which shows the time since establishment of each bond portfolio. OBJECTIVES which represents the available opportunities of moving between mutual funds with different investment objectives within the same fund management company. WARET is the weighted average of gross returns of all bond mutual funds with similar investment goals. p statistics are given in parenthesis. *** and ** are indicative of 1 and 5 percent significance level respectively.

**Table A2: Estimated factors determining inflows/outflows
of capital in bond mutual funds**

Variables	Capital Flows			Percentage Flows		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
ASSET/LASSET (t-1)	-5,523*** (0,000)	-5,486*** (0,000)	-5,366*** (0,000)	-5,462*** (0,000)	-5,128*** (0,000)	-5,039*** (0,000)
FLOW/PFLOW (t-1)	0,345*** (0,000)	0,329*** (0,000)	0,321*** (0,000)	0,058*** (0,000)	0,051*** (0,000)	0,045*** (0,000)
FLOW/PFLOW (t-2)	0,178*** (0,000)	0,169*** (0,000)	0,173*** (0,000)	0,002 (0,782)	0,005 (0,691)	-0,003** (0,022)
FLOW/PFLOW (t-3)	0,074*** (0,000)	0,068*** (0,000)	0,075*** (0,000)	0,003* (0,045)	0,001* (0,049)	0,000 (0,895)
LOWP (t-1)	-0,015 (0,582)			0,045 (0,178)		
MIDP (t-1)	0,024*** (0,000)			0,022*** (0,000)		
HIGHP (t-1)	-0,009 (0,748)			0,048** (0,009)		
LOWSRATIO (t-1)		-0,055 (0,135)			0,189*** (0,000)	
MIDSRATIO (t-1)		0,025*** (0,000)			0,029*** (0,000)	
HIGHSRATIO (t-1)		0,137*** (0,000)			0,145*** (0,000)	
LOWA (t-1)			-0,008 (0,680)			0,105*** (0,000)
MIDA (t-1)			0,033*** (0,000)			0,029*** (0,000)
HIGHA (t-1)			0,088** (0,014)			0,109*** (0,000)
AGE (t-1)	-0,007 (0,366)	-0,003 (0,487)	-0,006 (0,287)	-0,012*** (0,000)	-0,014*** (0,000)	0,009*** (0,000)
TURNRATIO (t-1)	-0,003 (0,381)	-0,002 (0,104)	-0,009 (0,175)	0,004*** (0,000)	0,008*** (0,000)	0,007*** (0,000)
SDRET (t-1)	-0,158 (0,207)			-0,128 (0,132)		
OBJECTIVES (t-1)	0,087*** (0,000)	0,094*** (0,000)	0,097*** (0,000)	0,085* (0,079)	0,073* (0,068)	0,077** (0,032)
WARET (t-1)	0,485*** (0,000)	0,548*** (0,000)	0,576*** (0,000)	0,519*** (0,000)	0,536*** (0,000)	0,542*** (0,000)
CDUMMY	-2,354*** (0,000)	-2,289*** (0,000)	-2,175*** (0,000)	-2,894*** (0,000)	-2,729*** (0,000)	-2,953*** (0,000)
INTERCEPT	0,684 (0,589)	0,482 (0,294)	0,045 (0,188)	-10,594*** (0,000)	-11,257*** (0,000)	-11,947*** (0,000)

Notes: In order to study the factors affecting fund flows in bond mutual funds we utilize the estimations of the model below, using the available sample of bond mutual funds.

$$\begin{aligned} FLOW_{i,t} = & \alpha + \beta_1 ASSET_{i,t-1} + \beta_2 FLOW_{i,t-1} + \beta_3 FLOW_{i,t-2} + \beta_4 FLOW_{i,t-3} \\ & + \beta_5 LOWP_{i,t-1} + \beta_6 MIDP_{i,t-1} + \beta_7 HIGHP_{i,t-1} + \beta_8 AGE_{i,t-1} + \beta_9 TURNRATIO_{i,t-1} \\ & + \beta_{10} SDRET_{i,t-1} + \beta_{11} OBJECTIVES_{i,t-1} + \beta_{12} WARET_{i,t-1} + \beta_{13} CDUMMY_{i,t-1} + u_i + \varepsilon_{i,t} \end{aligned}$$

The ASSET variable represents the assets under management of each bond mutual fund. Variable RAW calculates the mean 3-month returns of each portfolio. Variables LOWP, MIDP and HIGHP calculate the returns of each portfolio relative to the mutual funds with similar characteristics, and they refer to the ranking of each portfolio in the normal distribution, as being in the low tails, middle, or high tails of the distribution respectively.

The SDRET variable calculates the standard deviation of monthly returns of each portfolio in a context of 12 months. The SRATIO variables offers the results based on the Sharpe Ratio, as a measure of the incurred risk. It is calculated as the mean monthly returns above the returns of the zero risk fixed interest investments in the last 12 months divided by the standard deviation variable. Variable FLOW measures flows of capital in millions of euros, and is calculated as the difference in total assets under management above the possible profits achieved by the fund manager and potential inflows as a result of mergers/acquisitions. The PFLOW variable measures percentage flows and is calculated as the percentage increase/decrease of flows as a result of inflows/outflows of capital respectively. When PFLOW is used, the dependent variable used as an alternative is the LASSET variable as the natural logarithm of ASSET. Respectively instead of the variables used for FLOW with time lags, the respective variables of PFLOW with time lags are used, to capture the time lags effects of ASSET/LASSET respectively. TURNRATIO measures the movements between bond mutual funds with similar characteristics. OBJECTIVES measures available alternative investment opportunities within the same fund management firm, while AGE measures the years since establishment for each bond fund in our sample. WARET is the weighted average of mean gross returns of all bond funds in our sample with similar investment objectives, while CDUMMY is a dummy variable measuring the impact of commissions on flows.

Furthermore, as indicated in model 16, variables LOWSRATIO, MIDSRATIO and HIGHSRATIO with time lags are used, as a measure of the risk weighted returns. Also variables LOWA, MIDA and HIGHA estimators, as described in model 17, are given. p statistics are given in brackets, while ***, ** and * are indicative of 1, 5 and 10 percent significance level respectively.

Multicriteria Evaluation of National Entrepreneurship In Newly EU Countries

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Abstract

When evaluating entrepreneurship at the national level, the influence of small and medium-sized enterprises (SMEs) on the state economic development is analyzed. Also, the impact of significant factors (goods and services competitiveness, innovations, diversification, clusterization, creating social value, etc.) on SMEs working effectiveness (respectively improving the entrepreneurial efficiency) is investigated. When focused on the national economic competitiveness as a general criterion, the principles and models for consolidated quantitative estimation of national entrepreneurship development level are applicable for newly admitted EU countries (on account of some of their specific factors). The results of assessing the entrepreneurship level in 2009-2010 and the nearest future are presented in this study using Lithuania's data as a typical case. The multicriteria estimation process includes the identification and expert examination, in addition to quantifiable assessment of essential primary indicators. Moreover, the pillar indexes underlying them and entrepreneurship development index using the significance parameters of primary indicators are determined by the authors. The relative impact of the different primary and partial criteria is taken into account by calculation of the integrated criterion-level index, which allows us to evaluate more adequate differences in newly EU countries. To improve the (World Economic Forum) WEF methodology, the authors are using various, not predetermined, weights of primary indicators, also indexes of performance and propose a more adequate differentiation of significances for the pillars. The complex evaluation of the primary indicators influencing business may be used for the strategic solutions reasoning.

Keywords: Competitive Advantage, Entrepreneurship Level, Primary Indicators, Competitive Pillars, Quantitative Assessment, Multicriteria Methods

JEL Classification: C82, L52, O22

1. Introduction

The increase in competitive advantage is the strategic priority of the economic development in the newly EU member countries. The transformation processes in general are an important part of the economic development of a country with a small open

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economy, also of business macroenvironment as well as enhancing entrepreneurship development oriented to the advanced growth. The significance of the investigation and estimation of the indigenous entrepreneurship development level as well as the predicting future trends in different developing countries - EU members may be emphasized in few aspects. The expanding of the state economic competitiveness is one of its strategic tasks when designing and evaluating acceptability of the national entrepreneurship development strategy. The favourable factors of business macro surrounding, on the one side, substantially influences the growth of national economy. On the other side, the research of these factors is important for the business entities so as to reveal premises to avoid the threat of growing environmental dynamism and new competitive abilities of particular business. The formalization of the macro surrounding components is the basis for the complex quantitative evaluation.

The entrepreneurship development has also to be analysed in the context of a country's integrated competitive advantage, in particular, on basis of the country's competitiveness index according to the World Economic Forum (WEF), which determines the so-called competitiveness pillars (The Global Competitiveness Report, 2009). They include many significant primary and integral advantage indicators which determine the level of state entrepreneurship development. Especially important accents are the establishment and accumulation of dominant advantages and application of their totality (Hao, 1999). They can be interconnected with competitiveness of the goods and services what is one of the most important of SMEs marketing functions and the significant stage in enterprise marketing research (Smith, 2003; Porter, 2008). In this case, important are the interconnections between the competitiveness level and financial stability of the sectoral enterprises (Allen, Gale, 2004).

The researchers accented mostly the entrepreneurship development at the state level in view of SME activities' impact on the country's economy. SMEs working effectiveness (with a view to activating integrative processes and dynamic changes of entrepreneurship development) is important since they create the significant part of the GDP in the newly EU states. The investigations of the corruption impact and other institutional factors on the national economic growth were also performed for some selected transitional economies (Yusuf, Ngomori, 2002; Gries, Naude, 2010). Other papers deal with aspects of entrepreneurship and SMEs development in the context of the key factors affecting countries in the specific region (Fairbairn, 2006).

Nonetheless, much entrepreneurship studies are fragmentary and focused narrowly on the essential aspects of entrepreneurship, according to our opinion and opinion of some other authors (Anderson, Starnawska, 2008). The published research investigated how the SMEs were integrated into the holding structure, the processes of related diversification and internationalization, also the integration of activities as well as the separation of closely linked activities that improve the entrepreneurial efficacy (Lechner, Leyronas, 2009; McGee et al., 2009). The latter studies analysed the impact of clusterization on the development of SMEs in order to employ its advantages (Capello, 1999).

The various theoretical aspects of SMEs innovations were also analysed in the empirical studies (Avlonitis, Salavou, 2007). The growing attention has to be attributed to

the influence of intellectual property (Buracas, 2007), to the efficiency of social capital employment and risk management. The corporate social responsibility (CSR) in business (entrepreneurship) strategy is revealed as of high priority when measuring the created social value (in Lithuania - Krisciunas, Greblikaite, 2007).

To summarize, it is insufficient to focus the empirical research on the problem of complex investigation and the assessment of entrepreneurship development at national level, revealing its priority aspects. It is important to evaluate more adequately the differences in the newly EU countries, to apply estimated rather than predetermined weights of primary indicators, and the more adequate differentiation of significances levels for the (Primary Indicators) PI and their pillars. The same opinion is expressed by other researchers: "Most competitiveness indicators aggregate primitive data using predetermined fixed weight values that are applied uniformly to all countries. The use of fixed and uniform weights may bias inferences of relative performance since it ignores that countries can have different policy priorities or lack inherent capabilities on some dimensions" (Bowen, Moesen, 2009).

The theoretical framework and empirical point of view, first of all for solving the problem were defined on basis of the general evaluation criteria and determined by a totality of essential PIs (Zvirblis, Buracas, 2009). Besides, this totality of PIs has to be structured by specific attributes, adopted for the particular newly EU countries and formalized for the quantitative evaluation oriented towards development of public management systems, also in other EU economies. This study is focusing on the principles of the consolidated multicriteria estimation of the national entrepreneurship development in the newly EU economies and the comprehensive approach to influence on the economic competitiveness (by applying the reasoned multicriteria evaluation methods on the basis of the models designed for this particular task).

2. Conceptual Provisions of Entrepreneurship Level Estimation

2.1 Basic Conceptual Provisions

The conceptual theoretical principles of the state's entrepreneurship development and the estimation models are determined by such general parameters as a dynamism, progressivity, and efficiency of the activity, potential. More importantly, the new value-added creation and competitive magnitude of goods and services are proposed to be included into the investigation of the various entrepreneurial characteristics affecting the behavioural efficiency of SMEs. The competitive entrepreneurship is considered to be a totality of the components characterized by a great multitude of quantitative indexes and qualitative indicators as variables which have to be included into the complex evaluation of the economic competitiveness. It is important to measure its influence on multiaspect balancing between the entrepreneurship efficiency and its social aspects. The estimation principles are designed for this purpose on the basis of modern management theories, also continuing examination methods.

The applicability of complex quantitative assessment methods, the conceptual principles for evaluation of socioeconomic impact on the enterprising and the basic models of the complex quantitative evaluation were developed, compared with the previous publications. The consolidated estimation of entrepreneurship level index must also follow these general principles: PI may be analogically grouped (5-7 indicators) for these purposes and the indices of every group have to be determined. The variety of these components (groups, pillars) describing the essential PI (enhancing or minimizing the competitive priorities) also determines the required quantitative evaluation methods (Zhang, Yang, 2001; Ginevicius, Podvezko, 2008). An assessment may comprise the scenarios interpreting the government macroeconomic policy trends, also the variants of perspective national economic development. After all, only this evaluation (with applying quantitative methods and algorithms) may be incorporated into the computerized system of public sector management which is just formed for the purposes of strategic decisions in newly EU countries.

The groups (pillars) of PI determining the level of entrepreneurship may be composed according to the so-called global competitiveness pillars used by the WEF and integrating the institutional, goods' market efficiency, business sophistication and innovation indicators. However, the analysis of the entrepreneurship development level in transitional economies suggested to include additionally many other important indicators according to their different impact on resumptive measure of its expanding, at last for some newly countries - members of the EU. So, e.g., the important indicators not accounted by the WEF experts are as follows: the procedures and time for starting business, the activity of associated structures, the procedures of the controlling institutions and the sufficiency of competitive financial facilities. The reasonable idiosyncratic pillars of PI determining level of the entrepreneurship as a totality are also the competitive advantage indicators for goods and services, the transformation indicators for goods and services' markets and SMEs working effectiveness indicators; they were selected by the expert way. Besides, it is possible to include the additional primary indicators for those pillars of PI what would be actual for different countries as well as to add some additional pillars. It is expected that a given quantitative evaluation methodology (compatible with qualitative (SWOT) analysis, also with scenario method) will be a useful methodical tool. The importance of the research is in the using of *different*, not predetermined, weights of primary indicators and in the adequate differentiation of pillars' significances.

2.2 Promising Multicriteria Evaluation Methods

The quantitative evaluation of the entrepreneurship development level may be based on principles of the conceptual solution of analogous social tasks. The perspective multicriteria methods of the quantitative evaluation are suggested to be reviewed in the first place as best applicable to the tasks solved below and by character of those tasks. In particular, it is preferred to apply SAW (Simple Additive Weighting), COPRAS

(COMplex PROportional ASsessment) and TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) methods as the most widespread (Hwang, Yoon, 1981; Parkan, Wu, 2000; Zhang, Yang, 2001; Saaty, 2001; Zapounidis, Doumpos, 2002a, 2002b; Dombi, Zsiros, 2005; Ginevicius et al., 2008; Turskis, 2008; Ginevicius, Podvezko, 2009). The application of the multicriteria evaluation methods requests to formulate the adequate valuation criteria system.

The SAW method is especially applicable for the compound evaluation of substantially different primary criteria (both having quantitative and qualitative parameters to be measured) and determining the integral measure (the last one can be used also as subcriterial measure on different level). The choice is determined by the moment that this method is suitable in case all factors are independent in the system and when their interaction with the integral measure is not important (as observed in the case study). By using the SAW method, the significance of every factor is measured, because the system must finally involve only these factors (criteria) that meet the essential level of significance (Ginevičius, Podvezko, 2009). The sum of significance coefficients of all factors (criteria) in the group must be equal to 1 (or 100%), therefore, it is permitted to differentiate them by significance (however, the system of unvaried significance criteria can also be applied) and use the adapted software. The SAW method in this investigation (when evaluating entrepreneurship as a system) is applied to estimate the PI pillars mentioned above (as some partial criteria) and to determine the generalized value (the entrepreneurship development level).

2.3 Technique of Quantitative Assessment

The calculated indexes (in points) of indicator pillars and estimated entrepreneurship development level were evaluated within 100 point system. The essence of the suggested assessment technique is the quantifiable expert examination of all essential PI: 50 point corresponds to medium evaluation, higher levels – to good or very good (more than 70 points) evaluation, and lower levels – to weak or bad (less than 30 points) evaluation. PI, the impact of which enhances the competitive disadvantage, are evaluated below 40 points and do not have negative values. The indicator significance parameter (in the non-dimensional expression) values was determined by the expert's way. Expert examination procedure must be implemented applying the widely known concordance methods (including coefficients W , their significance parameters χ^2 a/o) and W , χ^2 formulas (Kendall, 1979). As a result of the identification, the PI with determined significance levels in the outcome was listed according to every pillar. The procedure evaluating the PI values and their significances is a *first* (of three) stage quantitative assessment. In summary, the process of the consolidated estimation of the entrepreneurship development level using justified multicriteria SAW method (on basis developed backgrounds models) included the *following* stages:

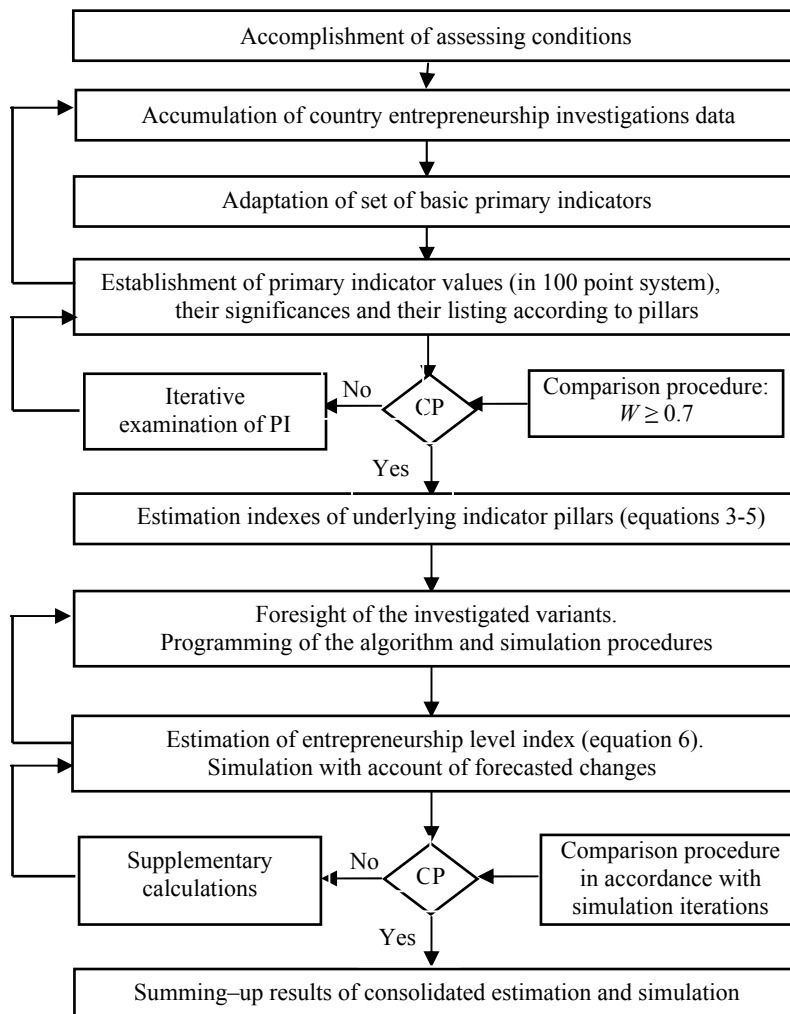
quantifiable (in points) expert examination of identified PI (as primary criteria) significances and listing the determinative PI according to the underlying pillars on this basis;

quantitative (multicriteria) assessment of determinative indicator pillars (as a partial criteria in evaluation system) and determination of the pillar weights (according to their influence on generalized measure);

estimation of generalized measure – the entrepreneurship level index (as an integrated criterion) on basis of the determined partial criteria and their weights.

As it is shown, the reliability of multicriteria method application is limited by the results of expert evaluations of the primary indicators.

Figure 1: Principal Scheme of the Estimation Algorithm of Entrepreneurship Level



So, the computer-generated multicriteria estimation process (schematically shown in Fig. 1) reveals that the various significance parameters (weights) of the primary and partial criteria are taken into account by the calculation of integrated criterion. Its main features are as follows: the appliance of national entrepreneurship data, the algorithmisation of estimation procedures (on basis of special means), the presentation of resulting findings. Every procedure of estimation process is adequate to scheme 1: expert examination of PI (presented in detail in 3.1), determination of the pillar indexes (equations (3-5) below), and, later, estimation of entrepreneurship level index (according to the equation (6) as below). According to the various scenarios and entrepreneurship development parameters, the consecutive simulation is applied by iteration procedures.

This algorithm is rather universe and it allows to choose the different (by stages mentioned above) conditions not only in the newly EU countries but also in other countries of different level of the development using the adequate data bases.

The viability of the presented evaluation system is determined also by the fact that this quantitative evaluation technique may be applied even for the establishment of main parameters of business development strategy.

2.4 Background Models

The background models applicable for the countries of different economic development level were developed by the authors with orientation to the conceptual provisions approved above. Their adaptation is presented in the case of Lithuania (see in the section 3.2). In general, the PI pillar level index $T_i(I)$ (as partial criterion for estimation of the generalized measure - entrepreneurship level index) may be calculated by using the formula:

$$T_i(I) = \sum_{j=1}^m p_{ij} R_{ij}; \sum_{j=1}^m p_{ij} = 1, \quad (1)$$

where p_{ij} – significance parameter of j -th PI at i -th selected pillar, R_{ij} – value (in points) of j -th listed determinative PI (m – number of listed PI at i -th group).

The consolidated entrepreneurship level index $L_a(I)$ may be estimated after determining the indexes (values) of all partial criteria and their weights as follow:

$$L_a(I) = \sum_{i=1}^n k_i \sum_{j=1}^m p_{ij} R_{ij}; \sum_{j=1}^m p_{ij} = 1, \sum_{i=1}^n k_i = 1, \quad (2)$$

where k_i – weight (determined by expert way) of partial criterion $T_i(I)$ according to their direct impact on the entrepreneurship level $L_a(I)$; n – number of PI pillars.

The total amount of PI (their m groups) or n pillars in particular is determined by the complexity of the evaluation according to the formulated tasks and conditions of the valuation. The alternative directions of enterprising development and the monitoring of

their development programs are simulated taking into account the forecasted changes. The pillars mentioned before are presented in detail below.

2.5 Typical Primary Indicators Selected by Underlying Pillars

The expanded set of typical PI is selected preliminary (on basis of accomplished analytical investigation and SWOT analysis) and arranged according to the previous approach. The indicators of the *first* pillar of competitive advantage for goods and services (as level of their competitiveness) are such as their quality, up-to-date (to high-tech criteria), also suitability to export, and capacity for innovations. The indicators of *second* pillar of transformation for goods and services markets indicators include PI, as transparency of competition, means of government promotion, level of legal regulation, level of markets infrastructure. The *third* pillar of SMEs working effectiveness indicators is focusing on export share, marketing sophistication, diversification parameter, and appliance of social and intellectual capital. The set of typical PI is presented in the Table 1, however only the identified PI would be included, those with sufficient significance, by establishing the partial criteria. Some of them, such as diversification level, export share, outsourcing spread, may be measured quantifiable besides the qualitative evaluation, however their integrated measurement is preferred within a unified point system.

3. Estimating Lithuania's Entrepreneurship Development Level

3.1 Expert Examination of Determinative Primary Indicators

Lithuania's entrepreneurship development level assessment presented below permits the investigation (as well as using SWOT analysis and derivative quantifiable indices, corresponding to the assessed PI) of the typical PI (Table 1) determining the underlying pillars. Adequate to Lithuania's situation in 2009-2010 elaboration measurement system provided taking into account to results of quantifiable expert examination (as were indicated, according to 100 points evaluating system) of the identified PI and their significance coefficients by the competent professional expert group (7 experts: 3 –from business research and 4 - bank macroeconomics analytics). The significance of the identified PI in the preliminary investigation was evaluated in the task of establishment of determinative PI by every pillar; in the outcome, they were listed (as the number of the determinative primary criteria by pillars $n \leq 7$ can be seen in Table 3) and the average significances for listed PI were established. Later, the determinative PI were valuated (in points) concerning both 2009-2010 (I) and the nearest future (II) in Lithuania entrepreneurship development. It was pursued that the null hypothesis would be correct in the case under review for the any PI values and significance tests exceptionally performed by experts. The procedure of rejection of the best and worst evaluations of every indicator was also applied, for the elimination of any possible inadequate influence of any extreme expert opinion to the final evaluation results.

Table 1: The underlying pillars of the typical primary indicators (not ranked)*

The name of a pillar	The essential indicators of a pillar
<i>1. Competitive advantage indicators for goods and services</i>	1.1.Level of goods and services competitiveness 1.2.Production of high-tech goods 1.3.New value-added creation 1.4.Export of high-tech goods 1.5.Capacity for goods and services innovation 1.6.Innovations in production 1.7.Value chain breadth 1.8.Development of competitive derivative services 1.9.Sufficiency of competitive financial facilities 1.10.Other indicators (by the situation)
<i>2. Transformation indicators for goods and services markets</i>	2.1.Level of legal regulation 2.2.Means of government promotion 2.3.Transparency of the competition 2.4.Tariff barriers 2.5. Impact of bureaucracy spread 2.6.Level of markets infrastructure 2.7.Procedures and time necessary for starting business 2.8.Procedures of the controlling institutions 2.9.Spread of shadow economy 2.10.Spread of e-commerce 2.11.Other indicators (by the situation)
<i>3. SMEs working effectiveness indicators</i>	3.1.Diversification level 3.2.Marketing sophistication 3.3.Activity of associated structures 3.4.Corporate social responsibility 3.5.Export share 3.6.Cluster formation breath 3.7.Appliance of social and intellectual capital 3.8.Spread of lobbyism 3.9.Outsourcing spread 3.10.Business expenses resulting from racket 3.11.Legal rights of shareholders 3.12.Other indicators (by the situation)

The Table was composed by the authors.

*Additional pillars can be added in the following research stages depending on the particular tasks of the expert examination.

The consensus and the necessary reliability of evaluation (taking into account the calculations of the applied expert opinion compatibility) is usually achieved when the statistical values of main reliability parameters $W=0.65-0.8$ and concordance coefficient significance χ^2 related to pre-selected significance level α determining the confidence interval. The χ^2 test statistic is basically the sum of the squares of the differences between the observed and expected frequencies, with each squared difference divided by the corresponding expected frequency. In our case the values of the concordance coefficient W amounted to 0.66 – 0.74 (for PI values - 70 percent of $W>0.7$; for PI significance - 60 percent of $W>0.7$) so they did not exceed the marginal values in the tables (Kendall, 1979). The concordance coefficient significance parameter χ^2 is acceptable (taking into account the widely accepted marginal values) by the pre-selected level $\alpha= 0.05$ and by $\alpha= 0.01$ (in detail it is shown in Table 2).

Table 2: Expert Examination Reliability Parameters for Determinative Primary Indicators by Pillars

Pillar and number of primary indicators	Concordance coefficient W		The values W significance χ^2 and min $[\chi^2]$		
	For primary indicators	For significance coefficients	De facto	$[\chi^2]$ as $\underline{\alpha}= 0.01$	$[\chi^2]$ as $\underline{\alpha}= 0.05$
Pillar (F); $n=6$	0.74	0.70	24.50 >	15.086	11.071
Pillar (E); $n=6$	0.72	0.68	23.80 >	15.086	11.071
Pillar (S); $n=7$	0.69	0.66	27.72 >	16.812	12.592

The results of evaluation of the determinative PI and their significance as well as the weights of partial criteria are given in Table 3.

3.2 The Equations to Be Applied

For the case of Lithuania and other newly EU countries, the background model (1) can be adopted for the measurement of indexes of established pillars mentioned before (taking into account the determinative PI and their significance coefficients). The pillar indexes were calculated (Table 3) on the basis of equations below for 2009-2010 and in the nearest future.

To estimate the level index $F(I)$ of competitive advantage indicators for the goods and services (as the first partial criterion), the equation (3) was applied:

$$F(I) = \sum_{i=1}^{i=p} a_i F_i; \sum_{i=1}^{i=p} a_i = 1, \quad p=6, \quad (3)$$

Where a_i – the significance coefficient of direct impact of primary indicators F_i (level of goods and services competitiveness, production of high-tech goods, new value-added creation, capacity for goods and services innovation, etc.) on the level index $F(I)$.

To estimate the level index $E(I)$ of the transformation indicators for goods and services markets (as the second partial criterion), the following equation (4) was applied:

$$E(I) = \sum_{i=1}^{i=n} b_i E_i; \sum_{i=1}^{i=n} b_i = 1, \quad n=6, \quad (4)$$

Where b_i – the significance coefficient of direct impact of primary indicators E_i (means of government promotion, level of legal regulation, level of market infrastructure, impact of bureaucracy, transparency of the competition, etc.) on level index $E(I)$.

To estimate the level index $S(I)$ of SMEs working effectiveness indicator (the third partial criterion), the equation (5) was applied:

$$S(I) = \sum_{i=1}^{i=m} c_i S_i; \sum_{i=1}^{i=m} c_i = 1, \quad m=7, \quad (5)$$

where c_i – the significance coefficient of direct impact of primary indicators S_i (innovations in production, export share, diversification parameter, marketing sophistication, activity of associated structures, appliance of social and intellectual capital, etc.) on level index $S(I)$.

On the basis of common expression (2) the equation for establishment Lithuania's entrepreneurship development level $L_a(I)$ is detailed:

$$L_a(I) = k_1 F(I) + k_2 E(I) + k_3 S(I); \sum_{i=1}^3 k_i = 1; \quad (6)$$

where k_1 , k_2 and k_3 – the weights of direct impact of partial criteria $F(I)$, $E(I)$, $S(I)$ on level index $L_a(I)$.

When applying the similar equation system for other newly EU countries, the peculiar determinative PI and their number have to be taken into account on the basis of additional expert evaluations.

Table 3: The Results of Assessment of Lithuania Entrepreneurship Level Index

<i>Indicator pillars and determinative indicators</i>	<i>Conditional marking</i>	<i>Assessment (in points)</i>		<i>Averaged significances and weights</i>
		I	II	
<i>Pillar of competitive advantage indicators (of goods and services)</i>	F			$k=0.4$
Level of goods and services competitiveness	F_1	42	52	$a=0.22$
Capacity for goods and services innovation	F_2	45	49	$a=0.18$
Production of high-tech goods	F_3	33	43	$a=0.16$
New value-added creation	F_4	43	54	$a=0.16$
Sufficiency of competitive financial facilities	F_5	39	46	$a=0.15$
Export of high-tech goods	F_6	36	49	$a=0.13$
<i>Level index</i>	F (I)	40	49	
<i>Pillar of transformation indicators for goods and services markets</i>	E			$k=0.3$
Means of government promotion	E_1	52	46	$b=0.24$
Level of legal regulation	E_2	45	53	$b=0.19$
Level of market infrastructure	E_3	41	44	$b=0.15$
Impact of bureaucracy	E_4	39	46	$b=0.15$
Transparency of the competition	E_5	41	45	$b=0.14$
Procedures and time necessary for starting business	E_6	43	48	$b=0.13$
<i>Level index</i>	E (I)	43	47	
<i>Pillar of SMEs working effectiveness indicators</i>				$k=0.3$
Innovations in production	S_1	42	48	$c=0.19$
Export share	S_2	48	52	$c=0.17$
Marketing sophistication	S_3	48	57	$c=0.16$
Diversification parameter	S_4	42	51	$c=0.15$
Appliance of social and intellectual capital	S_5	38	47	$c=0.13$
Activity of associated structures	S_6	51	58	$c=0.10$
Cluster formation breadth	S_7	39	42	$c=0.10$
<i>Level index</i>	S(I)	44	51	
Consolidated entrepreneurship level index	La(I)	42	49	

3.3 Results of Estimation of Lithuania Entrepreneurship Level

The final results of calculations of partial criteria indexes, on the one side, Lithuania's entrepreneurship development level for 2009-2010 (I) and its nearest future (II) values, on the other (Table 3), may be interpreted in the following way. The values of indexes for all pillars were at comparable medium levels: for the pillar of SMEs working effectiveness indicators– 44-51 points, the pillar of transformation indicators for goods and services markets - 43-47 points and pillar of competitive advantage indicators for goods and services - 40–49 points.

The problematic primary indicators are production and export of high-tech goods, appliance of social and intellectual capital, impact of bureaucracy. The amelioration of some low scored primary indicators (excluding means of government promotion) is expected in the future. At the same time, the activity of associated structures valued as good, the procedures and time for starting business and the sufficiency of competitive financial facilities are at lower level.

At last, Lithuania's entrepreneurship development level can be evaluated respectively 42 (I) and 49 (II) points (irretentive evaluation) and that means its level is lower than middle in newly EU countries. These results are some additive marks for the directed sustainable development of national entrepreneurship system by growing competitive advantage in the context of macroeconomic country's development perspectives; they may be useful as well for the associated business structures interested in evaluation forecasting the surrounding factors.

The amelioration of some low scored primary indicators as the production and export of high-tech goods and the appliance of social and intellectual capital (excluding means of government promotion) are expected in the future. When simulating the effects of challenges, these results may be used for determining some indicators of the entrepreneurship development strategy and/or for *ex-post* multivariate analysis. The computer simulation is possible according to the process presented in Fig. 1 when evaluating the real changes monitored, for evaluation of the consequences of the financial crisis, also the alternative scenarios of the entrepreneurship development at national level.

4. Conclusions and Suggestions

1. The investigations and estimation of the entrepreneurial transformations processes in the newly EU members are important when validating the strategic economic development decisions determining the country's integrated competitive advantages. However, the previous theoretical publications mostly concerned the specific problematic aspects of entrepreneurship development, not complex approach to its evaluation. The important indicators for newly EU countries not included by the WEF are as follows: the procedures of the controlling institutions, the activity of associated structures, and the sufficiency of competitive financial facilities.

2. According to the comprehensive approach to the different impact of multiple factors on the presumptive measure of the entrepreneurship development, its consolidated assessment is preferred for analysis of newly EU members based on various indicators, on adaptable theoretical basis and sophisticated methodological tools. The principles of the quantitative multicriteria evaluation on basis of background models applicable to consolidated estimation of a generalized criterion – the level index were designed by the authors and adapted for these countries.

3. The core of the reviewed sophisticated estimation principles is the three-stage evaluation system: the joint application of quantifiable expert examination of the primary indicators, quantitative evaluation of the underlying pillars' level and consolidated assessment of the national entrepreneurship development level. The pillars of competitive advantage indicators of goods and services, of transformation indicators for goods and services markets, indicators of SMEs' working effectiveness are named as most appropriate. The assessment algorithm of entrepreneurship level is rather universal and allows us to select different conditions not only in the newly EU countries but also in other countries of different development level using adequate data-bases, to review the plausible scenarios of its development.

4. The promising quantitative multicriteria evaluation methods may be expediently applied to those tasks. The Simple Additive Weighting method is suitable for measurement of every primary indicator pillars and for determining the integrated entrepreneurship development level index that accounts for the significance of both the primary and partial criteria. The authors are using different, not predetermined, weights of primary indicators and propose a more adequate differentiation of significances for the pillars. However, the reliability of multicriteria method application is limited by the results of expert evaluations of the primary indicators.

5. The results of consolidated estimation of the entrepreneurship level in Lithuania (in 2009-2010 and in the nearest future) show that its index is equal 42 to 49 points, i.e. medium significance. The level indices of underlying pillars vary from 40 to 51 points (e. g., the goods and services' competitiveness pillar have comparatively less favorable level index: it scored respectively 40 points for 2009-2010, and 49 points for the nearest future; the pillar of transformation indicators for goods and services markets scored similarly 43 and 47 points). The activity of associated structures are valued as good, but the procedures and time for starting business and the sufficiency of competitive financial facilities are at lower level.

The research methodology is also applicable to a wider assessment of the entrepreneurship development strategies in the newly EU countries, more particularly the evaluation of the consequences of the financial crisis.

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Economic Returns and Risks to Investment in Education: An Application of the Multifactor CAPM

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Abstract

Considering the investment in education as uncertain financial decision making we modify the short-cut method of calculating rates of return to education by incorporating the risk premium. Recognizing that market risk isn't the only factor affecting returns, we estimate the returns to education in fifteen member - states of the European Union and the Organisation for Economic Co-operation and Development during the period 2005 – 2007 as seen from a macroeconomic point of view using Multifactor CAPM.

Following this model we assess, except market risk, the impact of three key macroeconomic variables (investments, productivity and unemployment) on returns and, using panel data regression techniques, we investigate whether this holds true with respect to investment in education. We also evaluate the risk – adjusted performance of investment in education and the role of returns as well as that of the key macroeconomic variables to economic development. The results tend to confirm the theoretical expectations and empirical literature.

The purpose of the present study is twofold: first, to estimate the relationship between education returns and risk and second to measure the impact of return and key macro factors on real GDP growth rate, therefore casting light in the channels through which the economic growth can be affected.

Keywords: CAPM, Human Capital Theory, GMM

JEL Classification: I22, G11, C23

1. Introduction

The study intends to assess the profitability of investing in education and the trade-off relationship between risks and return in education in the framework of the Multifactor Capital Asset Pricing Model. Regarding education as an investment on human capital (although human capital includes education, health, and aspects of “social capital”, the

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main focus of the present study is on education) we deal with education, the stock of competences, knowledge and personality attributes gained by a worker according to his level of education, the same way as the financial assets (i.e. stock market). Therefore, education, like asset portfolios, comprises a wide range of assets, where each individual selects the specific asset that matches his preferred amalgam of risk and return in terms of future income..

Considering the education as an asset portfolio, we looked at individual returns on education. We take into account not only the direct gains and costs in money terms according to short – cut method (Psacharopoulos, 1992), but also the aspect of unemployment as a constituent element of risk premium i.e. the additional economic gains an individual may have by investing on their higher education level¹.

The subject of returns to investment in education, in the modern / human capital sense of the term, has been discussed broadly and estimated since the late 1950s. Since the human capital revolution, economists have viewed education as an investment as well as consumption good. In the 50 - plus year history of estimates of returns to investment in education, there have been numerous reviews of the empirical results in attempts to validate patterns (see, Psacharopoulos, 1973; 1985; 1994; 2002).

The computation of rates of return and their usage in educational planning and policy making is generally conducted within the framework of human capital theory, which, since its formulation, has drawn attention to the importance of economic considerations in educational decision making both at private and social level.

On the other hand, it is remarkable and it must be taken into account that human capital theory does not examine uncertainty and risk in its return function in depth. The empirical evidence on the importance of uncertainty is still emerging. However, most of the papers suggest a substantial role for uncertainty in producing ex post returns.

Relatively little is known about the properties of human capital returns despite the vast amount of evidence suggesting the importance of human capital to the structure and evolution of earnings, employment, productivity, fertility, and economic growth; Rosen (1987), Becker (1993)².

Based on our present knowledge there are only few papers that investigate the risk - return trade - off on human capital investments in a way similar to ours. Palacios - Huerta (2003c) bring to light that frictions on human capital markets help explain the risk - adjusted return on human capital. Palacios - Huerta (2003a) uses mean - variance spanning tests to compare the properties of the returns to various human capital assets by comparing the efficient frontier in the mean - variance space spanned by a subset of assets to that spanned by all assets. For example, human capital assets of white males are

¹ Investment of money may come from the individual, the public or private sector or a combination of both. Gains can be measured in terms of increased job opportunities and higher wages.

² On top of that, human capital has a dominant position in the aggregate wealth portfolio. Becker (1993) estimates the value of human capital to be three to four times the combined value of stocks, bonds, and other assets.

compared to those of white males and white females in order to examine whether the mean - variance trade - off would be more favourable had the choice set been extended. He finds a wide diffusion in the return per unit of risk for distinctive human capital assets.

The main purpose of this paper is to shed more light on the risk - return trade - off in human capital investment as estimated from the available dataset. Drawing upon national data from 15 European countries (Austria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Hungary, Spain, Sweden, Slovakia and the UK), in the first part, the study examines the trends concerning returns and risk on tertiary and secondary education as well as their impact on the labour market in terms of the levels and dispersion of inequality in wages, taking into account some key macro variables. In the second part, the impact of return to investment in education and specific macro factors on real GDP growth rate is tested, in an attempt to shed light in the channels through which the economic growth can be affected.

Thus, the mainstream literature about the fundamentals of financial economics approach to the risk - return trade - off according to the CAPM, the meaning of human capital and the estimation methods of return and systematic risk to human capital investments are presented in section 2. Then, methodological issues and the concept of the approach employed in the design and implementation of various empirical tests are included in section 3. The empirical results are presented in section 4. In section 5 a brief introduction is followed by the literature review and the results. The last section constitutes a summary: the results of empirical tests confirm the theory.

2. Literature Review

2.1 The Fundamentals of Financial Economics Approach to the Risk-Return Trade - off

The empirical analysis is based on the mean - variance model of Markowitz (1952) because it is widely accepted and very helpful in studying human capital assets (Christiansen, Joensen and Nielsen, 2006). The well - known Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965) is a popular generalization of the mean - variance model, which is often applied to portfolio analysis in financial economics.

The CAPM builds on the model of portfolio choice developed by Harry Markowitz (1959). In Markowitz's model, an investor selects a portfolio at time $t-1$ that yields a stochastic return at time t . The model assumes investors are risk averse and, when choosing among portfolios, they care only about the mean and variance of their one - period investment return. Therefore, investors choose "mean - variance efficient" portfolios, in the sense that the portfolios: 1) minimize the variance of portfolio return given expected return, and 2) maximize expected return given variance. Thus, the Markowitz approach is often called a "mean - variance model." The portfolio model supplies an algebraic condition on asset weights in mean- variance efficient portfolios.

The CAPM turns this algebraic statement into a testable prediction about the relation between risk and expected return by identifying a portfolio that must be efficient if asset prices are to clear the market of all assets.

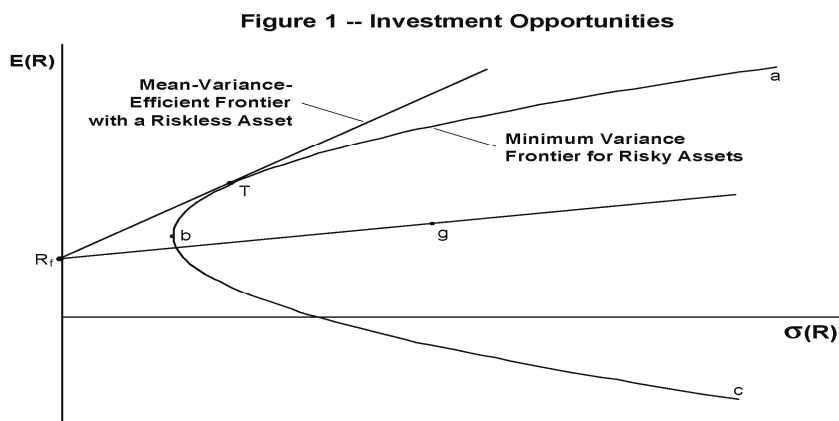
Sharpe (1964) and Lintner (1965) add two key assumptions to the Markowitz model to identify a portfolio that must be mean - variance efficient. The first assumption is *complete agreement*: given market clearing asset prices at $t-1$, investors agree on the joint distribution of asset returns from $t-1$ to t . In addition, this distribution is the true one, that is, it is the distribution from which the returns are drawn in order to test the model. The second assumption is that there is *borrowing and lending at a risk free rate*, which is the same for all investors and does not depend on the amount borrowed or lent. In general form, CAPM states that

$$E(\tilde{r}_i) = r_f + \beta_i \cdot [E(\tilde{r}_m) - r_f] \quad (1)$$

or, in words:

The relation of expected return and beta is linear. Beta suffices to explain differences in returns among securities or portfolios. The expected return of an asset or portfolio with zero beta is r_f . The expected return of an asset or portfolio with beta one is the same as the expected return on the market.

Figure 1 describes portfolio opportunities and tells the CAPM story. The horizontal axis shows portfolio risk, measured by the standard deviation of portfolio return; the vertical axis shows expected return. The curve *abc*, which is called the minimum variance frontier, traces combinations of expected return and risk for portfolios of risky assets that minimize return variance at different levels of expected return. (These portfolios do not include risk free borrowing and lending). The trade - off between risk and expected return for minimum variance portfolios is apparent. For example, an investor who wants a high-expected return, perhaps at point *a*, must accept high volatility. At point *T*, the investor can have an intermediate expected return with lower volatility. If there is no risk free borrowing or lending, only portfolios above *b* along *abc* are mean - variance efficient, since these portfolios also maximize expected return, given their return variances (adding risk free borrowing and lending turns the efficient set into a straight line).



Source: Fama and French, 2004

Within the framework of CAPM there is an attempt to examine the impact of some key macro factors and risk on the profitability of investment in education according to the spirit of Human Capital Theory.

2.2 Estimation Methods of Return and Systematic Risk to Human Capital Investments

Human Capital Theory, the most significant economic theory of Western education traces its roots in the work of British economists Sir William Petty (1623 - 1687) and Adam Smith (1723 - 1790). More recently (1960's decade) it was extensively developed by American economists Gary Becker (1930 -) and Theodore Schultz (1902 - 1998). According to them Human Capital Theory can be defined as the stock, the portfolio of individual knowledge, the capability and the skills that are economically profitable or, in other words, bring in economic returns. So, education is a particular production factor and a specific kind of capital.

The standard approach assumes that the individual invests an amount of time and effort in education and then the return is visible in terms of enhanced future earnings. The returns to human capital literature focuses on certain mean parameters. The estimation methods (the short - cut method, the reverse cost – benefit method, the earnings function method or “Mincerian” method with refinements and adjustments) make little difference on the returns to education despite the rise in earnings inequality experienced during the 1980s and 1990s. Earnings inequality in many countries leads to renewed interest in estimates of returns to schooling. Murphy and Welch (1992) document the alternating pattern of education premiums, increasing in the 1960s, narrowing in the 1970s, and rising sharply in the 1980s. They attribute the cause of increased premiums to relative demand shifts, yet highlight the role of relative supply from the entry of the well-educated baby boom cohort in the 1970s that led to the narrowing of education premiums.

A more selective rate of return estimate review focusing on the causality debate between schooling and earnings (Card, 2001) restates Griliches' (1970) conclusion that the effect of ability and related factors does not exceed 10% of the estimated schooling coefficient. Instrumental variable (IV) estimates of the returns to education based on family background are higher than classic OLS (Ordinary Least Squares) estimates (based on Mincer - Becker - Chiswick). The finding that the IV estimates exceed the OLS estimates may arise because the instruments are based on policy interventions that affect the educational choices of people with low levels of education (Card, 2001). A second explanation of the larger IV in comparison to OLS estimates is that the schooling variable contains random measurement error, which leads to a downward bias in the OLS estimates. As long as the instruments for schooling are not correlated with this error, the IV procedure eliminates this bias (Card, 1999; 2001). A third explanation is that there may be spillover effects in the sense that the health outcome of an individual depends on the average schooling of individuals in their area as well as on his own schooling or that of his parents (Acemoglu, 1996; Acemoglu and Angrist, 2000). Currie and Moretti (2003) show that IV estimates of this combined effect based on area - level instruments are consistent with it, while OLS estimates understate it.

While estimation methods of return to investment in education have been modified and developed over the years, estimation methods of risk have been examined less thoroughly despite the fact that expenditure on training and education is costly and the returns are uncertain. Becker (1962) was the first to remark that investment in human capital declines with age. Apparently, due to the fact that younger workers earn the returns to education over a longer period, the investment risk increases with age, which implies that older workers discount future earnings with higher discount rate (Zucker, 1967). Briefly, by looking at risk - return trade - off from the microeconomic point of view, reducing marginal returns and growing marginal costs lead to an optimal amount of human capital investment which is inversely related to age (Mincer, 1970). However, human capital investment may not monotonically fall off with age if the aggregate human capital is comparatively specific than general. While profitability of general skills depends on the length of working life, the profitability of specific skills only depends on the expected duration of the current job (Bartel and Borjas, 1977). Other studies, for example Carneiro et al. (2001), Harmon et al. (2001), distinguish between the level and the years of education and incorporate uncertainty in Mincer's Model (1974). As the human capital market includes a wide range of assets, i.e. educations, each individual is permitted to choose the assets that match their preferred combination of risk and returns in terms of future income without a priori limits and restrictions from factors like age or years of education.

Human capital has been termed as a specific sort of capital, a real asset investment because: it is sluggish (it only changes slowly), it may be depreciated, its current expenditures³ are exchanged with future returns and its accumulation affects earnings. It

³ Of course, expenditure for education does not only have a character of reproducible capital which produces return on investment, but it is also a component of consumption and contributes to the development of many socio-economic areas, (Araki, 1962).

is only distinguished from other real capital in that it cannot be sold, or mortgaged, or separated from its owner. Dissimilar equity investments, investing in a specific education is a binary choice variable: either you invest in a certain education or you do not. Moreover, this investment in education is irreversible: once you hold a certain education, you are not able to sell it again. Concisely and generally speaking, you can only exploit human capital by ‘renting’ it out, not selling it. Only two limitations characterize human capital compared to real capital; diversification and gearing⁴ disability. For example, gearing is not possible. By gearing it is meant that the investment cannot be scaled arbitrarily as arbitrage opportunities are done away with in financial markets.

Recently, such an argument has been used to consolidate uncertainty in human capital models. More specifically, the return to investment in education examined within the traditional framework either by allowing returns to education to be stochastic (Carneiro et al, 2001; 2003, and Harmon, Hogan and Walker, 2001) or estimating the risk compensation in incomes (Hartog and Vjiverberg, 2002). In fact, unlike the finance literature, it is not yet well - established considering risk and uncertainty in studies of return to human capital investments. In order to be able to explain why human capital theory does not examine uncertainty in its return function thoroughly we must keep in mind that human capital theory was developed before the tools of dynamic decision making under uncertainty were fully developed. Concepts that are central to human capital theory like the internal rate of return are not appropriate for the evaluation of investment programs under sequential resolution of uncertainty.

The absence of the dimensions of risk and uncertainty is apparent in the traditional methods of estimating rates of return. According to these methods, the private rate of return to an investment in a given level of education can be estimated by finding the rate of discount (r) that equalizes the stream of discounted benefits to the stream of costs at a given point in time. In the case of university education lasting n years the formula is:

$$\sum_{t=1}^n \frac{(W_u - W_s)_t}{(1+r)^t} = \sum_{t=1}^n (W_s + C_u)_t (1+r)^t, \quad (2)$$

where $(W_u - W_s)$ is the earnings differential between a university graduate (subscript u) and a secondary school graduate (subscript s , the control group) in length of time n periods (roughly equal to the potential working lifetime of a person). C_u represents the direct costs of university education (for example the cost of tuition, fees, books etc.) and W_s denotes the student’s forgone earnings or indirect costs. The streams of earnings and costs are considered certain through time. In a similar way, in the classic “Mincerian” (see Mincer, 1974) earnings function is given as:

$$\ln W_i = \alpha_0 + \alpha_1 S_i + \alpha_2 X_i + \alpha_3 X_i^2 + \varepsilon_i \quad (3)$$

⁴The gearing ratio measures the percentage of capital employed that is financed by debt and long term finance. Traditionally, the higher the level of gearing, the higher the level of financial risk due to the increased volatility of profits.

where $\varepsilon_i \sim N(0, \sigma^2)$ W_i denotes wages, X_i denotes years of experience, and S_i years of schooling. It is implicitly assumed that future earnings streams are perfectly certain. In this function, the a_1 coefficient (years of schooling) can be interpreted as the average rate of return to an additional year of schooling. Since $a_1 = (\partial \ln W / \partial S)$, this is the relative increase in wages following an increase in S , or the rate of return to the marginal year of schooling. This method assumes that forgone earnings represent the only cost of education, and therefore measures only the private rate of return, and assumes further that individuals have an infinite time horizon.

Experiments conducted to incorporate uncertainty in the return to schooling within the established Mincer (1974) framework provide empirical evidence that risk is indeed compensated resulting in a positive risk - return trade - off. More analytically, Carneiro, Hansen, and Heckman (2001) and Harmon, Hogan and Walker (2001) base their studies on random coefficients while distinguishing level or years of education. Additionally, focusing on levels of education, Palacios - Huerta estimated the return per unit of marginal risk, and found that it was higher for investment in human capital compared to financial capital, and higher for males than females. Hartog and Vjiverberg (2002) estimate risk compensation by using occupation - education cells, where education is measured in years. This is a proxy for detailed career choices, but in reality, the job-related choice follows completion of education. Utilizing education specific cells and applying a range of various risk measures, Diaz-Serrano, Hartog and Nielsen (2003) find a positive risk compensation for both permanent and transitory income shocks.

Pereira and Martins (2002), in a cross-country study estimate the return using equation (1). Risk is measured as the divergence in returns between the 90th and 10th percentile estimates from quantile regressions. This is an appropriate measure of income risk if individuals do not know where they will end up in the conditional income distribution before entering the labour market. The authors report a positive relationship between risk and return across countries. However, since we show that a lot of this income risk is predictable ex - ante by the type of education the individual is holding, this is not a suitable risk measure (Christiansen, Joensen and Nielsen, 2006).

Weiss (1972) applied the Mincerian coefficient of variation to correct the return to education across age and educational groups within a sample of scientists. Yet, the original Mincer (1974) model entertained the possibility that returns varied in the population. Chiswick (1974) and Chiswick and Mincer (1972) estimate variation in rates of return as a contributing factor to overall income inequality. Recent developments in the literature use rich panel data to estimate distributions of the response of earnings to schooling using the modern theory of econometric counterfactuals. They disclose substantial variability in ex post returns to schooling.

Several modifications have been added to the given framework. The return to education has been calculated using mainly the Mincer (1974) model taking the average annual income for workers within a given educational group and the systematic risk as the standard deviation of the annual income for workers within the same group. Then,

both the Markowitzian efficient frontiers as well as the Sharpien performance measure are transferred to the human capital investment problem.

3. Methodology

According to our present knowledge Psacharopoulos (1981) used the simplest method for calculating individual rates of return to education, the short-cut method. This method focuses on the net earnings differential at graduation and can be used with mean lifetime earnings (varying with different levels of education) without reference to age. The formula used to compute the rate of return to higher education is the following (Psacharopoulos, 1992):

$$r = \frac{E_h - E_s}{N(E_s + C_h)} \quad (4)$$

where E_h and E_s stand for the annual mean earnings of graduates of higher and secondary education respectively, C_h represents the direct annual cost of higher education and N refers to the number of years of the educational investment. This approximation of the rate of return is based on the assumption that discounted earnings over a long time period do not count much if discounted to the present. The short - cut method has the advantage that it can be used with already tabulated or summarised data on the earnings of workers (despite the fact that it does not take into account unemployment of groups of workers even if they have an identical level of education), thus making it unnecessary for individual earnings data to be provided (Psacharopoulos, 1981).

Nevertheless, a major weakness of the method is that it ignores the fact that age - earnings profiles are concave. Moreover, its focus on early earnings inevitably leads to less accurate rate of return estimates relative to other methods. Nonetheless, in our case, we study time series (2005 – 2007) using the average annual income of each educational level from Greece and other fourteen European countries – members of European Union (EU) and Organisation for Economic Co-operation and Development (OECD) within a group of workers at age between 18 and 64 years with the same educational level. The average annual net income was attributed to all workers reflecting the combined effect of employment, occupation, sector, and wage outcomes. Hence, the major weakness of the method is solved. In addition, the number of years of the educational investment is taken into account according to the official data from OECD for the average duration of tertiary studies (in years) in each country.

The precise sums of expense per student of Tertiary Education emanate also from OECD data. It is assumed that the total direct annual cost of higher education per country is a more representative and valuable indicator of estimated expenses. Unfortunately, there is no absolute accurate and precise indicator of total real expenses. It is well known that cost-sharing between participants in the education system and society as a whole is an issue under discussion in many countries. Moreover, at the tertiary level, students' living costs and precise foregone earnings can also account for a significant proportion of

the costs of education. All such expenditure outside educational institutions, even if publicly subsidised, is excluded from this indicator. Therefore, total direct annual cost of higher education per country could be considered as a proxy variable for cost.

We treat the investment in education as a process of decision making under risk and we present an approach for estimating a rate of return that takes into account not only earnings and cost but also a form of uncertainty. Decision making under risk can be viewed as a choice between future earnings prospects. A prospect $(\bar{w}_h, p_h; \bar{w}_s, p_s)$ is the annual labour that yields outcome \bar{w}_i with probability p_i , where $p_h + p_s = 1$. The value of each probability p_i , $(i = h, s)$, was calculated using the formula $p_i = \frac{E_i}{E}$ where E_i is the employment level corresponding to educational level $i = h, s$ and $E = E_h + E_s$.

In addition, we suppose that the investor is risk – averse, so dislikes risk and therefore will stay away from adding high-risk investments to his portfolio. Let $E[\bar{w}|z]$ denote the expected income, with given choice of alternative z . Let the individual risk aversion be described by a concave utility function say $U = \sqrt{w}$. Then a measure of individual risk premium⁵ is given by the difference: $\bar{w} - \tilde{w}$, where \bar{w} is the (unconditional) expected income, $\tilde{w} = \bar{u}^2$ is the certainty-equivalence income and $\bar{u} = p_h \sqrt{\bar{w}_h} + p_s \sqrt{\bar{w}_s}$ is the expected utility.

We modify the return formula by incorporating the risk premium (consistent with “excess return” in terms of CAPM):

$$r = \frac{E_h - E_s + (\bar{w} - \tilde{w})}{N(E_s + C_h)} \quad (5)$$

A measure of the systematic risk (representative of the “market risk” in terms of CAPM) comes from the Standard Deviation⁶ Formula:

$$\sqrt{(w_h - \bar{w})^2 + (w_s - \bar{w})^2} \quad (6)$$

This has been divided by the direct annual cost of higher education in order to be fully compatible with other data.

The CAPM as Mertens (2002) wrote is primarily a “model”. Its assumptions are not strived to give a precise description of reality, but to focus on what might be outstanding and workable features of real-world markets yielding a solid description of

⁵ It is generally agreed that investors demand a higher expected return for investment in riskier projects, or assets. However, as Jagannathan and Wang wrote in 1993 “we still do not fully understand how investors assess the risk of the cash flow on a project and how they determine what risk premium to demand”.

⁶ In finance, uncertainty and risk (represented by volatility) most commonly refer to the standard deviation of the continuously compounded returns of an asset within a specific time horizon. Standard deviation is used to quantify the risk of the asset over the specified time period.

asset prices. Like any other model, it should not be judged by the validity of its assumptions but by the accuracy of its prediction.⁷

CAPM uses a single factor, the market beta as an index, as a measure of systematic (not diversifiable, uncontrollable) risk. For empirical purposes CAPM is expressed as $R_i - r_f = \alpha + \beta_i \cdot (R_m - r_f) + u_i$ and the theory tells us that if the actual return is equal to required return (given risk) we should find $\alpha = 0$ (Jensen, 1968). Investors, however, are usually concerned with other risks that will affect their returns. In general, there are two types of systematic risks:

Static (temporal) - Market risk

Dynamic (intertemporal) - Changes in investment opportunities.

Investors demand to be rewarded for bearing both types of risks. So, we can add factors to the regression model to give a better r - squared fit⁸. In this spirit, we construct a model in order to explain the returns of investment in education from the macroeconomic perspective. In general, the returns to education using the macro approach are estimated by either (a) an aggregate production function explaining GDP of the type $Y = f(\text{conventional inputs, an education measure})$, or (b) an aggregate “macro-Mincerian” earnings function of the type $\ln Y = a + bS$, where the units of observation are individual countries, and Y and S are mean earnings and years of schooling within each country (Heckman and Klenow, 1998; Krueger and Lindahl, 2001). In our approach, a version of the CAPM derived by Robert Merton (1976), a multifactor CAPM⁹ that includes risks from three key macroeconomic variables (investment, productivity, unemployment, variables left out in other versions of the CAPM), are used as conventional inputs combined with risk (the measure of the systematic risk to return of the investment in education comes from the Standard Deviation Formula) in order to capture the cross - sectional variation in average returns. Multi-factor CAPM tries to model the two types of systematic risk and how these risks are priced. The macroeconomic variables are called factors, and in our case are included in the model for the estimation of risk-return trade - off to investment in education.

Practically the multifactor extension of the CAPM formula represents the mean return of an asset as a linear combination of the mean returns of several factors, not just a single factor (the market portfolio) as in the standard CAPM. The multifactor formula can be derived from equilibrium conditions similarly as in the standard CAPM, or,

⁷ Perhaps it is reasonable to say that assumptions may not be valid, but they should not be implausible either. In search for parsimonious models we need to make simplifications, but we should not assume away anything important. This is indeed a thin line where we tread on in order to improve our models if they fail to yield a satisfactory description of the world (Mertens, 2002).

⁸ The best - known approach like this is the three-factor model developed by Fama and French (1992).

⁹ The multifactor CAPM says that investors want to be compensated for the risk associated with each source of extra - market risk, in addition to market risk.

alternatively, it can be shown that it has to hold approximately in a model with many assets, in the absence of arbitrage¹⁰.

The multifactor CAPM is an attractive model since it recognizes that market risk is not the sole factor affecting returns. There are other factors besides market risks that affect returns, like macro variables. The prices of these factors with the market risks all together reflect the total risk premium. Unfortunately, it is impossible to identify all extra-market risks and to value each of these risks empirically.

The effect of some key factors and more specifically the significance of total investment, unemployment, and the rate of return to education, to growth rate of GDP volume (as percentage change on previous year) is also tested. Generalized Method of Moments (GMM) and Fama - MacBeth two - step panel regression are implemented to test the models empirically.

In addition, we measure the risk – adjusted performance of investment in education based on the Sharpe ratio (Sharpe, 1965). The Sharpe ratio is considered to be the standardized excess return above the risk - free return by the volatility:

$$\text{Sharpe ratio: } \frac{r_i - r_f}{\sigma_i} \quad (7)$$

The Sharpe ratio is a direct measure of the performance of a portfolio against risk over a given period of time. The Sharpe ratio also contributed to the systematization of the CAPM. Under certain assumptions, the Capital Asset Pricing Model suggests that the optimal risky portfolio (with the highest Sharpe ratio) must be the *market portfolio*. A higher Sharpe ratio indicates better historical risk - adjusted performance¹¹ and this is the important aspect of the Sharpe Index: this performance indicator takes the risk of the portfolio into consideration.

In the present case, in order to calculate the Sharpe ratio according to type (7), three figures are used; the average annual income r_i (as the computed percentage calculated with the modified short – cut method $r = \frac{E_h - E_s + (\bar{w} - \tilde{w})}{N(E_s + C_h)}$), the risk - free rate of return r_f (as the average of net replacement rates over 60 months of unemployment multiplied by the average annual income r_i) and the volatility which is used to quantify the risk of the investment in education over the specified time period. The volatility of the investment in education annual returns (annual returns according to the educational attainment) has been calculated by using the standard deviation formula $\sigma = \sqrt{(w_h - \bar{w})^2 + (w_s - \bar{w})^2}$ (a measure of the systematic risk) divided by the direct annual cost of higher education in order to be fully compatible with other data. Then, the

¹⁰ The latter is called the Arbitrage Pricing Model, or APT.

¹¹ Palacios – Huerta (2003a) notes that human capital assets tend to have higher returns and lower variances than financial assets, i.e. they have higher Sharpe ratios.

highest Sharpe ratio within the given period implies an efficient mean variance that represents better return per unit of volatility.

4. Empirical Results

4.1 Data

Data for fifteen European countries from official organizations are exploited and more specifically from the Organisation for Economic Co-operation and Development (*OECD*) and Euro stat for the years 2005 – 2007. We have taken into consideration data for Mean Income from graduates of Secondary and Tertiary Education aged between 18 and 64 years, the corresponding levels of unemployment. Also, the average duration of tertiary studies (in years), expenditure on educational institutions in tertiary education for all services per student and change in expenditure relative to different factors, real Gross Domestic Product (GDP) growth rate, total investment as percentage of GDP and labour productivity per annum and gross national savings have been examined as well.

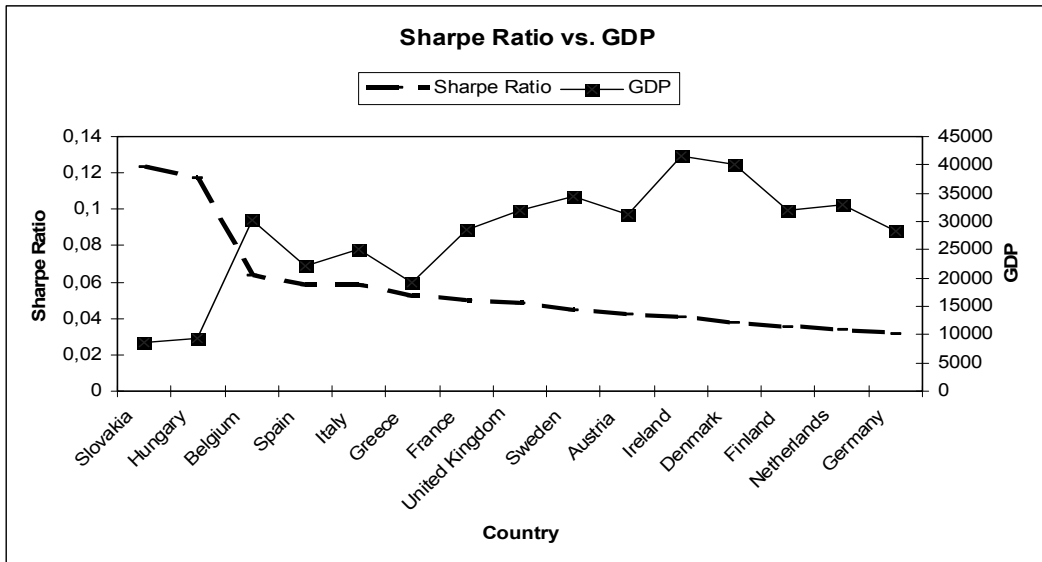
Sharpe Ratio

The results of Sharpe Index computation (at the descending ranking) are as Table 1 shows:

Table 1: Sharpe Ratio vs. GDP per Capita

Country	Sharpe Index	Average GDP per Capita (In Euro) (2005 - 2007)
Slovakia	0,12325251	8.533,33
Hungary	0,11714116	9.266,66
Belgium	0,06376327	30.166,66
Spain	0,05841812	22.200,00
Italy	0,05787501	25.200,00
Greece	0,0521011	19.100,00
France	0,04989531	28.533,33
United Kingdom	0,04845426	32.033,33
Sweden	0,04437287	34.433,33
Austria	0,04223162	31.133,33
Ireland	0,04070933	41.500,00
Denmark	0,03752129	40.000,00
Finland	0,03534716	31.866,66
Netherlands	0,03403426	33.033,33
Germany	0,03158489	28.300,00

Figure 2: Sharpe Ratio vs. GDP per Capita



The correlation coefficients (Pearson and Spearman) between Sharpe ratio and GDP per Capita are given below in Tables 2 and 3:

Table 2: Pearson's Correlation

		Sharpe Index	GDP per Capita
Sharpe Index	Pearson Correlation	1	-,856(**)
	Sig. (2-tailed)		,000
	N	15	15
GDP per Capita	Pearson Correlation	-,856(**)	1
	Sig. (2-tailed)	,000	
	N	15	15

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

Table 3: Spearman's Correlation

			Sharpe Index	GDP per Capita
Spearman's rho	Sharpe Index	Correlation Coefficient	1,000	-,689(**)
		Sig. (2-tailed)	.	,004
		N	15	15
	GDP per Capita	Correlation Coefficient	-,689(**)	1,000
		Sig. (2-tailed)	,004	.
		N	15	15

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

The results are compatible with the worldwide patterns. The classic pattern of negative relation between returns to education level and stage of economic development (reflecting on GDP per Capita) has been certified many times all around the world (see Psacharopoulos, 1994; Psacharopoulos and Patrinos, 2002).

In our case, even if we consider excess returns taking into account the systematic risk and evaluate historical risk - adjusted performance we reach at the same conclusion. Countries with lower level of development like Eastern European countries (Slovakia and Hungary) in comparison with Southern European countries (Spain, Italy and Greece) show better historical risk - adjusted performance of investment in education. The lower performance is recorded in the Central Western, Nordic and English - speaking Europe.

Belgium is a notable exception due to the duration of studies in Tertiary Education. Characteristically when the average duration of tertiary studies (in years) in countries – members of OECD is 4,11 years the respective duration in Belgium is 2,99 years (according to the official data of OECD). This is the reason why the Sharpe ratio in Belgium is much higher than the respective Sharpe ratio of countries with the same level of development.

More impressive are the similarities with the financial markets. Dimson, Marsh and Staunton (2010), bring into question the broadly held view that investing in countries that are achieving heavy economic growth will lead to higher investment returns. Markets predict economic growth, and looking at history, the return on investment in countries that have attained higher economic growth has expected to be slightly worse than the return on investment in countries with lower growth. The authors claim that this may be analogous to the value effect within stock markets, by which, historically, value stocks have achieved higher returns than growth stocks. Economic growth does, of course, matter, and the authors show that intuition and prediction about future economic growth would have been very profitable. They also demonstrate that, even though no one has the ability to predict stock returns from past economic growth, stock market returns are helpful in forecasting future economic growth.

4.2 Multifactor CAPM & Panel Data Estimation

Panel has the form X_{it} , $i=1,\dots,N$ & $t=1,\dots,T$ where i is the individual (country) dimension and t is the time (specific period) dimension. A general panel data regression model is written as $Y_{it} = a + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + u_{it}$. Different assumptions can be made on the precise structure of this general model. Two important models are the fixed effects model and the random effects model.

In our data set the number of time periods is smaller than the number of units ($T < N$), in other words the structure of our data set is such that the number of cross – section index i is much greater than the index of time series t . Therefore, we ignore a model specification with fixed effects. Furthermore, we examined the adequacy of model specification with random effects. To check the assumption of independence between random effects and explanatory variables, we employ the Hausman test (for discussion see, for example Wooldridge (2002), and Baltagi (2001). Therefore, we use the Hausman test to check whether the random model specification is adequate. The results are given below in the Table 4:

Table 4: Hausman Test

Correlated Random Effects - Hausman Test			
Equation: HausmanTest			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	8.212593	4	0.0841

Although we have found no support of the random effect model, since the exogenous macro variables are correlated, Ordinary Least Squares (OLS) estimations are inconsistent. To avoid this problem we are using GMM estimation method. Of course there is a dynamic version of the panel model, however in our case we did not use it since there are not enough degrees of freedom (number of time periods equals to three). The empirical results have been produced employing the Generalized Method of Moments¹² (GMM) with cross section weights (White covariance) to handle the heteroscedasticity problem. The results are given below in the Table 5:

¹² Modern macroeconomic models are typically based on the intertemporal optimization and rational expectations. The Generalized Method of Moments (GMM) is an econometric framework which allows estimating the parameters of such models. Generalized Method of Moments (GMM) improves over ordinary least squares or two stage least squares in the presence of heteroskedasticity of unknown form (Gragg, 1983) or neglected serial correlation (Wooldridge, 2001). For the application of GMM in Panel Data see Wooldridge (2002).

Table 5: GMM Estimation of Multifactor CAPM Model

Return = -0.000 + 0.117·Invest + 0.102·Productivity - 0.322·Unemployment + 0.073·Risk
(-0.15) (5.51*) (1.49) (-3.69*) (13.55*)
Determinant residual covariance 0.000116
J-statistic 0.397621
p - value 0.5283

Notes: t-values are presented in brackets below the regression coefficients. Coefficients marked * are significant at the 5 percent level. The coefficient covariances are White heteroscedasticity consistent. Generalized Method of Moments (cross-section weights) estimation method was applied for the data set covering the period 2005 - 2007.

The J - statistic is distributed as a chi-square and the null hypothesis of the test assumes the validity of the instruments (Davidson, and MacCinnon, 1993, p. 365). From the above table the p - value of the test indicates an acceptance of the null hypothesis supporting the validity of the instruments.

Next, we derive estimates of our model using the well known Fama – Macbeth approach. In general the Fama - Macbeth regression is a method used to estimate parameters for asset pricing models such as the CAPM. The method estimates the betas and risk premia for any risk factors that are expected to determine asset prices. The method works with multiple assets across time (panel data). Fama - MacBeth first interpreted the CAPM as implying a basic linear relationship between stock returns and market betas that should completely explain the cross - section of returns at a specific point in time.

In order to test the effectiveness of the CAPM in justifying that observed cross - sectional variability of returns, Fama - MacBeth designed and implemented a basic two-step regression procedure that eventually survived the first set of empirical results generated to become a standard approach in the field of finance. The procedure is as follows: In the first step, for each single time period a cross - sectional regression is performed. In other words, first each asset regresses against the proposed risk factors to determine that asset's beta for that risk factor. Then, in the second step, the final coefficient estimates are obtained as the average of the first step coefficient estimates or, in other words, regress to all asset returns for a fixed time period against the estimated betas to determine the risk premium for each factor. We have implemented the two – step regression procedure on our model. The final results are given below in Table 6:

Table 6: Estimation of Multifactor CAPM Model with Fama – MacBeth Procedure

Return = .004 + 0.11·Invest + 0.117·Productivity - 0.396·Unemployment + 0.076·Risk
(1.38) (7.79*) (3.14*) (61.73*) (20.53*)

Notes: t-values are presented in brackets below the regression coefficients. Coefficients marked * are significant at the 5 percent level. Fama-MacBeth (1973) Two-Step procedure Number of obs = 45 Num. time periods = 3 $F(4,2) = 38.76$ Prob > F = 0.0253 avg. R-squared = 0.7183. The data set covering the period 2005 – 2007.

From the equation, according to both GMM method and Fama – MacBeth two-step regression procedure we can see that the estimators - except productivity as reported by the results of GMM method - are highly statistically significant (significantly greater than zero). The intercept term turns out statistically insignificant (i.e. statistically equal to zero), so for all practical purposes we have a regression through the origin. The multifactor CAPM model for the returns of investment in education is supported from the empirical results. Risk variable is considering being an important factor affecting positively the returns of education. In addition, investment has a positive impact and this is explained by the theory. It seems plausible that returns for workers of a given quality, as represented by the level of education, are affected positively by higher investments. It is widely believed in the literature that higher investment is likely to increase the productivity of workers through spread of knowledge and technology and overall wages and therefore returns of education rise (Baldwin, R. E., 1995).

In general, the theory of human capital holds that investment in education directly augments individual productivity¹³ and, therefore, earnings (Schultz, 1961; Ben - Porath, 1967; Becker, 1964 and 1967; Mincer, 1974). Productivity has been initially quantified by Becker (1964) and Mincer (1974) in the form of anticipated increase in future earnings either as a result of general education or firm - specific training.

Educational investment may not only result in increasing the educational level and returns of the labour force, but also in greater productivity of physical capital and more efficient management. The positive relationship between returns and productivity is not surprising in view of the marginal productivity theory of labour economics. Economic theory says that the wage a worker earns, measured in units of output, equals the amount of output the worker can produce (Mankiw, 2006).

On the contrary, the phenomenon of unemployment has a negative influence on the returns of investment in education as corollary of the “wage curve”. The wage curve is a stable, negative relationship between unemployment and pay level. Through random samples of nearly four million people from sixteen countries, Blanchflower and Oswald (1994) find that the local unemployment rate affects pay level such that “A worker who is employed in an area of high unemployment earns less than an identical individual who works in a region with low joblessness” (Blanchflower and Oswald, 1994, p. 5). Their major finding is that the log of wages is a monotonically decreasing and convex function of local unemployment rates. The elasticity of pay with respect to unemployment - that is, the percentage amount that pay will change as unemployment changes - is minus ten percent (-0.10). Therefore, hypothetically, a region with an unemployment rate one percentage point higher than another region will have wages that are ten percent lower. Hence, our empirical findings are in line with this theoretical setup.

¹³ There is, however, an alternative line of thought. The ‘sorting’ hypothesis attests that education also ‘signals’ or ‘screens’ intrinsic productivity (Spence, 1974; Arrow, 1973; Stiglitz, 1975). Higher levels of education are associated with higher earnings, not because they raise productivity, but because they certify that the worker has the qualification to do high standard work.

4.3 Returns of Investment in Education, Income and Savings

It is well known that savings from income of households and individuals are potential investments and contribute to economic development (Barkoulas, Filiztekin, Murphy, 1993; Nelson, 2009). A considerable part of the increase in national income caused by improved human capabilities is attributable to the increased level of education of the labour force, while the rise in the educational level or standard of the labour force is indirectly demonstrated by the increase in the stock and return of educational capital. The increase in the stock of educational capital brings a corresponding increase in its economic return from education. This increase in economic return from education contributes in its turn to the increase in national income and gross national savings. Moreover, Becker (2003) in his lattermost work stressed the role of education in decisions pertaining to savings and investments.

Thus, the economic return from increases in educational capital may be assumed to represent the contribution of education to the increase in the national income and gross national savings. For this reason, we consider the causality issue for the variables returns and savings using Granger Causality test as a measure of precedence and information content¹⁴. The empirical results, given in the Table 7, can be considered as simple indication that there is causality among returns and savings. The returns from investment in education affect savings and this effect is statistically significant.

Table 7: Pairwise Granger Causality Tests

Pairwise Granger Causality Tests			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
Savings does not Granger Cause Returns	30	1.76790	0.1948
Returns does not Granger Cause Savings		5.23388	0.0302

5. Measuring the impact of returns and specific macro factors on GDP growth rate

We test the impact of some key factors and more specifically the impact of the rate of return to education, labour productivity (as percentage change on previous period), total investment (as percentage of GDP), and the percentage of unemployment to growth rate of GDP volume (as percentage change on previous year). Based on statistical data for

¹⁴ Granger causality measures precedence and information content but does not by itself indicate structural causal relationship.

the period 2005 – 2007 we try to investigate the rate of return to education - investment - growth rate relationship in case of OECD members and in the same time to verify some hypotheses widely used in standard economic literature about the determinant factors of economic growth.

Our interest is stimulated by the considerable amount of cross-country evidence internationally which points to a positive association between investment in education and economic growth (see, for example, Barro and Sala-I-Martin, 1995; Barro, 1991; Bassanini and Scarpenta, 2001). In many OECD countries, the impact of increases in educational attainment on economic growth is stronger than the impact which other factors have on economic growth such as trade exposure, variability of inflation or the investment share (OECD, 2002). Moreover higher education seems to be the most relevant education variable in highly developed countries.

5.1 Literature Review

Countries with higher average years of education tend on average to grow faster (Barro, 1991). Furthermore, OECD countries, which expanded their higher education sector more rapidly from the 1960s, experienced faster growth and greater fall (or smaller rise) in unemployment than countries with less tertiary expansion (Ischinger, 2007). Other studies find that education is more important via its effects on productivity than directly as a factor input (Sweetman, 2002). Additionally, education is found to be positively affecting physical investment in the economy, which in turn further increases growth rates (Mankiw, 2006). However, the estimates from the literature are subject to wide margins of uncertainty and there is also a potential problem of reverse causality (Gemmell, 1997).

Furthermore, in specialised literature, unemployment and investment are among the central variables influencing growth rates. As a popular macroeconomic topic, the significant role of education as the determinant of economic growth has been tested and proven comprehensively by many researchers, for example Romer (1990), Barro (1997), Stevens and Weal (2003). It is widely acceptable that growth regressions should control for the steady state level of income and returns, for example Barro and Sala-i-Martin (1995); Mankiew, Romer, and Weil (1992). Thus, a growth-rate regression model typically includes investment ratio, initial income, unemployment and measures of policy outcomes like academy enrolment and the black - market exchange - rate premium as regressors.

In his empirical work Barro (2002) analyzed the determinants of economic growth and investment in a panel of around 100 countries observed from 1960 to 1995. Generally, the importance of investment to economic growth (according to neo-classical growth model or exogenous growth model, the new growth theory like endogenous growth theory, Keynesian Formula etc.) is well known and generally accepted. Also, mainly according to classic Neo-Keynesian economic theory, when the economy is experiencing rapid growth in real GDP, employment will increase, and therefore

unemployment will decrease. In contrast, during tough periods of the business cycle the economy is experiencing declines in real GDP, and unemployment rates are high. As Altig et al (1997) notes, this is often formally summarized by the statistical relationship known as “Okun's law¹⁵”.

5.2 Results

We use the Hausman test to check whether the random model specification is appropriate. The results are given below in Table 8:

Table 8: Correlated Random Effects - Hausman Test

Correlated Random Effects - Hausman Test			
Equation: HAUSMAN			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.816665	3	0.4208

Although we have found no support of the random effect model, considering that the exogenous macro variables are correlated, Ordinary Least Squares (OLS) estimations are arbitrary. The empirical results, based on the Generalized Method of Moments (GMM) with cross section weights (White covariance) to handle the heteroscedasticity problem are as follows in Table 9:

Table 9: Estimation of impact of macro factors on GDP growth rate using GMM

Real GDP growth rate =	- 0.02	+ 0.01·Returns	+ 0.81·Product	+ 0.24·Invest	- 0.17·Unemployment
	(-4.20)	(0.22)	(12.67*)	(8.70*)	(-2.36*)
Determinant residual covariance	5.05E – 05				
J – statistic	3.69E – 28				
p – value	1.000				

Notes: t-values are presented in brackets below the regression coefficients. Coefficients marked * are significant at the 5 percent level. The coefficient covariances are White heteroscedasticity consistent. Generalized Method of Moments (cross-section weights) estimation method was applied for the data set covering the period 2005 – 2007.

¹⁵ As developed by economist Arthur Okun in 1962, this law related "decreases in the unemployment rate to increases in output growth." The same inference draws from many studies, for example Mauro, Carmeci (2001).

The p – value of J – statistic reveals an acceptance of the null hypothesis supporting the validity of the instruments.

The coefficient of returns to tertiary education is found to be statistically insignificant (i.e. statistically equal to zero), implying that returns are not associated with real GDP growth rate. The significance of productivity is remarkable. According to the literature, productivity also incorporates the positive effects of education, (see, for example Denison, 1967; 1979, Lau, Jamison and Laut, 1991). The impact of investment (total gross fixed capital formation expressed as a percentage of GDP for the public and private sectors) is significant, and unemployment, as theory predicts, is also significant and is found to be negatively associated with output growth.

6. Conclusion

Treating the investment in education as a process of decision making under uncertainty we have adopted the expected utility model. We have modified the short-cut method of calculating rates of return to education by incorporating the risk premium. Then, employing the Sharpe ratio we have considered excess returns taking into account the corresponding risk and evaluated the historical risk - adjusted performance. We have confirmed the classic pattern of falling returns to education by level of economic development.

From the macroeconomic point of view and in the framework of multifactor CAPM, we construct a model adding key macro factors to the classical regression model of CAPM, in order to better capture the cross - sectional variation in average returns of investment in education. We also test the model empirically by applying the Fama - MacBeth two-step panel regression. Our results tend to confirm the theoretical expectations and evidence based literature for the positive impact of investments and productivity on returns. The negative effect of unemployment on returns is also affirmed. Furthermore, using ideas and the basic concept from financial economics analysis of stock markets, we show a clear risk-return trade - off to investment in education. Applying panel estimation procedure, we found support for the multifactor CAPM model. Moreover, the empirical evidence provides an indication of Granger causality's existence from returns to savings.

We also examine the impact of rate of return to education and some major macroeconomic variables (productivity, investment and unemployment) on economic growth. Productivity and total investment are found to have the greater implications on real GDP growth rate. Data on a panel of 15 EU - OECD countries covering the period 2005 – 2007 support theory predictions for the positive effect of investments and productivity on GDP, in contrast to the negative effect of unemployment. Briefly, all the empirical methods lead to qualitatively similar conclusions.

In the near future, we aim to affirm the pattern of results extending over time and across a greater number of countries around the world (the most important caveat is that the study is extended over a short period). That would hopefully offer solid evidence for the validity of our approach.

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Data Appendix

Country statistical profiles 2009

<http://stats.oecd.org/Index.aspx?DataSetCode=CSP2009> (accessed 5/9/2010)
(OECD.Stat includes data and metadata for OECD countries and selected non-member economies).

Data Base of Eurostat

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Education by OECD

http://www.oecd.org/topic/0,3373,en_2649_37455_1_1_1_1_37455,00.html
(accessed 5/9/2010)

Statistics Portal of OECD

http://www.oecd.org/statsportal/0,3352,en_2825_293564_1_1_1_1_1,00.html
(accessed 5/9/2010)

Expenditure on Education

<http://lysander.sourceoecd.org/vl=12267833/cl=23/nw=1/rpsv/factbook2009/09/02/01/index.htm> (accessed 5/9/2010)

Education at a Glance by OECD

http://www.oecd.org/document/9/0,3343,en_2649_39263238_41266761_1_1_1_1,00.html (accessed 5/9/2010)

Harmonised Unemployment Rate by Eurostat

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<http://lysander.sourceoecd.org/vl=12128461/cl=20/nw=1/rpsv/home.htm> (accessed 5/9/2010)

UNESCO Institute for Statistics

http://stats.uis.unesco.org/unesco/TableViewer/document.aspx?ReportId=143&IF_Language=eng (accessed 5/9/2010)

Real GDP Growth Rate by Eurostat

<http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsieb020> (accessed 5/9/2010)

Collaboration and Innovation in Sweden and Bulgaria: A Study of a Mature Industry

Maya Hoveskog¹ and Diana Antonova²

Abstract

Nowadays, creation, exchange and transfer of knowledge (CETK) are turning into the most significant activity for companies. This article sheds light on Swedish and Bulgarian companies within a mature industry in terms of their knowledge flows for collaboration and innovation. Companies from the two countries as well as Small and medium enterprises (SMEs) and large firms are compared. Quantitative and qualitative research methods are combined. A set of variables which have a positive relationship with the companies' research and development (R&D) activities and innovation is developed.

It was found out that the set of variables employed can predict the innovation and R&D of companies, laying of electrochemical and conversion surface treatments with functional and decorative purposes (ECSTFDP) for the sample. In both countries innovation and R&D are positively affected by places for knowledge exchange followed by collaboration factors and market situation. However, the factors for collaboration and interaction are the most important for increasing the innovation activities in companies with ECSTFDP, irrespective of size, age and country of operation. Moreover, the article reveals the vital role of the social element in the CETK, which is also emphasized in the knowledge management literature. Furthermore, it illustrates that companies are influenced by the number of factors in this collaboration and actively evaluate the trade-offs from it. Additionally, the dynamics of the market is setting the pace and degree of newness of innovation and R&D activities.

Keywords: collaboration, innovations, mature industries

JEL Classification: O31, O32, L61

1. Introduction

Contemporary economic development is characterized by rapid technological change leading to knowledge creation that highly intensifies the competition between

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companies (Castells, 2000). Emphasis is given to technological development causing accumulation of knowledge or higher levels of comprehensiveness of information. New products, processes, technologies and interrelations, different from the previous ones in nature, type, status and quality, keep emerging. Castells (2000) emphasizes the fact that inputs for all industries are transformed from material to knowledge and information based. Besides, the industry in the so called developed economies is being transformed from one processing raw materials and production to one of a post-industrial society, based on processing information and knowledge. Competition and collaboration acquire new dimensions, and often the saying “One for all, all for one” is of paramount importance for intensive knowledge flows aimed at creating successful innovation. In line with these changes, many researchers have argued that as business has become more global, increasingly competitive and turbulent, both markets and hierarchies display inefficiencies as modes of organizing production of both goods and services (Miles and Snow, 1992; Powell, 1990). Therefore, these changes along with globalization and technological advances, are a source of uncertainty for the enterprises. Consequently, network organizational form emerges which balances the flexibility of markets with the predictability of traditional hierarchies (Achrol, 1997; Miles and Snow, 1992; Powell, 1990; Snow, Miles and Coleman, 1992). Companies become more dependent on their participation in strategic alliances, networks for collaboration, etc. In order to grow and survive they must go beyond organizational boundaries as a mechanism for creating new knowledge and innovation that would allow them to create and maintain a sustainable competitive advantage.

The scientific thought within knowledge management, dedicated to creation, exchange and transfer of knowledge (CETK) for collaboration and innovation, are mostly aimed at industries characterized by intensive research and development (R&D) activities, such as information and communication technologies (ICT), telecommunications equipment as well as biotechnologies. Additionally, the ability and willingness of the partners as well as the incentives to share knowledge-based capabilities attract great attention (e.g. Goyal and Moraga-González, 2001). In these studies patenting is frequently used as an indicator for measuring innovation activities and performance (e.g. Sampson, 2007). Furthermore, the majority of the main contributions within collaborative networks investigate high-tech industries where the pace of development is rapid and innovative performance is vital, thus pushing companies to look for alternatives of the in-house R&D activities (e.g. Hagedoorn, 2002; Sampson, 2007). However, the results and implications of these studies are contingent to the context the empirical investigation is carried on and most relevant to the high-technology industries and large firms (Sampson, 2007). Evidently, the mainstream literature in both fields is focused on large organizations and high-tech industries while small businesses and mature industries have been neglected (see, Andersson and Karlsson, 2004; Sampson, 2007; Wong and Aspinwall, 2004).

On the contrary, Tunzelmann and Acha (2005), based on data from Organization for Economic Co-operation and Development (OECD), point out that a relatively small

part of the value added is due to the high-tech industries, while the remaining part is generated by medium and low-level technological productions. Additionally, there are countless articles identifying small and medium enterprises (SMEs) as the main drivers of a national economy growth. It suggests that SMEs with medium- and low- level technological production also have a significant contribution both to development and growth of the economy. Surprisingly, even studies concluding that the collaboration game is dominated by high-tech industries from developed countries, have identified peaks in low-tech R&D partnering during certain periods (e.g. Hagedoorn, 2002). Nevertheless, these studies identify a trend of decreasing share of low-tech industries in R&D partnering. This fact does not necessarily mean that low-tech industries have unimportant role in the innovative activities. Instead, one could explain this with the fact that these industries rely predominantly on incremental innovation which does not require high R&D costs and allows firms to collaborate informally.

The deficiency of empirically based research on low-tech production within the area of knowledge flows (CETK) for collaboration and innovation as well as collaborative networks indicates a gap which the authors believe is important to be addressed. Therefore, in this article there is an investigation of the knowledge flows for collaboration and innovation in a quite different, mature type of industry, which, at first glance, seems non-dynamic and is defined as low technological - laying of electrochemical and conversion surface treatments with functional and decorative purposes (ECSTFDP)¹. By intentionally choosing the empirical context, there is an effort to reveal why and how firms in this under investigated context collaborate for innovation. This mature industry is characterized with tacit nature of knowledge which makes its transfer within the collaboration difficult, with uncertain level of success. As a result the industry is characterized with a loose appropriability regime which makes the use of patenting as a measure for innovation activity and performance inapplicable (see Sampson, 2007 for a discussion on patenting as a measure). Instead, there is an interest to see which variables have the biggest influence on collaboration and innovative activities. The study includes both horizontally and vertically related partners as well as other organizations such as universities and research institutions as opposed to Sampson (2007) and Goyal and Moraga-González (2001) amongst others.

The choice made is based on the structural idea of knowledge-based economy which is seen as analytically useful by Cooke and Leydesdorff (2006). It links the knowledge creation to the knowledge exploitation system and repulses the perception that only industries with heavy concentration of knowledge assets should be in the focus of research. Furthermore, innovative performance is critical to corporate outcomes no matter how technology intensive the industry is. The choice of a single industry is reinforced by the recommendations in the Frascati Manual by OECD (2002) that every research should be grouped into separate industries. It helps the collection of data and at the same time

¹ See OECD (1997) Revision of the High Technology Sector and Product Classification, OECD, Paris.

takes into consideration the specific characteristics of every industry or production type. Additionally, Hagedoorn (2002) points out that most empirical studies on R&D partnerships and other forms of inter-firm collaboration have a cross-sectional nature. However, as he further explains, the literature suggests that partnerships are somewhat sector-specific as the propensity to enter into partnerships differs from industry to industry. This further supports the choice of a single industry.

The ECSTFDP offers surface treatment by thin metal or oxide layers with specific properties for a broad range of industries. The coatings are primarily applied on metal parts but also on plastic, composites, glass, etc. The manufacturers perform the finishing after the parts have been given their geometrical form. The surface treatment process is a sensitive one which is directly related to the fact that the quality of the final finish is complex to control. This industry has a long history and has been developed a long time. However, the past centuries craftsmanship, is quite different from today's advanced technology. The modern ECSTFDP has developed an extremely diverse scope of techniques and processes, heavily relying on innovation, for coating and protecting virtually all possible materials (BSTSA, 2007). Additionally, there is an understanding among the industry actors that CETK are vital for sustaining the competitiveness of the industry. Furthermore, the ECSTFDP companies are narrowly specialized in a limited set of all available techniques and processes. However, in order to meet and exceed their customers' demands they need to be able to offer the full range of surface treatment processes which will not be possible without collaboration with other actors from the industry. All these indicate that ECSTFDP is characterized with abundant knowledge flows between various interested parties within and outside the industry (Paskaleva, 2008).

The research is set in this background. The main purpose of this article is to shed light on Swedish and Bulgarian companies within ECSTFDP in terms of their knowledge flows (CETK) for collaboration and innovation. The study offers a snapshot of the situation, rather than longitudinal study which can outline historical trends and sectoral patterns as Hagedoorn (2002) does. In his study he outlines some major international patterns within the Triad - North America, Europe and Asia. In that respect, our study could be related to that of Hagedoorn (2002), as we make an international comparison of a sectoral situation in Western and Eastern European firms. However, unlike Hagedoorn (2002) study which looks on formal agreements (contractual agreements and joint ventures), there is a focus on informal forms of collaboration. Within those forms, part is devoted to innovative activities which would lead to the creation of new and/or improved products, services and processes.

The approach adopted employs earlier analytical work, the results from a self-administered questionnaire and in-depth interviews with experts from the industry. A comparative research design is adopted based on a selection of a certain industry (ECSTFDP). Swedish and Bulgarian companies as well as SMEs and large firms in ECSTFDP are compared in order to be able to create a better understanding about a mature industry supplying high-tech industries and outline the competitive position of the

companies working with it. A set of specific variables which have a positive relationship with the companies' R&D activities and innovation is also developed. Using them will allow to illustrate companies' knowledge flows for collaboration and innovation.

The outline of this article is as follows: in section 2 there is an outline of the conceptual issues discussed throughout the article, in section 3 there is a description of the method while in section 4 there is a presentation of the results. In the final section there is a presentation of the conclusions, limitations and recommendations for future research.

2. Conceptual issues

As a foundation of every human activity, knowledge is described as a source of competitive advantage and the most powerful engine for innovation and growth for all companies (Cooper, 1998). As such, it has been explored, analyzed and discussed by various branches of science – economics, organization theory and philosophy. Nonaka and Takeuchi (1995) define knowledge as a justified true belief, i.e. containing an interpretation of the individual (knower). Additionally, they make a distinction between knowledge and information by defining the latter as a flow of messages that the receiver uses both supporting the decision-making process and creating new knowledge. Similar distinction is made between knowledge and information flows. Gupta and Govindarajan (2000) note that knowledge flows transfer know-how, consisting of expertise or external market data of strategic value, while information flows equal more to operational information that is structured but lacks interpretation. However, the information flows and the communication processes together build up the knowledge flows used for CETK (Laihonen, 2006).

One important feature of knowledge is that it is fragmented and is not possessed entirely by only one individual, company or organization and only separate parts of it are passed on to those concerned (Cooke and Leydesdorff, 2006). Therefore, interaction between all interested actors becomes a vital process for putting the “knowledge puzzle” together. It does not only enable and facilitate the knowledge exchange and transfer. It is actually within the interaction process, combining and recombining different aspects of the knowledge base, when new knowledge is created. Consequently, the contemporary companies exhibit new properties to stimulate CETK (Laihonen, 2006). A small fraction of those are namely intangibility of inputs and outputs; perpetual interaction with customers, suppliers, lead users and other actors; strong interdependence on experts; constant innovation in a form of product line extensions or business models modifications, etc. All this is made with the sole purpose to overcome knowledge asymmetry. These new properties influence organizational efficiency and performance. They exemplify the strong dependency of any company, including SMEs, by activities beyond the individual organization and the increasing significance of collaboration and network structures for CETK (Chua, 2002). It also implies that knowledge flow term is an important concept for any company no matter high-tech or not.

Alike every human activity, innovations are based on CETK. Additionally, the modern way of viewing innovation is as an interactive, iterative process based on tacit knowledge and skills (MacKinnon et al., 2002) which makes its definition as a completely linear process obsolete. As Darroch and McNaughton (2002) point out innovation is a process of knowledge embedding in products, processes and management. Due to the asymmetric nature of knowledge, parts of it are possessed by various agents (Andersson and Karlsson, 2004). It means that there is not a single organization which is in the position to independently develop the winning innovation. On the contrary, in order to overcome this knowledge asymmetry each company needs to interact and collaborate with other interested actors. Within this process, every organization could be described as a bundle of knowledge (Gupta and Govindarajan, 2000) which is combined and recombined with the knowledge of other actors in order to boost up the innovation process. The most common way described in the literature for taking advantage of these various bundles of knowledge is to actively collaborate and create networks with various interested actors.

The research on networks is quite rich, developing the field of study which encompasses many disciplines such as organizational theory and behaviour, strategic management, business studies, public administration, sociology, communications, etc. This is a prerequisite for the existence of variety of definitions of this phenomenon. Despite differences, nearly all definitions imply certain common themes as social interaction (of individuals acting on behalf of their organizations), relationships, connectedness, collaboration, collective action, trust, and cooperation (Provan et al., 2007). Networking also encompasses softer, socialized issues, such as social learning and confidence building through interdependence and sharing of experience (Jack et al., 2010).

In a broad sense, networks for collaboration (NC) are defined as successful organizational structures for the formation, exchange and transfer of knowledge within a specific industry (see, Arbonies and Moso, 2002; Asheim, 2004; Aylward, 2004; Bell, 2005; Bröker et al., 2003; Cappellin, 2003; Cooke, 2003; Orstavik, 2004). Poulymenakou and Prasopoulou (2004) see networks as inter-firm informal collaboration agreements for achieving of common strategic aims within a particular industry. In Bulgaria, The Ministry of Economics introduces the term NC, defining it in similar terms as Poulymenakou and Prasopoulou (2004), as a group of companies and productions related by a common strategic goal within a specific industry (Vanev and Vuchkov, 2006; Paskaleva, 2006; CED, 2005).

NC facilitate the reduction of knowledge discrepancies between less developed industrial enterprises and the other partners in the network. Additionally, participation of industrial enterprises in NC gives them access to scarce resources and new markets; reduces costs and shares the risk of new product and process development. It also allows them to maintain costly functions like R&D due to the collaboration efforts within the network. NC are voluntary structures with mutual but fluctuating level of benefits for all participants. They allow the participants to deal with the increasing industrial complexity

and the constantly shortening innovation development life cycle. They also provide companies with greater strategic flexibility when facing both minor and disruptive technology changes.

It is believed that the process of CETK is more intensive where there is asymmetry between the abilities and competences of the collaborating companies (Paskaleva, 2006). However, the actors that have mastered the most advanced technology in comparison with the others might have quite a weak incentive to share their knowledge with anyone else (for a discussion see, Sampson, 2007). On the other hand, in its core knowledge is public. Only parts of it can be protected for a limited period of time through patents for example. In addition to that, in case of a disruptive change in the industry, the incumbent companies are usually the ones that first lose their competitive advantage and adapt slowly to the new technology. This implies that any technological advantage of a company might only have a temporary character. Therefore, it is a better option for a company to collaborate for CETK in order to be more flexible and adaptable in case of disruptive changes in the industry. These arguments are part of the learning perspective within the networking literature, i.e. participation in networks provides access to scares information and knowledge recourses that otherwise cannot be obtained and which at the same time improve firms' performance and innovation (Ilinitch et al., 1996; Kale et al., 2000; Kogut, 2000; Oliver, 2001; Powell et al., 1996; Rindfleisch and Moorman, 2001; Rosenkopf and Nerkar, 2001). Within this perspective, researchers argue that inter-firm network structures are not merely benefitting resource acquisition but affect learning and innovation to a large extent (Kogut, 2000; Oliver, 2001; Powell et al., 1996). As Sampson (2007, p. 382) points out "how *much* a firm has to learn and how well a firm is *able* to learn from its partner(s) matter for innovative performance". Most of the empirical studies within this perspective look into high tech-industries and how network collaboration helps high-tech firms to access more diverse sources of knowledge (e.g. Powell et al., 1996).

Despite the big interest in collaboration processes and networking, there is still no agreement when the benefits (learning and innovation activities) for collaborating partners are the highest - when they have relatively similar knowledge base or when they are different but complement each other. Some of the arguments presented are that companies are actually able to interpret transferred knowledge and successfully take advantage of it only if it is close to their existing knowledge base due to their absorptive capacity (Cohen and Levinthal, 1989). As Sampson (2007) points out partners require some sort of common stock of knowledge to utilize knowledge and resources that are not common to both parties. However, the results of this study indicate that firms benefit more from collaboration when they have some, but not all, of the technological capabilities in common with their partners. Diversity between partners is pointed out to be required for stimulating innovation. Otherwise, firms find they have nothing to learn from their partners. The opposite argument suggests that when companies have similar knowledge base, then the CETK strengthen it without actually expanding it, thus diminishing the benefits from the collaboration. No matter if the companies are similar or

more complement each other, it is important how much they manage to learn and the quality of the knowledge they have acquired.

The benefits from NC are widely researched and emphasized (e.g. Arbonies and Moso, 2002; Asheim, 2004; Aylward, 2004; Bell, 2005; Bröker et al., 2003; Cappellin, 2003; Cooke, 2003; Orstavik, 2004). Firstly, through the network tacit knowledge, which is believed to give the sustainable competitive advantage to companies, becomes mobile, materializing itself in goods and services that can be sold. Secondly, the structure of NC is both horizontal and vertical, and both have positive influence on growth. Thirdly, through the NC a common cognitive frame is created, which educates all participants while at the same time each actor preserves its identity. Last but not least, there is an emphasis on the innovative process requiring integration and combination of various kinds of knowledge. Besides, the differences between the individual actors are part of the evolution process since the various competences are not static but develop continuously on the basis of interaction and collaboration in the network.

The development of each actor's competences, together with the benefits from NC, depend heavily on the ability to find appropriate partners, to acquire the knowledge related to innovation, and to maintain the relations in the network. Moreover, Cappellin (2003) argues that the more individuals, industrial enterprises, organizations and institutions participate in a unified NC, the larger its economic value and its innovation capacity. Based on this, the NC are viewed as networks of constantly learning organizations using also non-market mechanisms for coordinating their activities with those of other companies and institutions generating knowledge within the frames of a specific industry. Moreover, a special emphasis is laid on mutual trust and social capital (De Wit and Meyer, 2005). NC help to maintain variety, and overcome the lack of flexibility and inertia, while the knowledge flows are much more intensive and turn into a ground for encouragement of innovation, exchange and development of new technologies. The organizations are not just gaining knowledge from the environment. Instead, they generate it as a result from the interaction. For the industrial enterprises participation in those networks is not an alternative but a first strategic choice.

The benefits of NC are significant for SMEs which often have a deficiency of knowledge. As a result, they are trying to obtain access to it through exchange and transfer with other actors. Then combining it with their existing knowledge base new cognitive content is created. This is an interesting aspect of the CETK in the light of innovations in SMEs, as well as the comparison of the latter to the innovations in large organizations. We argue that knowledge flows have an important role for any company, no matter how large it is and in which country it operates. Besides, knowledge is viewed as a process while emphasizing its creation, exchange and transfer through intensive flows. As a result of all this, new knowledge is created when the actors that acquire it, relate it to their own via understanding and interpretation, throughout its exchange and transfer. This is only possible when tacit knowledge is transformed into explicit.

For the purpose of this study the following hypotheses are formulated:

H1: *The industrial enterprises with ECSTFDP in Sweden and Bulgaria use intensive knowledge flows (CETK);*

H2: *The degree of interaction and collaboration between industrial enterprises with ECSTFDP and other economic subjects in Sweden and Bulgaria is a key factor for the formation of industrial networks;*

H3: *Innovations and R&D of the industrial enterprises with ECSTFDP in Sweden and Bulgaria are influenced in a positive way by CETK and the collaboration between various interested subjects;*

H4: *There are differences between the Swedish and the Bulgarian companies with ECSTFDP concerning CETK;*

H5: *The SMEs demonstrate a higher degree of interaction and collaboration through knowledge flows from the large companies.*

H6: *The size of the industrial enterprises with ECSTFDP, their age and the country of operation, do not have a significant impact on the variables, which have a positive influence on innovations and R&D.*

3. Method

The method used for collecting empirical data is a questionnaire since it has been widely used in the literature about investigating questions related to innovation, collaboration and networking (Manov, 2001). It was divided into five sections each of them marked with a letter – A, B, C, D, E. The first group of questions referred to general information about the company (A) and the second (B) to the market conditions and behaviour of the company. The third (C) asked about innovation activities, R&D and technological strategy of the company and the fourth (D) asked about the collaboration and knowledge exchange that the company was involved in. The last section (E) required more information about the respondent who filled the questionnaire. The total number of questions included in the questionnaire was 181. Slightly over 33% of them were included in Section D and were about the collaboration and knowledge exchange that the company was involved in.

It has been sent to the whole aggregate (59 companies) in South Sweden² and to 210 companies in North Central and Northeastern regions in Bulgaria³. Besides, expert interviews have been used as a widely applied qualitative method in order to complete, compare and clarify the survey results, as well as to provide another point of view and in-depth analysis (Massa et al., 2003).

² South Sweden includes the territories east, west and south of the two biggest lakes in the country – Vänern and Vättern.

³ For greater clarity, the term Bulgaria will be used interchangeably with *North Central and Northeastern regions of Bulgaria*, and *South Sweden as Sweden*. See, Paskaleva (2008) for more detailed overview of the questionnaire methodology.

Table 1: Summary of survey data

Phase	Location	Period (month, 2007)	Population Size	Method
1	South Sweden	01-03	59	Survey
2	North Central and Northeastern regions in Bulgaria	05-10	210	Survey
3	South Sweden	02-10	10	Expert in-depth interviews

The main criterion used to form the sample was that the companies should have *ECSTFDP as part of their main activity, according to the Statistical classification of EU economic activities (NACE)*, or the National classification of economic activities, respectively, or based on their own view. The response rate for Sweden was 54,24%, and for Bulgaria - 41,43%. For the whole survey the response rate is 44,24%. The data divided by *country* is a mirror reflection for each country with a predominant number of SMEs in the sample (Table 2).

Table 2: Descriptive statistics according to company size

Industrial enterprises (no of employees)	Small (0-49)	Medium (50-249)	Large (over 250)	Missing	Total questionnaires
Total (pcs)	65	34	10	10	119
Total (%)	54,62%	28,57%	8,40%	8,40%	100,00%
Bulgaria (pcs.)	45	24	9	9	87
Bulgaria (%)	51,72%	27,59%	10,34%	10,34%	100,00%
Sweden (pcs.)	20	10	1	1	32
Sweden (%)	62,50%	31,25%	3,13%	3,13%	100,00%

Within this study several variables that positively influence R&D and innovation activities of the companies are formulated. However, this study did not attempt to include a comprehensive set of measurers/variables but rather, focused on what an extensive literature study found to be a number of important measures. Every question included in the questionnaire contained sub-questions that together represented a scale measuring a specific variable. The questionnaire contained both closed and opened questions. We used continuous five point Likert-scales for the sub-questions forming the investigated variables. The other questions were either open-ended or close-ended (categorical and with unordered response categories). They were included to provide additional

information for each firm and were analyzed with the help of descriptive analysis. Below the main variables that were formulated are described.

Company environment and behaviour (CEBC) was measured by adapting questions from Zahra and Bogner (1999). Respondents were asked about their market approaches, target customers, production systems, nature and intensity of competition as well as different demands that the company had to respond to. This major question (variable) contained 15 sub-questions. It is expected that there will be a positive influence on companies' innovation and R&D activities. It could be explained with the fact that the faster the pace of competition is, the greater the pressure to the company to differentiate itself by introducing new products and processes with different level of newness. Additionally, the more technologically advanced the main customers and suppliers of the company are, the greater the incentive for the company is to be an equal partner in the relationship. This stimulates an intensive learning process for the company enhanced by its customers and suppliers.

Market situation (MSC) was measured by adapting questions by the Third Community Innovation Survey (Ribaille and Durvy, 2004). Respondents were asked about the type of changes in the company environment that occurred, during a three year period (2004-2006). This major question (variable) contained 17 sub-questions. The expected influence on companies' innovation and R&D is positive. If more disruptive changes in the industry occur, only the most flexible companies that innovate and adapt fast in line with the new developments would survive.

Company competences (CKC); innovations and R&D (IDC) measures were based on the work of Aylward (2004) and Zahra & Bogner (1999). Respondents were asked about the type of innovations they are involved in, to compare their competences and innovation activities with their strongest competitors, the ways to acquire technology as well as the availability and the quality of R&D resources. The CKC variable contained 5 sub-questions while IDC variable 18. The expected influence of CKC on companies' innovation and R&D is positive. Many researchers argue that it is actually the high level of company competences, including its employees' knowledge level that positively influences the innovative activity of the company.

Innovation factors (IFC), knowledge sources' frequency and importance (KSC), places for knowledge exchange (PKEC) were measured by adapting questions from the Third Community Innovation Survey (Ribaille & Durvy, 2004) as well as from Zahra (1996) and Wei, Zhu and Wang (2005). The questions presented lists with innovation factors (12 sub-questions), knowledge sources (26 sub-questions) and places for knowledge exchange (10 sub-questions) that the respondents had to rate on a five point Likert-scale. Recently, with the development of concepts such as open innovation and crowd sourcing, it is evident that sources and places for knowledge exchange have an important positive relationship to innovations activities.

Collaboration factors (CFC) and collaboration with competitors (CCC) were measured by adapting questions from the Third Community Innovation Survey (Ribaille and Durvy, 2004, and Karlsson et al., 2004). Respondents were asked about the nature of

the collaboration with the competitors (5 sub-questions) as well as to rate different factors that stimulate the collaboration (9 sub-questions). The expected influence of CFC and CCC on companies' innovation and R&D is positive. Recent literature on innovation management preaches that knowledge has a fragmented character and it is impossible for one single company to develop a successful innovation without cooperating with different interested actors including competitors in order to manage the "knowledge puzzle".

The firm age was examined, because the younger the company is, it may be more open and willing to perform knowledge creation, exchange and transfer. Additionally, age is also associated with resource availability (Casillas and Acedo, 2005). Age was measured by the number of years that the firm had been in existence.

Table 3: Results from scales internal reliability analysis

Variable/Main question	Abbreviation	Cronbach's Alpha	No of sub-questions	Influence on dependent variable
Company competence (independent variable)	CKC	0,688	5	(+)
Company environment and behavior (independent variable)	CEBC	0,747	15	(+)
Market situation (independent variable)	MSC	0,75	17	(+)
Company innovations and R&D (dependent variable)	IDC	0,801	18	
Innovation factors (independent variable)	IFC	0,878	12	(+)
Knowledge sources - combined (independent variable)	KSC	0,893	26	(+)
Collaboration factors (independent variable)	CFC	0,876	9	(+)
Collaboration with competitors (independent variable)	CCC	0,551	5	(+)
Places for knowledge exchange (independent variable)	PKEC	0,835	10	(+)

With the help of SPSS, a reliability test has been carried out, used to determine the scales internal consistency, i.e. how much free of errors every scale is (Manov, 2001). Following the recommendations of Nunnally (1978), a minimum level of 0,7 of Cronbach's quotient α for each scale is needed to be able to define it as reliable and to include it in the subsequent analysis (in Pallant, 2005). This quotient shows the average correlation between all questions that form the scale, i.e. to what extent each one measures the variable set. In the present survey seven variables (main questions with respective sub-questions/scales) in total have a proven internal reliability and compatibility with values of Cronbach's quotient α over 0,7. The sub-questions they consist of can be claimed as reliable scales with the sample surveyed. The results from the test for reliability of scales are shown in Table 3. Only two of the variables do not demonstrate internal compatibility of the scales according to the reliability test – *competences of the company* (CKC) and *collaboration with the competition* (CCC). Nevertheless, as Pallant (2005) points out, the values of Cronbach's quotient α are influenced by the number of sub-questions included in the scale and demonstrate tendency to lower outcome when the questions are fewer than ten. Following the recommendations of Briggs and Cheek (1986), using SPSS the mean inter-item correlation values show that CCC and CKC have reliable scales (in Pallant, 2003).

After the above performed analysis, we computed the means of all sub-questions forming each main question, thus nine main variables (quality parameters) were constituted describing the knowledge flows of the companies with ECSTFDP – CKC, CEBC, MSC, IDC, IFC, KSC, CFC, CCC, PKEC (the abbreviations correspond with those included in Table 3). The variable KSC was formed by combining the scales of the sub-questions describing the importance and the frequent use of the knowledge sources exploited in the of ECSTFDP in order to reduce the number of variables in the analysis.

4. Results

4.1 Industry - ECSTFDP

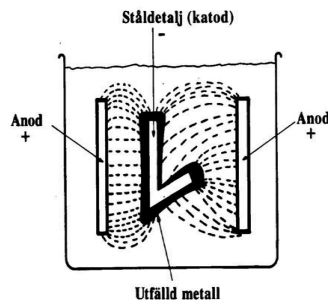
ECSTFDP's main production process is one of chemical and electrochemical conversion, electrolytic metal coating, and chemical coating, in which an electric current is fed through a solution containing dissolved metal ions and a metal object (Fig. 1). The latter serves as the cathode in an electrochemical cell, attracting ions from the solution (Regenstein, 1996). The anod can be inert or made of the coating material, e.g. zinc. It gradually dissolves in the solution.

Various parts are plated with a wide range of metals such as aluminum, brass, bronze, cadmium, copper, chromium, gold, iron, lead, nickel, platinum, silver, tin, and zinc. As Jan Skogsmo⁴ explains (SYF Conference in Elmia, Jönköping, 16.11.2006), it needs a robust quality control throughout the whole process (voltage and amperage,

⁴ Chairman of Svensk Ytbehandlings Förening (SYF)

temperature, residence times, concentration and purity of bath solutions, pH etc.). Additionally, competent knowledge (thickness of the layer needed, colour and brightness, alloys, hardness, friction etc.) is essential. Mutual collaboration between the producer (electroplater), the customer (exchange of information about the requirements for corrosion protection, appealing outlook, wearing out protection etc.) and the chemical suppliers (the right quality of the chemicals at the right time) also need to be in place.

Figure 1: The main production process in ECSTFDP



Source: Svensk Ytbehandlings Förening (SYF)

Parallel with the production process, strict environmental standards and requirements should be followed and kept. Moreover, the price is directly connected with the quality and determines the process to be used.

4.1.1 Main customers and target markets

Nowadays, the finishing offered by ECSTFDP is very common. The European Committee for Surface Treatment (CETS, 2006) has stated an approximate market structure of ECSTFDP consisting of automotive 22%, construction 9%, food and drink containers 8%, electrical industry 7%, electronics 7%, steel semis (components for other assemblies) 7%, industrial equipment 5%, aerospace 5%, others 30%. As Jan Skogsmo explains on a SYF Conference in Elmia, Jönköping (16.11.2006), this is mainly due to the fact that the surface of the metal products is altered, enhancing their corrosion resistance, electrical conductivity, reflectivity and appearance (e.g., brightness or colour), torque tolerance, solder ability, tarnish resistance, chemical resistance, ability to bond to rubber, hardness, wear resistance, etc. A product's life will be much shorter without the surface treatment that ECSTFDP provides. Moreover, as British Surface Treatment Suppliers Association (BSTSA) stated in 2007, the ECSTFDP is in the right direction of preserving raw materials and natural resources, protecting the environment and saving energy wherever possible, as it uses thin layers of just a few microns that are deposited onto base materials. The importance of ECSTFDP can be illustrated with the fact that each car

contains over 4000 surface treated components, including body panels, while an Airbus aircraft contains over two million (CETS, 2006).

According to the “European Business. Facts and Figures” (2006) only a small part of the output of the metal products sector reaches the final customers directly (e.g. household tools, cutlery) and consequently, the biggest share of the output is delivered to other industries (business-to-business setting). The biggest competitors in ECSTFDP on the European market are German, Italian, French, English, Slovenian, Spanish and Swedish companies (Eurostat, 2006). As ECSTFDP serves several major manufacturing areas, there is a high concentration of customers in some areas (such as the automotive industry in Sweden) with highly competitive markets, and surface treatment overcapacity (CETS, 2006). A small number of companies are large enough to serve more than three or four industry types. Consequently, they specialize in certain surface treatment types. Moreover, the companies operating in the ECSTFDP are mostly comprised by SMEs (CETS, 2006).

In Sweden there is a decrease in the number of companies in ECSTFDP following the overall international trend for decrease of the number in favour of the size as opposed to the situation in Bulgaria where there is an increase (Askengren and Clarin, 1991). This is also supported by the fact that there has been a loss of engineering manufacturing in Europe, largely to Asia, which has caused a decrease in the industry by over 30 % in recent years (CETS, 2006). However, neither the Swedish nor the Bulgarian ECSTFDP companies have entirely followed this trend as the majority of the companies are SMEs (Jan Skogsmo, SYF Conference in Elmia, Jönköping, 16.11.2006). Compared with the European competitors in ECSTFDP which have more than 100 employees, the Swedish and Bulgarian companies are predominantly much smaller (Askengren and Clarin, 1991).

Both the questionnaire results and the expert interviews showed that companies with ECSTFDP generate their sales on national (average value 43% of the sales) and regional markets (average value 34% of the sales), while only 23% of the sales are realized on international markets. This trend is valid both for Sweden and Bulgaria. The main markets and their relative share in the sales are investigated as they are considered to be a key parameter of innovation activity (see, Beise-Zee and Rammer, 2006). The predominantly national markets for the companies are not considered to be an obstacle for their CETK and innovation activities since their production is concentrated in specific regions which are close to the biggest customers. For the companies with ECSTFDP in Sweden, for example, Volvo, Scania, etc., the concentration of automobile industry predetermines the low level of export activities which emerges from the survey results too. Besides, the industrial enterprises with ECSTFDP do not manufacture end products but supply plated components, which are assembled or fitted (for example in automobiles). After that they are exported. This explains the fact that the results regarding export of the companies are not high.

4.1.2 Innovations and R&D

The intensity of R&D and the expenses incurred are considered to be another reliable index for the intensive knowledge flows and innovation activities of the companies (see Wei et al, 2005). The expert interviews show that innovation plays an important role for ECSTFDP. The majority of experts argue that it is the new processes together with consistent quality levels that account for the security and long term relations with customers. The orders are not redirected to countries with lower production and labour costs like China. The experts point out that innovation is necessary to meet increased environmental regulations and the ensuing ban on some of the existing processes. The new process development is also seen as a mean boosting the growth of ECSTFDP.

In the sample, the majority of the companies (42,86%) invest between 1% and 5% annually, while just 4,20% of the respondents invest over 21% per year, all of them being from Bulgaria. An average of 51,48% from the top managers are involved in R&D and innovation. Additionally, the middle, functional and other management levels are involved in R&D considerably less – average for each level 20,85%, 6,80% and 7,94%, respectively. The results are a mirror reflection for both countries surveyed. The explanation for this is the prevailing SMEs in the sample which have deficiency of resources for R&D investment. In relation to the expenses for R&D and product differentiation for the period 2004-2006, experts argue that the sum allotted annually from the company budgets for this purpose has increased. They explain this mainly with the changes in industrial production and the increased regulatory requirements for environmental protection.

Collaboration with customers, followed by competitors and suppliers, is indicated as the main factor stimulating innovation and R&D activities. The experts point out that the size of the company affects this process considerably because the smaller the company is, the harder it proves to be for it to influence its customers. The tendency in the last 20 years has been for major manufacturing companies to gradually assign the surface treatment to affiliated suppliers as it was not part of their core competences and main business. This led to loss of knowledge and competence regarding surface treatment processes. Nevertheless, the common way of working is that customers provide specifications and technical requirements for the surface treatment. According to the experts, the customers possess neither the competences necessary for the active selection of an appropriate process, nor the knowledge to create viable assignments. That is why they usually copy old specifications. For this reason, the unification of companies and other interested actors in a singular organization like SYF is crucial. It will have the role of a “mediator” between all interested parties and facilitate their learning about ECSTFDP. The respondents also highlight additional factors favourable for innovation and R&D activities such as EU environmental requirements; government financing and support; favourable interest rates; reduced bureaucracy. Furthermore, vital are the collaboration with universities for the development of competences as well as the creation

of technologies in the countries themselves (in this case Sweden and Bulgaria), instead of buying those from other countries (namely, from Germany, Italy, the USA).

For the time being, there is not a universal plating process, applicable to various parts and meeting all requirements, which can be a “quick fix” solution to production challenges of all kind. Therefore, another important aspect is the involvement of ECSTFDP companies in their customers’ new product development (NPD) from the very beginning of the process - idea screening. That is how they can contribute to the selection of the optimal shape for the surface treatment, which will guarantee the quality (i.e. integrated design of parts, technologies and production tools). According to the experts, this happens much later (testing and validation stage) when the development process is finalized by the customers’ R&D units. It poses potential quality problems during the full scale production as in most cases there is insufficient or even lacking knowledge about the available surface treatment types and requirements which can secure the quality.

The expert interviews show that there are four types of innovations in ECSTFDP. The first type is *new processes* developed on the due to increased environmental protection requirements. They also include improvement in the water treatment facilities. The second type is *organizational innovations* related to providing complete logistic solutions and quality customer service. They are evoked by the desire of the companies to add value to their products and provide complete service package to their customers. The third type is *other new processes* induced by the requirements of the large customers due to the change in their industrial production and the latest technological development. The fourth type is *changes in the equipment currently used* aimed at achieving better control and reducing the production costs. The experts emphasize all innovations are perceived as new in Sweden and Bulgaria, but are not new to the world developments.

The results from the survey, confirmed also by the expert interviews, show that companies with ECSTFDP are relatively active in the market launch of new or improved products for the period under investigation. This is due mainly to the specific characteristics of ECSTFDP, for which a new type of plating with different properties or improved quality can be introduced into production only through the change of chemical substances and voltage, without any replacement of existing equipment. This is supported by the statement that at least one new process is introduced annually, mostly in collaboration with the suppliers of chemicals (interview with Mr. Schimanke⁵, on 2007.03.25.). The high results found for the independent development of innovations are attributed to the organizational innovations for adding value to the products and providing better customer service, as well as using equipment for a comprehensive control over the production and reducing the costs.

In addition to the expert interviews, the innovations and R&D in the companies were investigated through the questionnaire looking at a period of three years (2004-2006). The majority of respondents (77,4%) have chosen *Agree* or *Strongly agree* for the statement that there is technological development in ECSTFDP. Around 58% declare that

⁵ Owner of a family controlled company

improvements/modifications of existing products have taken place. 51,2% have offered new or improved products/services and processes, while 50,4% even estimate that all innovations in the company have been developed independently. Most of the surveyed companies (33,6%) are self-confident and declare that they have presented a greater number of new products faster than their biggest competitors. Only a small number of the respondents (6,7%) have waited for the competition to introduce a new product and then copy it. In accordance with the findings from the expert interviews, 35,3% of the companies use advanced technologies as the main strategy to defend their existing markets. It supports the finding that 50,4% have developed innovations mostly independently. This predicts the findings that the skills for creating new products, services and processes are assumed as excellent by 42,9%. On the other hand, a smaller percentage (31,10%) of the respondents have chosen *Agree* or *Strongly agree* for the statement that all innovations in their companies have been developed in collaboration with other companies. Followed by 33,60% of the respondents who have bought technologies; 12,60% have acquired other enterprises, and 22,70% who have used license agreements for access to new technologies.

4.1.3 Collaboration

The collaboration with the competition is an important factor for the intensive flows of knowledge, i.e. CETK. It is one of the strengths of the SMEs which are trying to overcome the shortage of resources through collaboration with other companies. In addition to this, Askengren and Clarin (1991) state that ECSTFDP is dependant on external knowledge. It means that all companies have to facilitate the knowledge flows and collaboration as a tool to compete with the European competitors. This would allow introduction to new methods and products as Jan Skogsmo stated. There are examples of companies that work tightly together and have an intensive CETK. The representatives of the ECSTFDP companies described them as “*friendly (close) companies*” (J. Skogsmo and B. Schimanke, SYF Conference in Elmia, Jönköping, 16.11.2006). However, the collaboration levels were not at the level as SYF believed should be. The expert interviews show that collaboration between competitive companies is extremely rare and depends to a large extent on the personal contacts and trust between the industrial enterprises. Some of them even define it as “mission impossible”, but point out that the increased unity of action can turn into strength for ECSTFDP. The collaboration between companies with ECSTFDP and chemical suppliers is much more common due to the availability of resources for R&D.

The respondents perceive the achieved technological development level as the most important factor for collaboration (73,10% - *important* and *very important*). It is followed by reducing the costs for production; new products and new knowledge acquisition (71,50%) and trust and amicable relationship between top managers (69%). To a lower extent influence have larger benefit than the costs invested for collaboration (66,40%); the state of material and non-material infrastructure (63,90%); similar professional jargon

(63,8%) and opportunities for frequent personal meetings (56,30%). Technological superiority of the potential collaborating company (44,50%) and the physical distance between the partner organizations (30,30%) are seen as less important factors.

There is notable difference between the two countries regarding the factors influencing collaboration. In the Scandinavian country, managers prioritize the achieved technological development level, trust and friendship as well as the opportunities for frequent meetings. It illustrates the significance of social networking and personal relations. On the other hand, what matters most in the Balkan country is the opportunity to reduce the production costs, as well as the costs for new products and knowledge; the level of achieved technological development and a greater outcome from the resources invested.

4.2 Statistics

First, there is an effort to determine the relationship between the innovative activity in the industrial enterprises, the degree of interaction and collaboration through knowledge flows between various actors in the companies with ECSTFDP in Sweden and Bulgaria. Therefore, the relations between the variables are investigated using a linear correlation quotient – r . The investigation started with the calculation of these relationships for the entire sample (H1). After that, the sample was divided in two, based on a certain indication (1. the country where the company is operating, and 2. the size of the company), in order to determine the differences in the two cases (H4 and H5).

The results show a weak ($r = 0.10$ to 0.29), average ($r = 0.30$ to 0.49) and strong ($r = 0.50$ to 1.0) positive correlation between the variables under investigation. The only variables without statistically significant correlation between each other are the market situation (MSC) and the collaboration with the competition (CCC). This finding is somehow puzzling. From a theoretical point of view, the results were expected to show a correlation between MSC and CCC. The latest research indicates that the more dynamically changing the industry and the market situation are, the more intensive the collaboration between competing companies becomes. Therefore, an explanation for this finding might be that ECSTFDP is a mature industry where the market situation is not so dynamic. Another explanation might be that the questionnaire is a self reported form, i.e. the managers of the companies fill it in based on their own perceptions which might not be the most objective ones.

The strongest positive correlation is between *knowledge sources* (KSC) and *innovation factors* (IFC). The latter are also strongly influenced by the collaboration factors (CFC), the environment and behaviour factors (CEBC) of the industrial enterprises with ECSTFDP. CEBC is strongly influenced by the innovations and R&D (IDC), as well as the collaboration factors (CFC).

Table 4: Linear correlation quotient, *general*

Variable	Pearson correlation								
	CKC	CEBC	MSC	IDC	IFC	KSC	CFC	CCC	PKEC
CKC Sig. (2-tailed)		,464(**)	,202(*)	,350(**)	,273(**)	,459(**)	,240(**)	,225(*)	,268(**)
CEBC Sig. (2-tailed)	,464(**)		,375(**)	,535(**)	,508(**)	,477(**)	,549(**)	,402(**)	,433(**)
MSC Sig. (2-tailed)	,202(*)	,375(**)		,442(**)	,207(*)	,308(**)	,232(*)		,434(**)
IDC Sig. (2-tailed)	,350(**)	,535(**)	,442(**)		,351(**)	,443(**)	,445(**)	,393(**)	,493(**)
IFC Sig. (2-tailed)	,273(**)	,508(**)	,207(*)	,351(**)		,593(**)	,586(**)	,281(**)	,357(**)
KSC Sig. (2-tailed)	,459(**)	,477(**)	,308(**)	,443(**)	,593(**)		,527(**)	,458(**)	,542(**)
CFC Sig. (2-tailed)	,240(**)	,549(**)	,232(*)	,445(**)	,586(**)	,527(**)		,362(**)	,238(**)
CCC Sig. (2-tailed)	,225(*)	,402(**)		,393(**)	,281(**)	,458(**)	,362(**)		,435(**)
PKEC Sig. (2-tailed)	,268(**)	,433(**)	,434(**)	,493(**)	,357(**)	,542(**)	,238(**)	,435(**)	

n = ** Correlation is significant at the 0.01 level (2-tailed).

119 * Correlation is significant at the 0.05 level (2-tailed).

A strong positive correlation has also been detected between KSC, *places for knowledge exchange* (PKEC) and *collaboration factors* (CFC). It is essential that the variables researched have a minimum of average positive correlation with the company innovations and R&D. All registered weak, average and strong correlations are interesting because they confirm the studied variables are part of a process, i.e. they are not necessarily independent of each other.

The correlation quotients have been re-calculated after the data have been divided by *company size* and *country* (H4 and H5). Concerning *company size*, the analysis has determined that the number and strength of correlations between the variables is greater for SMEs than for large companies. Most correlations determined for SMEs are positive average, followed by strong and weak positive correlations. These results are identical with the general case, where the average correlations are predominant. For the big companies the correlations calculated are only strongly positive. Their number is much smaller compared to that of SMEs, with the biggest impact of KSC and CKC, and the strongest positive correlation between KSC, IFC and CFC. For SMEs the most important variables are CEBC, MSC and IFC, and the strongest positive correlation is between CEBC and CFC. Concerning innovations and R&D (IDC), in SMEs they are strongly influenced by CEBC, MSC, and PKEC. On the other hand, CKC, KSC, CFC, and CCC have only average influence of R&D and innovations. The smallest influence is determined for IFC. For the large companies the companies' R&D and innovations do not show any correlation to the other variables. These results could be explained by the fact that SMEs have a simplified structure; they rely on mutual trust and have fewer resources available, which force them to search actively for ways to get access to missing information, knowledge and resources. The great number of positive correlations is an indication that SMEs exploit various mechanisms, when their R&D and innovation activities are concerned. This reveals the great extent to which SMEs rely on the knowledge flows, i.e. CETK (H5). This in itself suggests that there are conditions for collaboration and networking.

Notably, when calculating the correlations based on *country*, their number for Swedish companies is much smaller, compared to the number of Bulgarian ones (H4). Besides, they are only average and strong, with the average correlations prevailing. Concerning the Bulgarian enterprises, the correlations prevailing are average positive, followed by strong and weak. It is specifically noted that the innovations and R&D (IDC) in the Swedish ECSTFDP are strongly influenced by CKC, CEBC and less by CCC and PKEC. In Bulgaria, the variables influencing IDC are CEBC, CFC, CCC, and to a smaller extent, MSC, IFC, KSC. In both countries the *collaboration with the competition*, environment and company behaviour prove to be essential for IDC. The strongest positive correlation among the variables for the Swedish companies is between *sources* (KSC) and *places for exchange of knowledge* (PKEC), while for the Bulgarian companies it is between the *innovation factors* (IFC) and the *sources of knowledge* (KSC).

The above-mentioned results necessitate the investigation of the relation between CETK, company innovations and R&D, i.e. how well CKC, CEBC, MSC, IFC, KSC, CFC, CCC and PKEC stipulate IDC in the sample surveyed. It is important to define the variables which best predetermine IDC.

A *standard multiple regression* has been carried out for the whole sample (both countries) among *company innovations* (IDC) as a dependent variable and *company competences* (CKC), *environment* and *company behaviour* (CEBC), *market situation* (MSC), *innovation factors* (IFC), *knowledge sources* (KSC), *collaboration factors* (CFC), *collaboration with competition* (CCC) and *places for exchange of knowledge* (PKEC), all of them like independent variables (H3).

The analysis shows that 40,7% of the variations of IDC (Adjusted R square) = 0.407, significance (sig) = 0,000) is determined by CKC, CEBC, MSC, IFC, KSC, CFC, CCC and PKEC (Table 6 and Table 7). In the present survey the recommendations of Tabachnick and Fidell (2006) have been followed and the adjusted determination quotient (adjusted R Square) is reported instead of the determination quotient (R square), since it provides a more realistic idea of the relevance between the regression model used and the sample surveyed. The values of the determination quotient (R-square) in most cases are too optimistic about the relevance of the regression model used (Pallant, 2005).

Table 6: Model summary (b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,670(a)	,449	,407	,43978

a Predictors: (Constant), PKEC, CFC, CKC, MSC, CCC, IFC, CEBC, KSC

b Dependent Variable: IDC

Table 7: Model summary (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16,697	8	2,087	10,792	,000(a)
	Residual	20,501	106	,193		
	Total	37,198	114			

a Predictors: (Constant), PKEC, CFC, CKC, MSC, CCC, IFC, CEBC, KSC

b Dependent Variable: IDC

Table 8: Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,119	,406		-,293	,770
	CKC	,099	,081	,107	1,232	,221
	CEBC	,213	,123	,180	1,726	,087
	MSC	,250	,104	,199	2,402	,018
	IFC	-,029	,078	-,038	-,379	,706
	KSC	-,011	,113	-,011	-,098	,922
	CFC	,170	,081	,211	2,088	,039
	CCC	,045	,038	,103	1,188	,237
	PKEC	,190	,082	,224	2,311	,023

a Dependent Variable: IDC

The greatest contribution to predicting IDC (the dependent variable) is made by PKEC (standardized coefficient $\beta = 0,224$). A smaller contribution is made by CFC, MSC, CEBC, CKC, CCC. Regardless of this, only PKEC, CFC and MSC have a unique statistically significant contribution (sig. < 0,05) for predicting the company innovations in the companies with ECSTFDP (Table 8). It is important to note that the values of standardized coefficient β show the average standardized unit change of the dependent variable as a result of the one standardized unit change of the respective independent variable (Manov, 2001).

The next step of the regression analysis is to test whether the selected set of independent variables will foresee the variation of IDC to a great extent if the possible effects of the company's age and its size in the country of its operation are controlled (H6). This is executed through the so-called hierarchical multiple regression analysis. The results show that after the variables for *company age, size and country of operation* are controlled for, the model accounts for 2,3% (Adjusted R Square = 0,023) of the variation (0,023x100). After introducing the remaining factor variables (CKC, CEBC, MSC, IFC, KSC, CFC, CCC and PKEC), the model as a whole accounts for 39,8% of the IDC variation (Adjusted R square) = 0.398, significance (sig) = 0,000). All independent variables account for 39,8% (0,398x100) different from the variation of IDC (change of determination quotient (R Square changed) = 0,398, significance (sig) = 0,000), even when the effects of *company age, their size and the country of their operation* are controlled statistically. This is a statistically significant contribution as the value change for sig. F (0,000) shows (Table 9). As a whole, the model including all independent variables (*company age, size and country of operation, CKC, CEBC, MSC, IFC, KSC, CFC, CCC and PKEC*) is significant [F(11,90)=7,066, sig. 0,000].

Table 9: Model summary (c)

Model	R	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
				R Square Change	F Change	df1	df2	Sig. F Change	
1	,227(a)	,052	,56473	,023	1,778	3	98	,156	
2	,681(b)	,464	,44321	,398	8,638	8	90	,000	

a Predictors: (Constant), Number of employees today working 35 hours or more per week, Country, Company age

b Predictors: (Constant), Number of employees today working 35 hours or more per week, Country, Company age, CFC, PKEC, CKC, CCC, IFC, MSC, CEBC, KSC

c Dependent Variable: IDC

The uniquely statistically significant contributions of the independent variables repeat the results of the standard multiple regression even when the effects of *company age*, are controlled, with the exception of the PKEC factor. The latter has no statistically significant contribution to foreseeing IDC, if *size and company age*, as well as *country of operation* are taken into account. This shows that the market situation (MSC, standardized coefficient $\beta = 0,251$) and the collaboration factors (CFC, standardized coefficient $\beta = 0,237$) have a statistically significant effect on innovations and R&D of industrial enterprises irrespective of the country of operation, their size and age.

Table 10: Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,753	,273		10,087	,000
	Company age	-,003	,002	-,130	-1,178	,241
	Country	,111	,140	,087	,798	,427
	Number of employees today working 35 hours or more per week	,000	,000	,152	1,491	,139
	2	(Constant)	,040	,469		,084
2	Company age	-,001	,002	-,074	-,820	,414
	Country	-,153	,137	-,119	-1,121	,265
	Number of employees today working 35 hours or more per week	,000	,000	,105	1,254	,213
	CKC	,107	,089	,115	1,207	,231
	CEBC	,153	,140	,130	1,093	,277
	MSC	,316	,137	,251	2,297	,024
	IFC	-,029	,084	-,038	-,349	,728
	KSC	,017	,123	,017	,136	,892
	CFC	,191	,089	,237	2,136	,035
	CCC	,047	,042	,108	1,132	,260
	PKEC	,163	,092	,192	1,761	,082

a Dependent Variable: IDC

5. Conclusion

Contemporary environment makes the traditional way of viewing an organization obsolete. Instead, it is seen as constituted of knowledge bundles, constantly in motion, in an attempt to address knowledge asymmetry and get access to parts it doesn't possess. Consequently, companies are impregnated with intensive knowledge flows (CETK) and actively network. Our research showed that, this alternative view is not dominantly valid only for knowledge-intensive, high-tech organizations, but also for companies from a rather mature industry – ECSTFDP.

The present study is provoked by the identified gap in the field of knowledge flows for collaboration and innovation, i.e. neglecting the low-tech industries as object of empirical research. We believe that our main contribution is addressing this gap. Additionally, we perform an international comparison between two European countries: Sweden and Bulgaria. The first one has an extensive R&D spending as a percent of Gross Domestic Product (GDP) as opposed to Bulgaria. Furthermore, to our knowledge, there is no empirically grounded article within this field which investigates Bulgarian companies, their competitive behaviour, perception of and participation in networks for collaboration and innovation. This is also seen as one of our main contributions. What is more, this research is perceived as beneficial and needed by industry representatives which further enhances its value. The industry experts have already identified collaboration and networking as vital but something that they need further understanding about. As Jan Skogsmo says “the industry needs appropriate competence and a long lasting mutual collaboration”. All this makes our study both theoretically and practically relevant.

In the business-to-business context in which ECSTFDP operates a high interdependence between all actors was revealed. The SMEs dominate in the industry. They actively try to compensate their knowledge deficiency by building on their strengths in order to facilitate all knowledge flows and networking for innovation. Compared with large companies, SMEs display a higher tendency for interaction and collaboration through knowledge flows, especially with respect to R&D and innovations, which is a prerequisite for networking. Our findings also revealed that managers have realized the importance of collaborating but still predominantly follow their usual practices to handle problems and challenges on their own.

In this study nine variables were identified in order to get a better understanding of the companies' knowledge flows for collaboration and innovation. Innovation and R&D activities turned to be correlated with different variables for each of the studied countries. The Scandinavian companies put priority to company competences and the environment in regards to their CETK for innovation. On the other hand, the Bulgarian companies are influenced foremost from the environment and claim to collaborate with their competitors. For them, the collaboration factors also have significant role for CETK. All other identified variables turned to have much weaker influence in relation to innovation and R&D activities.

Companies with ECSTFDP undertake mostly process innovations in collaboration with their suppliers. They also introduce organizational innovations in an attempt to increase the value added for their customers. Our regression analysis showed that innovation and R&D in both countries (i.e. for the whole sample) can be predicted by the set of eight variables even when the size and age of the enterprises, as well as the country of operation, are controlled. Namely, company competences (CKC), environment and company behavior (CEBC), market situation (MSC), innovation factors (IFC), knowledge sources (KSC), collaboration factors (CFC), collaboration with competition (CCC) and places for exchange of knowledge (PKEC).

Innovation and R&D are positively, statistically significant, affected by places for knowledge exchange followed by collaboration factors and market situation. Furthermore, our study showed that the key variables influencing innovation and R&D activities do not change (except places for knowledge exchange) when the size and age of the enterprises, as well as the country of operation, are controlled. However, the factors for collaboration and interaction (CFC) between various interested actors are the most important for increasing the innovation activity for companies with ECSTFDP, irrespective of size, age and country of operation. It shows presence of conditions for establishment of a network for collaboration and innovation. It also reveals the vital role of the social element in the CETK, which is also emphasized in the knowledge management literature. Moreover, it illustrates that companies are influenced by the number of factors in this collaboration and actively evaluate the trade-offs from it. Additionally, the dynamics of the market are setting the pace and degree of newness of innovation and R&D activities, so the above mentioned results do not come as a surprise.

In summary, in the studied context intensive knowledge flows are effectual for all companies no matter the size, country and the type of industry they operate in. Furthermore, SMEs have strong advantages that facilitate the knowledge, creation, exchange and transfer. Thus, a better understanding of their knowledge flows can help them organize their knowledge base in a sustainable way, enhancing their knowledge activities in order to survive in a highly competitive environment.

The above findings provide new insights and new avenues for research of knowledge creation, exchange and transfer, related to innovation and collaboration, in a mature, low-tech industry. It could be used as the first step to understand if, how and why networks emerge within this specific context. Future research could examine the transformation and the change processes of networks, i.e. how they develop over time and support growth. Moving beyond this study's single point of time results, future research can longitudinally explore these processes and existing trends in different contexts, similarly to Hagedoorn (2002). Additionally, specific aspects such as technological diversity and organizational forms of the collaboration could be investigated, providing data for comparisons with the results from already existing studies in other empirical contexts such as, for example, Sampson (2007). Furthermore, data from other mature, low-tech industries can add to the generalizability of the findings.

As for the limitations of this study, the major one is that self-reported data from CEOs or senior company managers was used as they sometimes tend to report too positive or overestimated information (Biazzo and Bernardi 2003). Another limitation was that we did not investigate any variables that were connected with the companies' intangible resources (e.g. corporate culture) and their relationship to CETK. These can intensify or hamper the knowledge creation, exchange and transfer, thereby influencing the companies' innovation activities and competitive advantage. We limited ourselves on purpose as our questionnaire was already too long and we wanted to keep the feasibility of its completion. However, investigating these aspects may provide new avenues of future research and contribute to the better understanding of CETK in a mature industry.

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Assessing Accrual Accounting Reform in Greek Public Hospitals: An Empirical Investigation

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Abstract

During the last decades, several countries worldwide have introduced financial management reforms, as an important part of the New Public Management (NPM) initiative at one or more levels of government sector, by either replacing or transforming their traditional budgetary cash accounting systems towards a business-like accrual accounting concept. Following the example of this upcoming managerial trend, the Greek government introduced in 2003 the accrual basis accounting into public hospitals, as the hospital sector is one of the areas where NPM reforms have been introduced in search of higher efficiency, effectiveness and economy in service production.

The purpose of this paper is twofold. The first goal is to provide an overview of the government sector reform initiatives in Greece and to present empirical evidence regarding the adoption level of the accrual basis accounting standards in the Greek public Health sector. The second goal of the research is to investigate the impact of a range of potentially contingent factors on hospitals compliance with the accrual financial and cost accounting reform.

The present analysis is based on the results of an empirical survey that took place during 2009. For the purposes of this survey, a structured questionnaire was prepared and sent to the Chief Financial Officers (CFOs) of 132 Greek public hospitals. In particular, a linear regression model analysis was used to examine the cross-sectional differences on a number of explanatory and implementation factors of the accounting reform adoption level.

The empirical evidence reveals that the level of accrual and especially cost accounting adoption in Greek public hospitals is realized only to a limited extent. In particular, results show that the level of reform adoption is positively related to IT quality, reform related training, education level of accounting staff, and professional consultants' support. However, no significant relationship was found between the level of reform adoption and hospital size,

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reform implementation cost, CEO educational background, experience effect, and absence of management-physicians conflict relationship.

The main contribution of this study is the empirical evidence it provides on the approaches and processes used by the Government of Greece to implement accrual financial and cost accounting systems in the Greek National Health System (GNHS) and the role certain human, organizational and situational factors played in such implementations for enhancing researchers' and managers' understanding of major implementation processes and challenges as well as helping them refine models of effective implementation process and improve systems and processes on similar future projects.

Keywords: Accrual Accounting, Public Sector Accounting, Compliance, Public Hospitals, contingency factors

JEL Classification: M4, M48

1. Introduction

Public service organizations across the globe have been engaged in strategies of institutional, organizational and managerial change in order to cope with increasing demands for greater financial accountability, efficiency and effectiveness.

Generally, governments are implementing numerous market-based and business-like reforms, broadly known as New Public Management (NPM), aiming at bringing the public sector in line with the private sector. NPM is used as an instrument to introduce market discipline in public bureaucracies as well as to indicate the shift in emphasis from input and process accountability towards output and results-oriented accountability. According to Christiaens et al. (2004; 2007) the governmental accounting reform has often been the first step of government reform and that is why it can be considered as an important condition and prerequisite for the success of other consequent governmental reforms under the transformation wave of NPM, such as organizational and managerial reforms. Therefore, effective and successful implementation of the accounting reform plays an important and dominant role in the implementation and success of other NPM practices and techniques within public organizations. Without an adequate and successful implementation, all the anticipated gains, the presupposed objectives and expectations of the reform will be lost due to the fact that the new accounting system will not be able to provide relevant and accurate managerial and financial information to support it. (Christiaens and VanPeteghem, 2007).

This change of public accounting systems towards accrual basis accounting seems necessary as the traditional budgetary cash accounting system is perceived nowadays as no longer satisfactory, mainly due to the lack of presenting an accurate financial picture

and providing useful and adequate management information to facilitate the planning and performance process (Cohen, 2007; Lapsley, 1999; Christiaens, 1999).

Within the context of NPM and following the example of numerous other countries in Europe and worldwide, the Greek public sector has encountered a number of financial accounting changes and reforms over the last ten years in order to meet the challenges that increased globalization has brought in. As a result, in 1997 the Greek government started introducing the accrual based accounting system and the double-entry bookkeeping method to some specific sectors of government activities in order to modernize its governmental accounting system. The most important examples of the Greek public sector entities where an accounting reform took place towards accrual basis accounting were: Social Securities funds (1997), Public law entities (1998), local government institutions; Municipalities, (1999) and finally public owned hospitals (2003).

In particular, in the international public sector accounting literature, the accrual accounting initiative is thought to have a number of benefits which can be grouped and summarized as follows: (i) it provides a clear picture of the total cost of government programs, activities and services provided; better measurement of costs and revenues; enhancement of control process and transparency; (ii) greater focus on outputs; focus on the long-term impact of decisions; (iii) more efficient and effective use and management of resources and greater accountability; (iv) reduction and better measurement of public expenditures; (v) better presentation of the financial position of the public sector organisations; (vi) better financial management; improvement of performance measurements and greater comparability of managerial performance between periods and organizations by calculating indicators on the basis of comprehensive and consistent financial and operational data; (vii) greater attention to assets and more complete information on public organisations' liabilities through better assets and liabilities management; (viii) better planning for future funding requirements (ix) helps with make/buy or rent/buy decisions; (x) better decisions on feasibility of providing services; (Mellett, 2002; and Olsen et al., 2001; Barrett, 1993; Evans, 1995; Pallot, 2000; Mellor, 1996; Brusca, 1997; Funnell and Cooper, 1998; Ryan, 1998; Chan, 2003; Guthrie, 1998; Jones, 2004; Barzelay, 1992; Moe, 1994; Venieris and Cohen, 2004; Cohen et al., 2007; Aucoin, 1995; Pessina and Steccolini, 2007; OECD, 2005; and International Federation of Accountants - Public Sector Committee, 2000 and 2002, pp. 7–10).

However, a considerable body of researchers call attention upon the adoption of the accrual-based accounting system by public organisations and believe that its implementation is often accompanied by a plethora of drawbacks and problems (accounting issues, and human, organizational and financial scarce resources) which hinder or delay the adoption level; for them, the transition from the cash to the accrual accounting system is not going to happen immediately and completely (Cohen et al., 2007; Christiaens, 2001; Windels and Christiaens, 2005; Guthrie, 1998; Carlin and Guthrie, 2003; Hodges and Mellett, 2003; Brusca, 1997). Thus, especially in a

governmental context, compliance with the accrual accounting regulation can be seen as a *sine qua non* condition before any further successful implementation takes place.

According to Pollitt (2002) the adoption of NPM innovations can be categorized at four distinct stages: (1) disclosure, (2) Decision, (3) practices, and (4) impacts of changes. Our study focus on the practice stage in which technical NPM innovations are used by public sector organizations, including contextual and organizational factors that may influence the use of new techniques in practice.

In particular, the present research study aims at describing and comparing in an objective way the actual adoption and implementation of accruals in the Greek public hospitals by quantifying the extent of accrual financial and cost accounting implementation and testing the impact of a range of potentially contingent factors that exert an influential role on the level of accrual accounting reform adoption. This study uses quantitative research methods in order to generalize findings from previous case studies and provides empirical evidence to support the scant literature on the accounting change in public sector (i.e. Greek public hospitals).

The remainder of this paper proceeds as follows. The next section presents a short description of the Greek National Health System (GNHS) and the financial accounting reforms that took place during the last ten years. The third and fourth section present the research hypotheses and methodology applied in this study respectively. The presentation of the data analysis of the empirical research is found in section five. The paper conclusions drawn from this research as well as its limitations are set out in the final section.

2. Accounting reform in the Greek public health sector

Greek public hospitals have experienced a number of organizational, administrative and financial reforms since the mid-1980s in the name of improved efficiency, effectiveness, and accountability.

The Greek NHS can be characterised as a “dual-mixed” system, in which elements from both the Bismarck (increased importance of social insurance in funding health care) and the Beveridge (health care primary funded by state budget) model co-exist. The GNHS was founded in 1983 by the Greek Law 1397/83 which declared that health is a “*social good*” and all citizens should have the right to high quality health care. Therefore, the health care system strives to guarantee universal and free access to medical services for the entire population, based on the principles of everyone’s equal treatment to health services and solidarity.

At central government level, a number of different ministries are involved in administering the supply of public health services, thus creating further inefficiency problems. The Ministry of Health and Social Cohesion (MHSC) is responsible for the provision of health care and the development and implementation on a national strategy for health policy. More specifically, the MHSC sets strategic priorities at a national level,

defines the extent of funding for proposed activities, allocates the necessary resources (staff and material resources), proposes legislative framework changes and undertakes the implementation of laws. Nonetheless, it shares responsibilities with other Ministries. For example, responsibility for the supervision and regulation of the public insurance funds, which also administer the pension schemes, lies with the Ministry of Employment and Social Protection. This involves determining what medical benefits are covered, conditions for accessing doctors and contribution rates. The Ministry of Finance (MoF) is responsible for retrospectively subsidising the GNHS and health insurance funds, and finally, the Ministry of Development is responsible for setting drug prices (Economou and Giorno, 2009).

There are three major categories of health care providers: (1) the GNHS (public hospitals, health centres, rural surgeries and emergency rooms per hospital care) administered by the MHSC; (2) insurance funds health services with their representative units and polyclinics (mostly established within the biggest Greek insurance fund called IKA) and (3) the private sector (private hospitals, diagnostic centres, independent practices, surgeries and laboratories).

Regarding secondary hospital health care provision, approximately 75% of hospital beds are in the public sector (67% in the GNHS) and 25% in the private sector. The average bed capacity for public hospitals is 233 beds and for private hospitals only 55. Health care services, in the public sector, (mainly Secondary and tertiary health care) are provided in 132 general and specialized public hospitals which operate within the NHS. The NHS public owned hospitals have a total capacity of 34.134 beds. Moreover, 195 Health Centres operate in rural areas. Rural Surgeries, attached to the Health Centres, provide primary health care services. The Health Centres provide also emergency services, short hospitalisation and follow up of recovering patients, dental treatment, family planning services, vaccinations, and health education (Economou and Giorno, 2009).

Traditionally, Greek governmental budgeting and accounting system at all three levels of public governance -central, regional and local- is regulated by law and not by an independent standard-setting professional body and it is still based upon the cash principle of accounting.

Similarly, the governmental accounting regulations applying to Greek public hospitals – which date back to 1974 with the legislative decree 496/74 – are also based on an old budgetary and single-entry book-keeping accounting system that still has a primarily cash basis accounting approach. Thus the form of accounting that exists in public hospitals is that of budgeting on a cash basis.

More specifically, the main purpose and concern of the public hospitals' budgetary cash accounting system was to recognize transactions and other events only when cash was received or paid, to record them in the authorised budgets, to be driven by budgetary principles, and finally to control the execution of the budget approved by the

governmental decision makers. On the other hand, little attention was given to providing a complete picture of the financial position and financial performance of public hospitals. Under this approach, calculations for decision making seldom take place, and focus of the budget evaluation process lies heavily on the cost side, whereas the income side is underestimated. In other words, focus lies on expenditure control and record keeping, and no attention is paid in performance evaluation and feedback. Consequently, no action is taken to tie performance measures, and thus accounting information is not used to guide decision making. According to Mossialos et al., (2005): “*Resource allocation mechanisms of public hospitals in Greece are historical and political with no relation to performance or output; therefore providers have little incentive to improve their productivity*”.

The Greek management literature has long pointed out the need for reforming this budgetary cash accounting system in the health public sector and has indeed supported the switch to accrual accounting (Ballas and Tsoukas, 2004; Venieris, Cohen, and Sykianakis, 2003). Traditional budgetary cash accounting has long been viewed as ‘outdated’, no longer satisfactory and making a significant contribution to the inefficiency and ineffectiveness of the Greek public sector because it does not permit the disclosure of the full picture of the economic activity and financial position of the public hospitals (Lüder and Jones; 2003).

The initial efforts of introducing the accrual basis of accounting in public hospitals in Greece commenced in 1997 under the Law 2519/97. This Law presented for the first time the government’s attempt and intention to introduce a double-entry bookkeeping accounting system and cost management methodologies in public hospitals based on the accrual basis.

For this purpose, the development and preparation of an Official Health Sector Accounting Plan (HSAP) aimed at developing the conceptual framework for accrual accounting in public hospitals, was assigned by the Ministry of Economy and Finance to the national Council of Accounting (ESYL) and to the Chamber of Finance (OEE).

The HSAP mainly included broad guidelines regarding principles for accrual basis accounting implementation, similar to those applied to the private sector, the charts of accounts, asset classification, examples of journal entries, templates of the layout and the content of the published financial statements (i.e. balance sheet, income statement, The Statement of Income Distribution, Budget report and Actual report) and some suggested financial and costing ratios (Venieris and Cohen, 2004).

Furthermore, a pilot implementation project, under the experimentation clauses of the HSAP, commenced in 1999 in order to test the suitability of the new accounting system and its readiness for full implementation. Five Public owned hospitals that would implement the HSAP as pioneers were selected.

The governmental efforts to reform the accounting system of the health sector escalated in 2003, after taking the pilot implementation experiences into account and

making the necessary modification and amendments to the HSAP, when a law, the Presidential Decree 146/03 (P.D. 146/03), was passed.

The P.D. 146/03 enforced the mandatory adoption of the new accounting system, based on accrual basis, on all the public hospitals that are part of the Greek NHS and established the necessary guidelines and accounting standards for financial reporting purposes. However, the previous traditional budgetary cash accounting system was not abandoned but, instead, the public hospitals just added the accrual accounting system separately and most of the budgetary accounting principles were maintained (Christiaens, 2001). The new accounting framework of the P.D. 146/03 defined two accounting systems that should work simultaneously under three independent accounting cycles; the financial accounting cycle, the budgeting cycle and the cost accounting cycle, within the same general ledger and while each one would still retain its autonomy. The legislator believed that the solution of introducing this combined approach for accrual accounting and double-entry budgetary cash accounting through two separate accounting systems should be the most beneficial in order to reap the best of the two accounting systems, as each one has its own strengths and weaknesses (Venieris and Cohen, 2004). The financial accounting system aims at reporting the financial position and the yearly profit and loss of hospitals, the budgeting system aims at authorizing and controlling the public spending (Christiaens and Rommel, 2008) and the cost accounting system aims at calculating the health services' full cost by using the accounting data of the financial accounting cycle (accrual accounting) and processing them within a rather complicated framework of double entry journal entries (Venieris and Cohen, 2004).

The P.D. 146/03 pointed out that the deadline for the implementation of accrual financial accounting in public hospitals was the 1st of January 2004, while the deadline for cost accounting introduction was the 1st of January 2005.

3. Research questions and hypotheses development

Although the NPM reform, regarding the implementation of accounting standards on an accrual basis, is coercively imposed by the P.D. 146/2003 it is not sure that its implementation will take place immediately and completely (Christiaens et al., 2004). Thus, the first objective of this study is to identify major areas of non-compliance with the accounting reform. This leads to the first research question:

RQ1: At what extent do public hospitals comply with the new accounting standards set out in the PD 146/03?

A second objective is to explain cross-sectional differences in the adoption and implementation of accrual accounting by identifying several characteristics of public hospitals that play an influential role to the level of accounting reform adoption. This leads to the second research question:

RQ2: Can the cross-sectional differences in the level of compliance with the accrual accounting legislation be associated on organizational capability factors derived from previous and current research?

Based in previous studies, (see for example, Ouda, 2004; Venieris et al., 2003; Christianens, 1999; Windels and Christiaens, 2005; Cardinaels et al., 2004; Arnaboldi and Lapsley, 2003) a number of related hypotheses can be formulated:

3.1 Education level of the accounting staff (EDUC)

Concerning the personnel's educational level, the literature suggests that, when educated to a higher level, an organization's staff is expected to appreciate the usefulness and use of new accounting techniques more and thus to promote its implementation in governmental organizations (Ouda, 2004; OECD, 2003; Venieris et al., 2003). According to Windels and Christiaens (2004) the general level of education of the executives and their staff has positively affected the level of NPM reform adoption in Flemish local governments. Furthermore, Stamatiadis (2009) found that the educational level of accounting staff is positively related to the user's perceived satisfaction level of financial accrual accounting system adoption in Greek public hospitals. Based on the above discussion the following hypothesis is formulated:

H1: The level of accounting reform adoption is positively associated with education level of accounting department personnel.

3.2 Training (TRAIN)

Prior studies support this hypothesis that adequate training has a positive influential effect on the successful adoption of cost accounting systems, as understanding of how to design, implement and use these systems is enhanced (Krumwiede 1998; Shields 1995). Similarly, public sector studies point out that the transition from cash based accounting to accrual and cost accounting requires significant training costs (see for e.g. Brusca, 1997). According to Ouda (2004), the fact that employees are neither sufficiently informed of the direction of the change nor empowered to contribute to the process, constitutes one typical reason for which many accounting changes in the public sector have failed in the past. Therefore, the introduction of a new accounting system in the public sector requires an overall training strategy to disseminate objectives and prerequisites of the change process, to clarify potential misunderstandings, to convey a common understanding of the key principles of the accounting changes and to convince for the potential benefits of the new system. In other words, training has to provide a mechanism for employees to understand, accept, and feel comfortable with the NPM ideas and instruments, and prevents employees from feeling pressured or overwhelmed by the implementation

process (Cavalluzzo and Ittner, 2004). If training resources are insufficient, then normal development procedures may not be undertaken, increasing the risk of failure (McGowan and Klammer, 1997; Venieris et al., 2003). Based on the above discussion the following hypothesis is formulated:

H2: The level of accounting reform adoption is positively associated with the level of reform-related training of the accounting staff.

3.3 The quality of information technology (ITQUAL)

Consistent with information system and management accounting change models, surveys in the private sector, report that information systems' inefficiencies and data limitations, such as the inability of existing information systems to provide reliable, accurate, and up-to-date data in a cost effective manner, represent a major impediment to management accounting systems implementation and use (Krumwiede, 1998; McGowan and Klammer, 1997; Kwon and Zmud, 1987; Anderson, 1995; Shields and Young, 1989). Krumwiede (1998), for example, suggests that organizations with more advanced information technology may be more able to implement new management accounting systems than organizations with less sophisticated information systems because of lower processing and measurement costs. Enterprise Resource Planning (ERP) systems have commonly been promoted as an appropriate technical platform. According to Reeve, 1995 and Anderson, 1995 (cited in Al-Omiri and Drury, 2007) organizations with ERP systems can integrate business processes across functional areas and accumulate operational data needed for resource and activity analysis from multiple sources in one central database. This can streamline processes, reduce processing time, and increase control within organizations.

Field studies and surveys from the public sector report similar results (GAO, 1997a; Jones, 1993; OECD, 2003; Ouda, 2004; Arnaboldi and Lapsley 2003; Guthrie, 1998; Hepworth, 2003; Scapens and Jazayeri, 2003). These studies suggest that advanced information technology will be required to facilitate and support the introduction of accrual accounting in the public sector. As a result, high existing quality in the organization's information systems should be considered as a necessary prerequisite of successful implementation of NPM initiatives (Ouda, 2004). These arguments lead to the formulation of the following hypothesis:

H3: The level of accounting reform adoption is positively associated with the level of existing information technology quality.

3.4 Professional support from consultants (CONSUL)

There is a large amount of governmental accounting literature which describes management consultants as epistemic communities of specialized knowledge and expertise – their assistance and hands on support is deemed as necessary in the current

reforming climate of NPM. Thus, management consultants have been identified as key levers in the process of changing management practices in the public sector and facilitating the implementation process as a technical implementation support but also as a “knowledge source” (Arnaboldi and Lapsley, 2003; Hood, 1995; Lapsley and Oldfield, 2001; Laughlin and Pallot, 1998; Ouda, 2004). In Christiaens’ study (1999) the assistance of professional consultants is the most important positive explanatory factor highlighting compliance differences among Flemish municipalities. Therefore, hospitals employing management consultants in their operations are expected to exhibit a higher level of reform adoption. Hence, the following hypothesis is formulated:

H4: The level of accounting reform adoption is positively associated with Professional support of management consultants’ use.

3.5 Long term experience in accrual accounting (EXPER)

Hospitals with long term experience in accrual accounting are assumed to have gathered all the relevant necessary experience and be familiar with the accrual concept by now. These hospitals are assumed to have resolved most of the accounting and implementation problems and shortcomings emerged during the accrual accounting system installation and progressively overcome most of these difficulties as they are getting familiarized with it. Thus, it could be expected that hospitals with long-term experience in implementing accrual accounting will attain a superior level of accounting compliance (Christianens, 1999). Therefore, the following hypothesis is formulated:

H5: The level of accounting reform adoption is positively associated with hospitals long-term experience in accrual accounting.

3.6 Accounting reform implementation cost (COST)

Prior studies on public sector reform have reported that the high implementation cost of a new accounting system (e.g., staff training, Information Systems changes, consultants’ fees etc), even if it is mandatory, can considerably deter or delay the whole adoption process and its anticipated consequences (Lawson, 2005; Udpa, 1996; Canby, 1995; Ouda, 2004). Because an accounting change can be rejected if it is too costly, although it is coercively enforced, the following hypothesis is formulated:

H6: The level of accounting reform adoption is negatively associated with the cost of its implementation.

3.7 CEO educational background (CEOEDUC)

Results of prior organizational change studies suggest that CEOs with a predominant administrative background may be more likely to advocate and support administrative innovations that promise to further managerial efficiency and

effectiveness, whereas CEOs with a predominant clinical background would be more likely to be interested in the adoption of innovations in the core technology (e.g., new surgical procedures, new drugs, new equipments etc) rather than administration (kimberely and Evanisko, 1981; Emsley et al., 2006; Finkelstein and Hambrick, 1996; Naranjo-Gil, Hartmann, 2007).

Based on the above discussion the assumption is made that Managers with an administrative/business-oriented educational background against clinical educational background would rely more on formal and hierarchical forms of management and thus would be more motivated to adopt accrual accounting systems and reap the expected benefits of the more accurate, reliable and relevant accounting information they provide for achieving efficient decision-making process, to disseminate objectives and prerequisites of the change process, to clarify potential misunderstandings, to convey a common understanding of the key principles of the accounting changes, and to convince users for the potential benefits of the new system. Therefore, the following hypothesis is formulated:

H7: The level of accounting reform adoption is positively associated with CEOs business-oriented educational background.

3.8 Management–physician relationship (CONFLICT)

Burns and Scapens (2000) suggest that in order to successfully implement changes in an organisation a thorough examination of the identification of potential organisational conflicts is needed. The various interest groups that are involved in a strategic change process are likely to have different goals, values and problem solving styles and different rationalities. According to Venieris et al, 2003 conflicts may arise from the existence of different and opposing rationalities between actors, those that promote change and those who resist it in fear of losing privileges. Consequently, the success level of reform adoption in public organizations can be hampered because of perceived incompatibility with the needs and values of different subculture groupings (Markus and Pfeffer, 1983; and Scapens and Roberts, 1993).

This is the case in hospitals where administrative activities (including finance and accounting practices) are loosely-coupled with clinical (core) activities (i.e. the treatment of patients) (Abernethy and Vagnoni, 2004; Coombs, 1987; Kurunmaki et al., 2003; Lapsley, 2001; Pettersen, 1999). Additionally, the study of health sector in Norway by Pettersen (1999) reports the existence of different professional cultures between hospital management staff and physicians. Pettersen (1999, pp. 392) concludes that:

“Hospitals are professional bureaucracies with very strong and specific norms which control medical actions. These norms are very different from ideas of accounting norms, which are supposed to control accounting action. In such situation, two different cultures are inside hospitals, the clinical and the administrative cultures. The clinical world follows the logic of appropriateness,

whereas the administrative world's decisions are based on the logic of consequentiality. In such situation, organizational learning and change can be a very difficult process”.

In the GNHS the hospital is operating as a professional bureaucratic organization under the structure of which physicians constitute the dominant operating core, whereas accountants and the rest of administrative staff are considered as secondary; thus, overall management style seems to favour clinical to financial objectives. In this context, physicians often perceive and interpret management and accounting reform initiatives in quite a different way from management staff because of different norms and training and diverse purposes (Ballas and Tsoukas, 2004). Thus, implementation of the accrual-based accounting systems may be achieved more easily in hospitals where the relationship between management and physicians portrayed as an area with minimum conflict. In this sense the following hypothesis is formulated in order to test the intra-organizational power relationships:

H8: The level of accounting reform adoption is positively associated with the absence management-physician conflict.

3.9 Size of the Hospital (SIZE)

The size-effect variable of the public organization in question has also been incorporated in other previous governmental accounting studies as an important factor influencing the level of management and cost accounting systems adoption. However, the impact of the size variable on the level of compliance is not clear. In particular, some of the previous studies noted a positive relation between the organization size and the level of businesslike management instruments adoption (Christiaens, 1999; 2001; Cardinaels et al., 2004; Krumwiede, 1998; Innes and Mitchell, 1995; Bjornenak, 1997). However, there are studies which found no significant relationship (Evans and Patton, 1983; Robbins and Austin, 1986) and even studies where a negative relationship is observed (Cohen et al., 2007; Lüder, 1992).

This study assumes that larger hospitals, in terms of bed capacity, are more likely to have implemented an accrual accounting system to a greater extent. A possible reason for this is that larger organizations have relatively greater access to resources to introduce and implement management systems and techniques. Another reason would be that as organizations become larger, the need to handle greater quantity and quality of information increases to a point where the introduction of management systems deems necessary. For these reasons the following hypothesis is formulated:

H9: The level of accounting reform adoption is positively associated with hospital size.

4. Research Method

4.1 Sample characteristics and data collection

In order to collect the necessary data, a survey using questionnaires was conducted during 2009 in all Greek public hospitals. The questionnaire was sent by electronic mail (e-mail) and facsimile (fax) to 132 Chief Financial Officers (CFOs) of public hospitals. The main criterion for the selection of CFOs as key informants in this study was their expected knowledge about the adoption and implementation of the new accrual accounting system within their organizations. Thus, we believe that the answers are reliable. Eventually, out of 132 distributed questionnaires, 94 usable questionnaires were returned, yielding a total response rate of 71.21%.

Prior to the presentation of the research findings, there will be a reference to the demographic characteristics of the public hospitals included in the sample. Table 1 (in Appendix) shows the hospitals' financial, geographical and organizational characteristics, such as geographic region, financial turnover, number of employees, number of beds and type of hospital.

In order to minimize the chance that the reported results differ between respondents and non-respondents a nonparametric, one-sample Chi-square test was performed to test respectively (a) whether the distribution of the 132 hospitals in the response (n=94) or non-response (n=38) was independent of two demographic characteristics: administrative region and size, and (b) whether early and late respondents provided significantly different responses (Naranjo-Gil and Hartmann, 2007). The Chi-square statistic indicated no significant differences in both the demographic characteristics (administrative region: $\chi^2 = 0.683$; $df = 6$; $p=0.995$, and size: $\chi^2 = 0.787$; $df = 2$; $p=0.675$) and in the means of responses for non-respondents and early versus late respondents respectively (administrative region: $\chi^2 = 3.395$; $df = 6$; $p=0.758$, and size: $\chi^2 = 0.379$; $df = 2$; $p=0.827$). Accordingly, it can be concluded that non-response bias is unlikely to be a threat to the conclusions based on the responses received.

In terms of size the sample counted 41.4% small facilities with less than 200 beds, 32.9% medium-sized hospitals with 200–499 beds and 25.5% large hospitals with over 500 beds.

4.2 Measurement of the variables

Dependent variable

In order to quantify and measure the extent of reform adoption, the index-methodology is used to capture the diverse set of reform into an easily understood indicator. This approach has proven to be a useful method for this as it permits a general research of many aspects of reform and it has been used in a number of previous studies

(Robbins and Austin, 1986; Ingram, 1984; Giroux, 1989; Cheng, 1992; Coy et al., 1994; Christiaens, 1999; Ryan et al., 2002; Cohen and Kaimenakis, 2007). In particular, the level of regulatory compliance variable “COMPLIANCE” was measured using an index developed for the purpose of this study and mainly based on the accounting grounds and characteristics established by the P.D. 146/03. This index comprises of 16 elements with each one measured dichotomously. Respondents were asked to respond “yes” (value = 1) if in compliance with the relevant accounting standard and “no” (value = 0) if not. The overall compliance index was calculated for every hospital as the sum of its scores in all dichotomous variables; a hospital’s index would take the value of 16 if it conformed to all accounting standards. The elements that were used in order to construct the compliance index are presented in Table 2 (in Appendix).

Independent variable measurement

Objective data was used for the “CEOEDUC”, “EDUC”, “SIZE”, and “EXPER” variables. Learning Experience effect (EXPER) is measured using the number of years passed of hospital first accrual based financial statements issuance year. The CEO educational background (CEOEDUC) is measured using the years of business-oriented education to the total number of education years¹. The size variable was measured using the natural logarithm number of beds. Regarding the general level of accounting staff education (EDUC), a compound average level of finished studies (master, bachelor and secondary level) was used². A dichotomous variable named COST was used in order to determine the level of the cost implementing and adopting accrual accounting as a percentage of the annual hospital budget. In cases where a hospital believed that the implementation cost was high the variable was assigned a value of 1, and 0 if it is low.

The other four independent variables, “CONFLICT”, “CONSUL”, “ITQUAL”, and “TRAIN”, required the use of perceptive measures and thus multi-question Likert-type five point scales (where 1 = strongly disagree and 5 = strongly agree) were used to derive composite scores for each factor. All of the measures were based on previous literature. Multiple items were preferred because they captured more of a construct’s multi-dimensionality than single items (Foster and Swenson, 1997; Cardinaels et al., 2004; Al-

¹ In particular, this indicator is measured by the following formula: Business-oriented educational background = $(UD + PD + T) / (\text{total number of education years})$ in which UD for years of undergraduate degree on business oriented education, PD stands for years of postgraduate degree on business oriented education, and T for years of training seminars and special courses on business oriented education.

² EDUC is measured using the following ratio: $(1*PD + 0.5*UD + 0*SD) / (PD + UD + SD)$ in which PD stands for the percentage of accounting staff holding a postgraduate degree, UD for the percentage of staff holding an undergraduate degree SD for the percentage of staff holding secondary education degree. The above approach is used in the present survey, in order to gain comparable scores over the hospitals.

Omiri and Drury, 2007; Krumwiede, 1998). The descriptive statistics of the independent variables in the study are presented in Table 3 (in Appendix).

The resulting composite factor scores are computed using mean standardized responses, having a mean of zero and a standard deviation of one, to the survey questions loading greater than 0.40³ on the respective factors with eigenvalues in excess of one. The construct validity and reliability for the multi-item variables were assessed by using a principal component analysis and Cronbach coefficient alphas⁴ respectively. Based on this analysis, the factors appear to be reliable and reasonably valid. The results of the factor analysis for the four composite variables are presented in Table 4 (in Appendix).

Finally, Table 5 (in Appendix) also presents a Pearson Correlation matrix for the independent variables. None of the Pearson Rank correlation coefficients are high thus suggesting that multi-collinearity is not an issue. Lewis-Beck (1990) (cited in Pavlatos and Paggios, 2009) reported that intercorrelations need to be 0.8 or above before they are of any concern.

5. Survey results

5.1 Main Results of the compliance Index

The elements related to the accounting compliance index are shown in Table 6 (in Appendix). The total extent of compliance scores range from a high of 93.75 per cent of the maximum possible score to a low of 6.25 per cent. On average, each organization reported a 50.99 per cent of compliance with the prescribed accounting reform (Table 2). Thus, in general public hospitals present a moderate to low compliance score to P.D.146 requirements after 6 years of its inception.

Moreover, the major non-compliance areas can be observed in the area of services costing as the worst performers are the “Accurate and updated costing system”, “Proper inventory management”, “Definition of cost centres/pools/ objects”, and “Accurate calculation of Fixed and variable cost”.

These findings are consistent with Comerford and Abernethy (1999) and Hill (2000) that supported the low adoption level of cost accounting systems in hospitals. They reported that hospitals traditionally had little incentive or demand for cost accounting systems to be used as a management control tool. Hospitals primarily reported to external funding authorities, such as the government, and therefore only served as external reporting factors.

In the Greek context, one possible explanation for these findings could be that the accounting reform was mostly dedicated with extensive guidelines to accrual financial

³ This is in line with Hair et al. (1998) who considered items that display factor loadings of .40 and above as important

⁴ All factors have coefficient alphas above the minimum level of 0.5 suggested by Hair et al. (1998) Indicating that are all reliable and reasonably valid.

accounting rather than cost accounting (e.g., no guidelines on how the corresponding cost of a department should be calculated). Thus, from an Institutional theory perspective, in order to gain legitimacy and financial security by conforming to external expectations and to appear rational, and efficient to their constituents regarding the new accounting practises, hospitals have to focus more towards accrual financial accounting compliance.

Additionally, the reformed accounting legislation neither identified explicitly the outputs nor had intention of connecting the cost of outputs with the reimbursement received by the hospital for the services offered to patients. Consequently, no incentive was given to hospitals to control their costs as they will continue to receive their subsidies (funding process) irrelevant of their performance and financial results. In particular, the current reimbursement system applied in the GNHS could be classified as a *retrospective per-diem reimbursement*. This payment method, in which the hospital's own costs are reimbursed ex post at a fixed rate per day of hospitalization, eventually provides no incentives to public hospitals to stimulate efficiency and to economize; hospitals are reimbursed for extra production and not for cost efficiency initiatives. Under per-diem reimbursement hospitals prefer to keep the patients in the hospital as long as they can, in order to allow additional revenues to be generated.

Finally, another reason why hospitals have failed to fully comply with the reformed accounting principles may be the lack of an effective enforcement mechanism to actually mobilize the implementation process with budgetary cutbacks or explicit financial restrictions and penalties in case of non-compliance. Hence, although fines and penalties have been established by the legislator in the P.D. 146/03 in case of non-compliance with the adoption timetables no such action has been taken yet. This finding is consistent with the argument of Berry and Jacobs (1981), (cited in Cohen et al., 2007), that the lack of an effective enforcement system is a leading reason of non-compliance.

5.2 Factors affecting the compliance level

In order to test the level of accounting reform in public the following model was applied:

$$Y = a + b_1 EDUC + b_2 TRAIN + b_3 ITQUAL + b_4 CONSUL + b_5 EXPER + b_6 COST + b_7 CEOEDUC + b_8 CONFLICT + b_9 SIZE + e$$

Where Y : is a variable measuring the level of compliance with the accrual financial and cost accounting based on P.D. 146/03 guidelines. Moreover, the above model contains 9 independent variables. In order to examine the associations proposed in hypotheses H1 through H9 in Section 3 a multivariate regression analysis was used because the univariate tests provide valuable information regarding a large number of variables over a sample and their results are informative but there is the question of whether the

association is a direct association or whether there is a joint correlation with a third or fourth variable.

The results of the Ordinary Least Squares (OLS) regression are presented in Table 7 (in Appendix).

The observed F-statistic of the regression is 17.040 and significant at $\alpha = 0.000$ which points at an acceptable goodness-of-fit. The validity threat of multicollinearity is examined with a Pearson correlation test and by calculating the tolerance and variance inflation factors (VIF) for all the independent variables (see the two final columns of the table). No indication of multicollinearity is found between the different variables⁵. The adjusted R^2 explains 60.8 percent of the variation for compliance level.

The results presented in Table 7 indicate that among the nine variables which were tested for associations on the level of the accounting reform, four are statistically significant: the level of specific training ($p < 0.1$), IT existing quality ($p < 0.05$), education level of accounting department staff ($p < 0.01$), and professional support from consultants ($p < 0.01$), were the most significant in statistical terms. On the other hand, the hospital size⁶, the years of accrual accounting experience, the CEO educational background, the absence of management-physicians conflict, and level of implementation and adoption cost do not exhibit a statistically significant influence on accounting reform compliance level. Thus, we summarize that statistical analysis showed that only H1, H2, H3, and H4 hypotheses are supported, while H5, H6, H7 and H9 are not supported by the data

6. Conclusion

6.1 Research findings

This present research study is not set up to explain the reasons of the accounting reform in public hospitals, nor is it an analysis or an appraisal of the impulses or incentives behind the reform. It aims at exploring, describing and comparing in an objective way the actual adoption and implementation of accrual financial and cost accounting practices in public hospitals. This can only be done by analyzing features of organisations that succeed in complying with the reform requirements and determining the impact on the level of accounting reform adoption of certain factors cited in previous studies (see for example, Ouda, 2004; Venieris et al., 2003; Christianens, 1999; Windels and Christiaens, 2005; Cardinaels et al., 2004; Arnaboldi and Lapsley 2003).

⁵ The Variance Inflation Factors (VIF) of the variables which comprise our model are well below the generally accepted critical threshold of 10, ranging between 1.08 and 2.13, and tolerances are of more than 0.20, indications that allude a potential severe problem of multi-collinearity (Kutner et al., 2004; Hair, 1998).

⁶ In order to examine the robustness of our results, we included number of employees in our analysis instead of bed number as an alternative proxy for hospital size. Results remain similar.

Under this research approach, the present research results indicate that the level of accounting reform adoption in public hospitals is realized only to a limited extent (i.e., 50.99% score), especially on cost accounting aspects of the reform. The relatively higher compliance index scores of financial accounting system aspects compared to the lower compliance score of the cost accounting system aspects indicate that hospitals' management focused more to some specific reform aspects than others maybe due to different institutional pressures.

Regarding the second research question, the data suggests that public hospitals experience implementation difficulties because of resources and operational capacity considerations (i.e., lack of organizational, technological and human resources) in complying with the regulatory requirements. In particular, the cross-sectional differences in the level of adoption reveal that there are certainly some significant enablers and /or constraints in the process of organizational change. In particular, this study reveals that organizational and technical capability aspects for action, such as the support of consultants, IT existing quality, education level of accounting department staff, and the level of specific training, are important positive factors in explaining the alternative implementation scenarios adopted by different public hospitals. On the other hand, other contextual factors, such as larger hospitals, familiarization with accrual accounting, CEOs with business oriented educational background, perceived implementation cost, and optimal relationship of professional groups within hospitals, do not exhibit any significant association with the accounting reform adoption level.

6.2 Limitations and suggestions for future research

The study findings are subject to a number of limitations. Cross-sectional studies as this work presented here can establish associations, but not causality. Another factor that may affect these results is the noisiness of the measures. A mail survey prevents an assessment of the survey respondent's actual knowledge of the accrual accounting, although the surveys were mailed to Chief Financial Officers. In particular, although tests were performed to look for evidence of non-response bias, there is no way to directly test whether the non-respondents (n=38) are systematically different to the respondents (n=94). Furthermore, the data regarding the compliance index is based on the respondents' opinions (perceptual measures) and not on objective measures in the absence of official statistics which could offer a clearer picture with regards to the impact of the explanatory and implementation factors discussed throughout this paper.

Future research may further examine the relation between level of accounting reform adoption and wider social and institutional forces that surround it as well as consider incorporating other important contextual variables that have been omitted from other studies and are likely to influence the compliance level. The most notable omitted variables are: the number of services variant as a proxy measure of hospital complexity; type of hospital (general or specialized); location of hospital (urban or rural); satisfaction

of the cash accounting system. In addition, the importance of inter-organizational variables such as support from external audit and central and local political support must not be underestimated.

Despite these limitations, this study contributes to the literature of accrual accounting reforms in public sector organizations by providing, to our knowledge, the first large cross-sectional assessment of accrual and cost accounting system implementation in Greek public hospitals. In particular, it adopts a contingency approach and uses empirical analysis to identify the influence of specific contingent factors on the level of compliance with accruals accounting in order to enhance researchers' and government managers' understanding of major implementation processes and challenges encountered in a complex political environment, such as the Greek context. Enhanced understanding can help them build and refine models of effective implementation processes on similar future projects of other accounting and systems reforms, as they can learn from the experiences of others.

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Appendix

**Table 1: Demographic Characteristics of Public Hospitals
that participated in the survey**

	Number of Hospitals
Geographical Area (N=94)	
Attica - Piraeus - Aegean	34
Macedonia & Thrace	23
Thessalia	9
Peloponnese - Ionian Islands - Western Greece	23
Crete	5
Total	94
Financial Turnover (€ thous.) (N=94)	
Up to 3.000	25
3.000 – 15.000	26
15.000 – 30.000	10
30.000 – 50.000	4
Over 50.000	29
Total	94
Size - No of beds (N=94)	
Up to 200	39
200 -500	31
Over 500	24
Total	94
Number of employees (N=94)	
Up to 100	17
100 – 400	22
400 – 700	22
Over 700	33
Total	94
Type of hospital Organization (N=94)	
General hospitals	76
Specialized hospitals	18
Total	94

Table 2: Descriptive statistics for dependent variable (compliance index)

Compliance Index^a	Cronbach's Alfa^b	Mean	Std. Dev.	Minimum score	Maximum score
C	0.788	8.16	3.502	1	14
C (%)		50.99%	21.880	6.25%	87.50%

Components	Mean	Std. Dev.	Minimum score	Maximum score
Accurate valuation of investments	0.53	0.502	0	1
Treatment of provisions	0.52	0.502	0	1
Accurate valuation of accounts receivables	0.64	0.483	0	1
Proper cash account Management	0.88	0.323	0	1
Accurate fixed assets valuation	0.49	0.503	0	1
Accurate valuation of liabilities	0.72	0.450	0	1
Accurate recognition of revenues	0.77	0.426	0	1
Accurate recognition of expenses	0.79	0.411	0	1
Accurate calculation of assets depreciation – amortization	0.77	0.426	0	1
Definition of cost centres/pools/ objects and structure	0.33	0.473	0	1
Proper inventory management	0.17	0.378	0	1
Calculation of the cost of capital	0.35	0.480	0	1
Short term issuance of financial accruals statements (trimester basis)	0.15	0.358	0	1
Accurate calculation of Direct and indirect cost	0.49	0.503	0	1
Accurate calculation of Fixed and variable cost	0.36	0.483	0	1
Accurate and updated costing system	0.20	0.404	0	1

^a It is the overall compliance index that is calculated as the sum of the 16 dichotomous variables that refer to the hospitals' compliance with reformed accounting legislation requirements of P.D. 146/03.

^b According to Hair (1998) if the variables being tested are all dichotomous, Cronbach's alpha is the same as Kuder-Richardson coefficient.

Table 3: Descriptive statistics of the independent variables in the study

Variable	Definition	Mean value	Std. Deviation	Actual Mini- mum	Actual Maxi- mum	Num- ber of items
Panel A : Independent variables based on a single question						
EDUC	The level of education of Accounting department staff	0.25	0.117	0.08	0.48	1
EXPER	The level of learning experience effect	3.77	2.112	1	10	1
COST	The level of implementation cost	0.30	0.460	0	1	
CEOEDUC	The level of the CEO's educational background (business orientation)	0.66	0.390	0	1	1
SIZE	The hospital's size (no. of beds)	368.39	302.96	40	1200	1
Panel B : Independent variables as a result of a factor analysis^a						
CONFLICT	The level of the management-physicians relationship	3.15	0.539	1.5	4.5	2
TRAIN	The level of the reform-related training	2.41	0.831	1	4.6	3
ITQUAL	The level of existing information systems quality	2.62	0.888	1	5	4
CONSUL	The level of management consultants professional support	2.34	1.297	1	5	3

^a Factors extracted using the principle component analysis (rotated solution; eigenvalues all >1).

Table 4: Factor analyses results of the independent variables

Variable	Factor Loadings	Eigen value	% of variance	Bartlett's test	KMO	Cronbach's alfa
Factor IT existing quality						
• Existing information technology is capable of providing cost and performance needed data	0.662	2.511	62.774	128.828 (Sig:0.000)	0.760	0.801
• Our information systems across functions (e.g. sales, operations, accounting, inventory, etc) are highly integrated	0.829					
• Overall, the information systems offer user-friendly query capabilities to various users	0.803					
• The IS generally provide data that are accurate and up to date	0.861					
Factor management-physicians conflict						
• Our relationship with our team of physicians can be described as optimal	0.859	1.476	73.806	25.065 (Sig:0.000)	0.635	0.521
• Accrual accounting is only a necessity in managing financial relations with our physicians (reverse coded)	0.859					
Factor consultants						
• Professional support from consultants was provided for designing accrual financial and cost accounting system	0.875	2.418	80.591	158.149 (Sig:0.000)	0.876	0.731
• Professional support from consultants was provided for implementing and developing accrual financial and cost accounting system	0.919					
• Professional support from consultants was provided for using accrual financial and cost accounting system (e.g. preparation of the annual reports, financial performance Ratios etc)	0.899					
Factor training						
• Adequate training was provided for designing accrual financial and cost accounting system	0.896	2.173	72.419	102.326 (Sig:0.000)	0.808	0.682
• Adequate training was provided for implementing accrual accounting	0.841					
• Adequate training was provided for using accrual accounting information	0.815					

Table 5: Pearson correlation matrix for all the variables.

Variables (N = 94)	1	2	3	4	5	6	7	8	9	10
COMPLIANCE	1.000									
EDUC(%)	0.482**	1.000								
TRAIN	0.588**	0.351*	1.000							
ITQUAL	0.585**	0.245**	0.482**	1.000						
CONSUL	0.674**	0.295**	0.616**	0.518**	1.000					
EXPER	0.071	-0.026	0.015	-0.042	0.085	1.000				
COST	-0.190	-0.139	-0.081	-0.168	-0.169	0.022	1.000			
CEOEDUC	0.091	-0.026	0.132	0.200	0.015	0.023	-0.141	1.000		
CONFLICT	0.124	0.043	-0.157	-0.012	-0.003	0.085	0.022	-0.016	1.000	
SIZE	0.267*	0.128	0.233*	0.213*	0.147	0.040	-0.061	0.185	0.126	1.000

Note: *, **, correlation is significant at respectively 5, 1% levels (2-tailed).

Table 6: Areas of accounting reform compliance vs. non-compliance

	Number of Hospitals that conform to the accounting standard	Number of hospitals that did not conform to the accounting standard
1. Accurate valuation of investments	50 (53.2%)	44 (46.8%)
2. Treatment of provisions	49 (52.1%)	45 (47.9%)
3. Accurate valuation of accounts receivables	68 (72.3%)	26 (27.7%)
4. Accurate valuation of liabilities	60 (63.8%)	34 (36.2%)
5. Proper cash account Management	83 (88.3%)	11(11.7%)
6. Accurate fixed assets valuation	46 (48.9%)	48 (51.1%)
7. Accurate calculation of assets depreciation – amortization	72 (76.6%)	22 (23.4%)
8. Accurate recognition of revenues	72 (76.6%)	22 (23.4%)
9. Accurate recognition of expenses	74 (78.7%)	20 (21.3%)
10. Proper inventory management	16 (17.0%)	78 (83.3%)
11. Definition of cost centres/pools/ objects and structure of the cost accounting system	31 (33.0%)	63 (67.0%)
12. Calculation of the cost of capital	33 (35.1%)	61 (64.9%)
13. Short term issuance of financial accruals statements (trimester basis)	14 (14.9%)	80 (85.1%)
14. Accurate calculation of Direct and indirect cost	46 (48.9%)	48 (51.1%)
15. Accurate calculation of Fixed and variable cost	34 (36.2%)	60 (63.8%)
16. Accurate and updated costing system	19 (20.2%)	75 (79.8%)

Table 7: Multiple regression analysis with the reform accounting compliance as the dependent variable

	Unstandardized Coefficients		Standardized Coefficients	Collinearity statistics		
	B	Std. Error	Beta	Test of Hypothesis	Tolerance	VIF
(CONSTANT)	6.133 (6.809***)	0.901				
EDUC (%)	6.204	2.275	0.208 (2.723***)	H1 (supported)	0.723	1.383
TRAIN	0.614	0.323	0.179 (1.944*)	H2 (supported)	0.496	1.939
ITQUAL	0.685	0.282	0.205 (2.483**)	H3 (supported)	0.618	1.618
CONSUL	1.244	0.332	0.356 (3.752***)	H4 (supported)	0.469	2.132
EXPER	0.076	0.110	0.049 (0.739)	H5 (no supported)	0.959	1.043
COST	-0.590	0.514	-0.069 (-1.031)	H6 (no supported)	0.938	1.066
CEOEDUC	0.168	0.622	0.024 (0.341)	H7 (no supported)	0.876	1.141
CONFLICT	0.358	0.243	0.099 (1.438)	H8 (no supported)	0.882	1.133
SIZE	0.252	0.238	0.092 (1.361)	H9 (no supported)	0.920	1.087
Adjusted R ²	0.608					
F-statistic	17.040***					
N	94					

Note: Ordinary least squares coefficients, with corresponding t-statistics in parentheses.

***, **, * indicate statistical significance at the 1, 5 and 10% levels, respectively.

Entrepreneurial orientation in family and non-family firms: evidence from Bulgaria

Desislava Ivanova Yordanova¹

Abstract

Despite the importance and potential role of entrepreneurship for economies in Central and Eastern Europe, little attention has been devoted to identifying which factors contribute to the entrepreneurship in the region. The purpose of the present study is twofold. First, there is a comparison of entrepreneurial orientation in Bulgarian family and non-family firms. Second, there is an examination of which individual, organizational and environmental factors underlie differences in entrepreneurial orientation between family and non-family firms. The findings reveal that several organizational and environmental factors are conducive for pursuing entrepreneurship within family and non-family firms. Lower environmental dynamism, smaller firm size and the lack of foreign ownership account partially for lower entrepreneurial orientation in family firms. The paper provides a discussion of implications for practitioners and suggestions for future research.

Keywords: entrepreneurial orientation, determinants, family firms, non-family firms, Bulgaria

JEL Classification: M1

1. Introduction

Since the beginning of the 1980s the phenomenon of entrepreneurship within existing organizations (corporate entrepreneurship) has attracted the interest of both scholars and practitioners (Antoncic and Hisrich, 2001, p. 496). It involves either the creation of new businesses through internal innovation or venturing or strategic renewal (Güth and Ginsberg, 1990, p. 5). Previously, the focus of entrepreneurship research was restricted mainly to the individual entrepreneurs, the context and the process of creation

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of new enterprises (Low and MacMillan, 1988, p. 146). The increasing attention on entrepreneurship within existing organizations is determined by the challenges faced by entrepreneurs and managers operating in an increasingly uncertain, complex and dynamic environment. Research findings demonstrate that corporate entrepreneurship can enhance firm performance (Zahra et al., 1999; Ripolles and Blesa, 2005; Wiklund, 1999; Wiklund and Shepherd, 2005). Recent empirical evidence also confirms the positive impact of entrepreneurship on firm performance in a transition economy (Manev et al., 2005).

Despite the importance and the potential role of entrepreneurship for transition economies (McMillan and Woodruff, 2002, p. 153, Smallbone et al., 2001, pp. 253-254), relatively little research attention has been devoted to entrepreneurship in this context (Manev and Manolova, 2008). Reviewing the research on entrepreneurship in transition economies, Manev and Manolova (2008) identified only 11 journal articles employing data analytical methods at firm level. Thus, existing empirical findings about entrepreneurship within existing organizations are applicable to developed economies, which are characterized with developed institutional environment, abundant resources, and presence of entrepreneurial role models. They cannot be easily extended to transition economies in Central and Eastern Europe, which have experienced profound economic, political, and institutional changes. Emerging studies on entrepreneurial firms operating in transition economies are mainly descriptive and exploratory in nature (Luo et al., 2005, p. 277).

Family businesses have increasing role in the growth-oriented economies in Central and Eastern Europe (CEE) (Pistrui et al., 1995, cited in Donckels and Lambrecht 1999, p. 171). In one of the first studies on family business in the Balkans, Poutziouris et al. (1997, p. 244) note that family business activity in Bulgaria is in the foundation phase. More than 10 years after the Poutziouris et al.'s (1997) research, the role of family businesses in Bulgarian economy may have increased significantly. Although entrepreneurship in transition economies in Central and Eastern Europe has attracted significant research attention, the role of family business is largely neglected (Pistrui et al., 1997, p. 221). It is acknowledged that family firms need to be innovative and aggressively pursue entrepreneurial opportunities (Zahra et al., 2004). This may be particularly valid for transition economies such as Bulgaria, which is characterized by a high degree of turbulence and uncertainty due to profound changes during the last 15 years and the integration into the European Union. However, family businesses may be more conservative and risk averse than non-family businesses and therefore unwilling to undertake entrepreneurial activities (Zahra, 2005), which may eventually influence negatively their survival and growth.

The purpose of the present study is to compare entrepreneurial orientation (EO) in Bulgarian family and non-family firms and to identify the reasons for possible differences in EO. It will be examined which individual, organizational and environmental factors account for differences in EO between family and non-family firms. In this study family firms are firms where one family controls the company and is represented in its

management team (Naldi et al., 2007). Practical implications for owners and managers of family businesses will be discussed.

This paper is organized as follows. Section 2 presents the literature review on antecedents of entrepreneurial orientation and the hypotheses to be tested in this study. Section 3 describes research methodology of the study. Section 4 contains the empirical analysis and results. The last section presents discussion of the research findings and conclusions.

2. Background of the study and hypotheses

2.1 EO in family and non-family firms

Enterprises that want to be entrepreneurial need to develop EO (Dess and Lumpkin, 2005, p. 147). While entrepreneurship is the act of new entry, EO reveals how it could be accomplished (Lumpkin and Dess, 1996, p. 136). EO refers to “the processes, practices, and decision-making activities that lead to new entry” (Lumpkin and Dess, 1996, p. 136). Miller (1983, p. 771) argues that “an entrepreneurial firm is one that engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with ‘proactive’ innovations, beating competitors to the punch”. Drawing upon Miller’s (1983) seminal article, several researchers have agreed that EO is a combination of the dimensions risk-taking, innovativeness, and proactiveness and reveals the extent to which firms take risks, innovate, and behave pro-actively (Wiklund and Shepherd, 2005, p. 75; Lumpkin and Dess, 1996, p. 139). Risk-taking refers to “incurring heavy debt or making large resource commitments, in the interest of obtaining high returns by seizing opportunities in the marketplace” (Lumpkin and Dess, 1996, p. 144). Successful corporate entrepreneurship requires that firms choose riskier alternatives, which may involve even forgoing existing products and methods (Dess and Lumpkin, 2005, p. 152). Innovativeness reflects a tendency “to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes” (Lumpkin and Dess, 1996, p. 142). Innovativeness requires that firms abandon existing practices and approaches and adopt novel solutions (Dess and Lumpkin, 2005, p. 150). Proactiveness is associated with “processes aimed at anticipating and acting on future needs” in order to capitalize on emerging opportunities and establish a first-mover advantage in the marketplace (Lumpkin and Dess, 1996, p. 146). Such processes may include monitoring trends, identifying the future needs of customers, anticipating changes in demand, recognizing emerging problems as well as acting upon anticipated changes before competitors (Lumpkin and Dess, 1996, p. 150).

The identification of factors that predict EO was one of the principle research objectives within the realm of research on EO (Covin et al., 2006, p. 58). Several models of entrepreneurship proposed in the literature posit that the following three groups of factors influence entrepreneurship within existing organizations: individual characteristics, organizational characteristics, and environmental factors (Güth and

Ginsberg, 1990, p. 7; Covin and Slevin, 1991, p. 9; Zahra, 1991, p. 262). Zahra (1991, p. 260) stresses that the corporate entrepreneurship's major precursors can be reliably understood only by examining the simultaneous effects of these variables.

Naldi et al. (2007) demonstrate that family firms take risks to lesser extent than non-family firms. The literature on family firms and innovation reveals that family firms are less innovative than non-family firms because "they prefer to avoid the risk of failure associated with the new and untried" (Gomez-Mejia et al., 2007, p. 133). Therefore, we suggest that:

H1: Family firms exhibit lower EO than non-family firms.

2.2 Individual characteristics as mediators of the effect of the family business status on EO

Drawing upon upper echelons theory (Hambrick and Mason, 1984) it can be argued that the presence of stock ownership, the education level, and the organizational tenure of the chief executive officer may partially mediate the effect of the family business status on EO. As Baron and Kenny (1986) note, partial mediation is more frequent model than complete mediation. The upper echelons theory is based on the assumption of bounded rationality (Hambrick, 2007, p. 334). Since top executives do not dispose with perfect information to take rational decisions, their biases and dispositions are crucial for understanding the functioning and performance of organizations (Hambrick, 2007, p. 334). Organizational outcomes can be partially predicted from demographic characteristics of executives (Hambrick and Mason, 1984, p. 197). The theory is focused on both CEOs and other individual leaders and top management teams (Hambrick, 2007, p. 334). Strategic choices of executives are a function of their perceptions of the situation combined with their values (Hambrick and Mason, 1984, p. 195). Observable characteristics of executives can be used as valid indicators of their cognitive base, values and behaviours (Hambrick and Mason, 1984, p. 196; Hambrick, 2007). Such observable characteristics include age, tenure in the organization, education, functional background, socioeconomic background, and stock ownership of top executives (Hambrick and Mason, 1984, pp. 196-201). Differences in observable characteristics of the chief executive officer in family and non-family firms may account for differences in EO.

Human capital characteristics of individual employees contribute significantly to companies' ability to innovate and create new businesses (Hayton and Kelley, 2006, p. 408). Empirical evidence suggests that top management team's level of education is positively associated with innovation (Bantel and Jackson, 1989) and strategic change (Wiersema and Bantel, 1992). Education affects positively perceptions of entrepreneurship within organizations (Rutherford and Holt, 2007). The link between the level of education of employees and EO was also supported in a transition context (Chow, 2006). The chief executive officer (CEO) in family firms may be less likely to have high level of education than the CEO in non-family firms because managers in non-family

firms are more likely to be promoted based on kinship rather than on specific knowledge and competences (Westhead, 1997). Empirical research confirms that CEOs in family firms tend to have lower level of education than CEOs in non-family firms (Reid and Adams, 2001). Therefore, it can be argued that:

H2: The CEO's level of education mediates partially the effect of the family business status on EO.

Organizational tenure of top management team was found to be negatively associated with strategic change (Wiersema and Bantel, 1992, p. 112). It was argued that individual members of top management teams tend to take the cognitive perspectives of other members of the team after a period of time (Wiersema and Bantel, 1992, p. 113). The chief executive officer's tenure may influence the firm's responsiveness to its environment (Miller, 1991, p. 35). Williams and Lee (2009, p. 1380) argue that organizations with top management teams with longer tenure are more likely to exhibit conservative EO. Empirical evidence demonstrates that the chief executive officer's tenure is inversely related to the match between the organizational strategy and environment especially in uncertain settings (Miller, 1991). CEO's tenure is significantly higher in family-firms than in non-family firms (McConaughy, 2000; Tsai et al., 2006). Particularly, in founder-managed family business founder-CEOs may enjoy long tenures (Zahra, 2005). Therefore, it is posited that:

H3: The chief executive officer's tenure mediates partially the effect of the family business status on EO.

2.3 Organizational characteristics as mediators of the effect of the family business status on EO

Drawing upon the Resource Based View of the firm (RBV) (Wernerfelt, 1984; Barney, 1991), it can be assumed that learning orientation, growth strategy, and the presence of foreign owners mediate the effect of the family business status on EO. The RBV emphasizes the strategic role of organization's resources and capabilities for organizations and their strategy. Central to the resource-based view of the firm are the assumptions of heterogeneity and immobility of resources (Barney, 1991). Resources may differ across firms in an industry or a group and some firms may be unable to purchase or create strategic resources held by a competing firm (Barney, 1991). The theory advocates that rare, valuable, inimitable, and non-substitutable resources may be sources of sustained competitive advantage (Barney, 1991). Company's ability to engage in entrepreneurial behaviour is highly dependent on company's resources and competences (Covin and Slevin, 1991, p. 15). The availability of resources may encourage experimentation and risk-taking (Hornsby et al., 2002).

Learning orientation is a critical resource which top managers may use in order to establish EO in the organization. Learning orientation is conceptualized as "the value that a firm places not only on adroitly responding to changes in the environment but on constantly challenging the assumptions that frame the organization's relationship with the

environment” (Baker and Sinkula, 1999, p. 412). Thus, learning may enable management to redirect individual employees and to generate cumulative knowledge and information that will encourage future entrepreneurial activities (Ahuja and Lambert, 2001, p. 540). Slater and Narver (1995, p. 66) argue that learning orientation should lead to greater new product success and superior growth. Empirical evidence confirms that learning orientation is associated with firm innovativeness (Calantone et al., 2002) and EO (Wang, 2008). Liu et al. (2002) find a significant relationship between learning orientation and corporate entrepreneurship in a transition context. Family businesses may exhibit lower learning orientation than non-family firms. Empirical research demonstrates that family firms are less likely to systematically analyze training needs and to provide training to employees (Reid and Adams, 2001). Therefore, it is suggested that:

H4: Learning orientation mediates partially the effect of the family business status on EO.

EO may be necessary for achieving growth in organizations. Growth strategy tends to stimulate corporate entrepreneurship (Zahra, 1991, p. 264). Therefore, entrepreneurial posture may be highest among firms with growth strategies (Covin and Slevin, 1991, p. 13). The realization of an internal-growth strategy requires extensive innovation and venturing in all functional areas within the organization, while the realization of external-growth strategy requires expansion of the scope of business and markets (Zahra, 1991, p. 264). Empirical evidence confirms the positive effect of growth strategy on the number and early introduction of new products (Zahra, 1993a) and corporate entrepreneurship (Zahra, 1991). Family firms are less likely to be growth oriented (Daily and Dollinger, 1993). Therefore, it is suggested that:

H5: Growth plans mediate partially the effect of family business status of EO.

Companies in transition economies may lack managerial and entrepreneurial skills. Foreign investors in Central and Eastern Europe may transfer products and marketing skills, technology and management skills and know how to local companies, which may improve their product lines and market penetration (Uhlenbruck and De Castro, 2000, p. 383) and thus make them more entrepreneurial. Foreign ownership in companies operating in Central and Eastern Europe may be associated with high learning, high efficiency governance, and high corporate restructuring effectiveness (Filatotchev et al., 2003, p. 334). Liu et al. (2002) report that state-foreign partnerships exhibit higher level of corporate entrepreneurship than solely state-owned companies. Family businesses tend to keep the ownership within the family and therefore may be less likely to have foreign owners among owners than non-family firms. Drawing upon these considerations, the following hypothesis is formulated:

H6: The presence of foreign owners mediates partially the effect of the family business status on EO.

2.4 Environmental dynamism as a mediator of the effect of the family business status on EO

In this sub-section it is suggested that environmental dynamism may mediate the effect of the family business status on EO. The Population Ecology Theory posits that environmental characteristics largely determine the survival of organizations through selecting the fittest organizational forms (Hannan and Freeman, 1977; 1984). Organizations face both internal and external constraints on their capacity for adaptation (Hannan and Freeman, 1977; 1984). The presence of considerable structural inertia in organizations makes adaptation less likely than environmental selection (Hannan and Freeman, 1977; 1984). Structural inertia derives from various internal and external factors. Selection favours organizational forms with high inertia because they exhibit high reliability, accountability, and reproducibility (Hannan and Freeman, 1984).

Environmental dynamism may favour organizations with high EO. Environmental dynamism refers to “unpredictability of customers and competitors, rates of change of change in market trends, industry innovation and R&D” (Miller, 1987, p. 62). Companies operating in transition economies in Central and Eastern Europe are confronted with significant environmental dynamism due to profound economic and institutional changes. Miller and Friesen (1982, p. 6) argue that dynamic environments are hospitable and advantageous to entrepreneurial firms because in such settings they may take risks and gain high rewards. Environmental dynamism is positively related to EO and corporate entrepreneurship (Covin and Slevin, 1991, p. 12; Zahra, 1991, p. 262). Güth and Ginsberg (1990, p. 7) suggest that changes in industry competitive structure and the underlying technologies tend to influence corporate entrepreneurship. Empirical evidence confirms the positive relationship between environmental dynamism and EO (Zahra, 1991; Zahra, 1993b; Miller, 1983). Family firms may be concentrated in more traditional sectors where the changes in the environment are less likely and thus may be confronted with lower environmental dynamism. Therefore, it is suggested that:

H7: Environmental dynamism mediates partially the effect of the family business status on EO.

3. Research methodology

3.1 Sample

This study uses a sample of 120 companies (46 family businesses and 74 non-family businesses) operating in Bulgaria. Data was acquired through a survey conducted at the end of 2008 among 350 enterprises randomly selected from a database of more than 73.000 Bulgarian enterprises extracted from the voluntary unified trade register of the Bulgarian chamber of commerce and industry and other sources. The response rate is approximately 34.3%. Some of the companies which refused to participate in the study have been contacted by e-mail or phone. They have reported that the main reasons were

lack of time or reluctance to reveal business information. Respondents are the chief executive officers (CEOs) of the companies. The survey uses a structured questionnaire containing questions about the characteristics of the organization, the characteristics of the chief executive officer, and the environment. More than 60% of the sample companies operate predominantly in the service sector, while about 20% of the sample companies are manufacturing businesses. Small and medium-sized enterprises (SMEs) represent 77.5% of the sample firms (26.7% – micro-enterprises; 31.7% - small enterprises; 19.2% - medium-sized enterprises). The rest of the sample firms have more than 249 employees. Half of the sample firms are registered after 1997 and only 7.5% operate for more than 20 years. The great majority of the sample firms (93.3%) are private enterprises, while the rest of the sample firms are either state-owned enterprises or enterprises with mixed ownership. About 34% of the sample companies report having foreign legal entities or individuals among owners. More than 57% of CEOs have ownership in the company they manage. Less than 26% of the CEOs are women.

3.2 Variables

Table 1 in the Appendix describes the variables used in the study. The dependent variable in this study is EO. It is measured with 9-item, 7-point Likert scale proposed by Covin and Slevin (1989), which contains items adapted from Khandwalla (1976/1977) and Miller and Friesen (1982). The items are of the forced choice type, with pairs of opposite statements. The scale reveals the extent to which the firms innovate, take risk and behave proactively. Wiklund (1998) identified several studies using this instrument, which provide evidence of its validity and reliability. In this study the EO scale reports acceptable reliability (Cronbach alpha's value is 0.857).

Two individual characteristics of CEOs are hypothesized to mediate the relationship between family business status and EO in this study. CEO_education indicates the level of education acquired by the CEO of the company (1 = university degree, 0 = other). CEO_tenure is measured with the length of CEO's tenure in the organization in number of years.

The organizational characteristics that are expected to mediate the relationship between family business status and EO include learning orientation, growth strategy, and the presence of foreign owners. The variable FAMILY indicates whether the company is a family business (value 1) or not (value 0). The variable LO reveals the level of learning orientation of the company. It is measured through a 11-item, 7-point Likert scale developed by Sinkula et al. (1997). The scale is retested by Baker and Sinkula (1999) who provide further evidence for its validity and reliability. The Cronbach's alpha of the learning orientation scale is 0.836. The variable GROWTH indicates whether the company aims to expand its business activities or to increase the number of employees (value 1) or not (value 0). The variable FOREIGN indicates the presence of foreign owners (value 1) or otherwise (value 0).

Environmental dynamism (DYNAMISM) is measured with the 4-item, 7-point Likert scale proposed by Miller (1987). The items are of the forced choice type, with pairs of opposite statements. The value of the Cronbach's alpha of the scale is 0.635.

Businesses with different age and size may exhibit different characteristics, which in turn may influence EO. Therefore, these variables are included in the analysis as control variables. In this paper we adopt the European Commission's employment criterion for an SME. The variable SIZE is a binary variable (1 = more than 249 employees (large company), 0 = less than 250 employees (micro, small or medium-sized enterprise). The variable FIRM_AGE indicates the age of the company in a number of years.

3.3 Data analysis

The most widely used method to assess mediation is Baron and Kenny's (1986) approach (MacKinnon et al., 2007), which involves 4 steps. The first step is to show that there is a significant relationship between the independent variable (IV) and the dependant variable (DV). The second step is to show that the independent variable (IV) is related to the mediator (M). The third step is to show that the mediator (M) is related to the dependant variable (DV) controlling for the effects of the independent variable (IV) on the dependent variable (DV). The final step is to show that the strength of the relation between the independent variable (IV) and the dependent variable (DV) is significantly reduced when the mediator is added to the model. Perfect mediation occurs if the independent variable has no effect on the dependent variable when the mediator is controlled. Partial mediation occurs when the effect of the independent variable on the dependent variable is less in the third step than in the first step but is different from zero. Since Baron and Kenny's (1986) approach may suffer from low statistical power (MacKinnon et al., 2002), a formal test of mediation should be performed. The mediation effect can be assessed with the procedure developed by Sobel (1982). MacKinnon et al. (2002) find that Sobel test is superior in terms of power in their study comparing 14 methods for assessing mediation. Standardized regression coefficients can be used to estimate mediation if the mediator and/or the dependent variable are binary (MacKinnon et al., 2007). MacKinnon et al. (2002) suggest another approach for testing mediation, which does not require the independent variable to be a significant predictor of the dependent variable. To have a more complete picture, this study tests mediation using both Baron and Kenny's (1986) approach and MacKinnon et al.'s (2002) approach.

Ordinary least squares regression analysis is used to examine the determinants of EO in family and non-family businesses in the sample. Table 2 in the Appendix provides the means, standard deviations, and correlations for the study variables. Correlations between variables are measured with Pearson correlation and Spearman's rho.

4. Empirical results

4.1 EO in family and non-family firms

Table 2 in the Appendix shows that there are statistically significant correlations among several independent variables employed in the study. Companies with growth strategies have higher learning orientation and tend to operate in highly dynamic environments. Table 2 in the Appendix demonstrates that CEO' tenure and level of education are not correlated with EO. The variable EO is significantly related to several organizational and environmental factors. In terms of organizational characteristics, EO has significant positive correlation with firm size, learning orientation, growth strategies, and the presence of foreign owners. Environmental dynamism is also positively correlated with EO. CEOs in non-family businesses are more likely to have obtained a university degree. CEOs in family firms have longer tenure than CEOs in non-family firms. There are no significant differences in learning orientation and growth plans in family and non-family firms. Family firms tend to be younger, smaller, and less likely to have foreigners among owners. Non-family firms operate in more dynamic environments than family firms.

Table 3 in the Appendix presents the empirical results of hypotheses tests in the given sample. Four separate regression models are estimated and presented in Table 3 in the Appendix. In Model 1, EO is regressed on FAMILY. In Model 2 EO is regressed on all independent variables. In Model 3 it is examined which independent variables have statistically significant effect on EO in the sub-sample of family firms. In Model 4 it is examined which independent variables have statistically significant effect on EO in the sub-sample of non-family firms. As a check on multicollinearity, the tolerance factor and the variance of inflation factor (VIF) are used. The VIF for the regressions indicate that there are no serious multicollinearity problems, as they are all well within the acceptable limits (less than 4). All models show relatively good fit to the data as demonstrated by the values of adjusted R^2 . Model 1 explains 4.4% of the variance in EO. The other models explain respectively 31%, 17%, and 32% of the variance in EO. The significant but modest R^2 values indicate that other variables not included in the study also influence EO. Residual plots were reviewed and no heteroscedasticity was found in the data.

According to Model 1 the coefficient of the variable FAMILY is significant and negative ($p < 0.05$). Family firms exhibit lower EO than non-family firms in the sample. Hypothesis H1 can not be rejected. In Model 2 the effect of family business status on EO controlling for other independent variables used in the study is examined. The coefficient of FAMILY is negative and significant at $p < 0.1$. After controlling for differences in CEO's education and tenure, the level of environmental dynamism, the level of learning orientation, the presence of foreign owners and growth plans, firm age and firm size, family businesses still exhibit lower EO than non-family businesses ($p < 0.1$). EO is also positively related to LO and GROWTH ($p < 0.01$) and DYNAMISM ($p < 0.1$). The

coefficients in Model 2 reveal that the variable GROWTH has the strongest effect on the dependent variable in the whole sample. The coefficients of the variables CEO_education, CEO_tenure, FOREIGN, FIRM_AGE, and SIZE are not significant. Model 3 demonstrates that only 2 independent variables have significant effect on EO in family firms. As expected, GROWTH has a significant positive effect ($p < 0.05$) on EO in family firms. Family firms with growth strategy tend to exhibit higher EO. SIZE is also positively related to EO. Large family businesses have higher EO than other family businesses. As in Model 2, the variable GROWTH has the strongest effect on the dependent variable in the sub-sample of family firms. The coefficients of the variables CEO_education, CEO_tenure, LO, FOREIGN, DYNAMISM, and FIRM_AGE are not statistically significant. Model 4 reveals that only the coefficient of the variable LO is significant in the sub-sample of non-family businesses. As expected, non-family businesses with high LO exhibit higher EO. The coefficients of the variables CEO_education, CEO_tenure, GROWTH, FOREIGN, DYNAMISM, SIZE, and FIRM_AGE are not statistically significant.

The variable FAMILY seems to moderate the effect of SIZE, GROWTH, and LO on EO. The coefficient of the variables SIZE and GROWTH are significant only in the sub-sample of family firms, while the coefficient of the variable LO is significant only in the sub-sample of non-family businesses.

4.2 Mediation effects of individual, organizational, and environmental characteristics on EO

The variables CEO_education, CEO_tenure, and FIRM_AGE have no statistically significant effect on EO, while the variable FAMILY has no statistically significant effect on LO and GROWTH. Therefore, the variables CEO_education, CEO_tenure, FIRM_AGE, LO, and GROWTH cannot mediate the effect of the family business status on EO because some of the conditions for establishing mediation suggested by Baron and Kenny (1986) are not completed. Hypotheses H2, H3, H4, and H5 can be rejected. It will be examined whether DYNAMISM, FOREIGN, and SIZE can mediate the effect of the family business status on EO.

Table 4 in the Appendix presents the results of several regressions models involved in Baron and Kenny's (1986) procedure for testing mediation. In Step 1 in Table 4, EO is regressed on FAMILY. In Step 2 in Table 4, the mediator (M) (DYNAMISM, FOREIGN, and SIZE) is regressed on FAMILY (IV). In Step 3 in Table 4, EO is regressed on both FAMILY (IV) and the mediator (M). The last column in Table 4 reports the results of Sobel test. The VIF values for the two regressors in all regressions in Step 3 (Table 4) indicate that there are no serious multicollinearity problems, as they are all well within the acceptable limits (less than 2).

According to Step 1 in Table 4, FAMILY influences positively and significantly EO. The conditions for establishing mediation suggested by Baron and Kenny (1986)

hold for DYNAMISM ($z = -1.9, p < 0.1$), FOREIGN ($z = -1.68, p < 0.1$), and SIZE ($z = -1.8, p < 0.1$). Hypotheses H6 and H7 can not be rejected.

5. Discussion and conclusions

The shift from centrally planned economy to market economy in the countries in Central and Eastern Europe has led to the emergence of a large number of privately owned enterprises including family businesses, which play important role for countries' economic development. In order these enterprises to remain competitive in both local and international markets it is of the utmost importance to gain understanding of which factors encourage the development of high EO. The present research is among the incipient investigations that attempts to compare EO in family and non-family firms and to identify individual, organizational, and environmental factors that mediate the effect of the family business status on EO in a sample from Central and Eastern Europe. The hypotheses are guided by previous theoretical and empirical research on EO and corporate entrepreneurship. The results reported in this study advance our knowledge about entrepreneurship within existing organization in a transition context.

This study reinforces previous findings (Zahra, 1991; Zahra, 1993b; Miller, 1983) that environmental dynamism is conducive for the development of EO only in the whole sample, but not in the sub-samples of family and non-family firms. The findings about the effects of individual characteristics of the CEO on EO are not consistent with predictions. The results show that there is no effect of CEO's level and education and tenure. These contradictory findings could be explained by means of institutional and cultural differences between Western and transition economies as well as among transition economies, which may have differential impact on CEO's behaviour and decisions related to pursuit of entrepreneurial opportunities.

Concerning organizational factors, the results point out the importance of learning orientation and growth strategy for adopting high EO. Similarly to Liu et al. (2002), we find that learning orientation is interrelated with the cultivation of EO in non-family firms. The finding that family firms with growth strategy are more willing to develop EO than the rest of the family firms is consistent with previous research (Zahra, 1991). Contrary to our predictions, however, the presence of foreigners or foreign legal entities among owners does not increase company's impetus to innovate, take risks, and behave proactively. This finding contradicts the previous empirical evidence about the positive effect of foreign owners on corporate entrepreneurship in a transition context (Liu et al., 2002).

We have demonstrated that environmental dynamism, the presence of foreign owners, and firm size account partially for differences in EO between family and non-family firms. Family firms exhibit lower EO because they are less likely to have foreigners among owners, they operate in a less dynamic environment and are smaller than non-family firms.

Before discussing the implications of the findings, some limitations of the study should be noted. First, the sample is not representative and the findings should be interpreted with caution. Thus, the results may not be generalized to the population of Bulgarian enterprises. Second, data was collected through a self-reported survey and thus may be subjected to cognitive biases and errors. Third, a number of other individual, organizational, and environmental factors, which are not included in this study, may be related to EO. Fourth, the findings may be influenced by specific features of the Bulgarian cultural and institutional environment and therefore may not be applicable to other transition or mature economies. Finally, due to the cross-sectional design of the research causal relationships cannot be deduced. The multiple measurements of independent and outcome variables in the study over time will allow examining the bidirectional relationships between the variables studied.

In order to enhance the understanding of EO in companies operating in a transition context, future research needs to examine the following aspects. First, future research should examine the mediation effects of other factors posited by theoretical and empirical literature as affecting EO, which are not included in this study. Second, the proposed hypotheses should be verified in a representative sample of Bulgarian enterprises. Third, future research should also examine to what extent the findings of this study can be generalized to family and non-family firms in other transitional countries. And finally, a longitudinal analysis should complement the findings in this research in order to confirm causal relationships.

The findings have several important implications for practitioners. Loan institutions, risk capitalists, and business angles trying to identify entrepreneurially oriented business in a transition context should pay more attention on organizational variables and environmental factors. Managers in non-family firms, who want to enhance the EO of their companies, should be aware of the interrelation between EO and learning orientation. The adoption of growth strategy in family firms may lead to higher EO. It should be noted that the company's ability to engage in entrepreneurial behaviour is highly dependent on the company's resources and competences (Covin and Slevin, 1991:15). Therefore, managers who aim to enhance EO of their businesses should make efforts to acquire the necessary resources and capabilities.

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Appendix

Table 1: Description of the variable used in the study.

Variable	Definition
EO	9-item, 7-point Likert scale (Covin and Slevin, 1989)
CEO_education	1 = university degree, 0 = other
CEO_tenure	CEO's tenure in the organization in number of years
FAMILY	1 = the company is family business; 0 = other
LO	11-item, 7-point Likert scale (Sinkula et al., 1997)
GROWTH	1 = the company aims to expand its business activities or to increase the number of employees; 0 = other
FOREIGN	1 = the presence of foreign owners; 0 = other
DYNAMISM	4-item, 7-point Likert scale (Miller, 1987)
SIZE	1 = more than 249 employees (large company); 0 = less than 250 employees (micro, small or medium-sized enterprise)
FIRM_AGE	the age of the company in a number of years

Table 2: Descriptive statistics and correlations for the study variables (N = 120).

		Min	Max	Mean	S.d.	1	2	3	4	5	6	7	8	9
1	FAMILY	0	1	0.38	0.49	1								
2	CEO_education	0	1	0.95	0.22	-0.21*	1							
3	CEO_tenure	0	24	7.82	5.13	0.24**	-0.082	1						
4	LO	20	75	55.13	9.55	-0.01	0.160	0.11	1					
5	GROWTH	0	1	0.79	0.41	0.02	-0.024	0.07	0.35**	1				
6	FOREIGN	0	1	0.34	0.47	-0.46**	0.085	-0.32**	0.09	0.11	1			
7	DYNAMISM	6	28	18.64	4.20	-0.21*	0.063	-0.04	0.29**	0.27**	0.25**	1		
8	FIRM_AGE	1	108	14.76	18.07	-0.195*	0.046	0.23*	0.03	-0.08	0.02	-0.01	1	
9	SIZE	0	1	0.41	0.5	-0.249**	0.158	-0.06	0.09	0.09	0.36**	0.02	0.20*	1
10	EO	9	54	37.41	9.89	-0.26**	0.068	-0.01	0.44**	0.40**	0.25**	0.34**	0.07	0.26**

Note: ** Correlation is significant at the 0.01 level (2-tailed)

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

Table 3: Determinants of EO in family and non-family firms.

Variables	Model 1	Model 2	Model 3	Model 4
	Coeff. (S.e.)	Coeff. (S.e.)	Coeff. (S.e.)	Coeff. (S.e.)
	All	All	Family businesses	Non-family businesses
(Constant)	39.2*** (1.1)	10.5* (5.9)	15.8 (9.9)	5.9 (10.3)
FAMILY	-4.6** (1.8)	-3.2* (1.9)		
CEO_education		-1.7 (3.6)	-0.5 (4.2)	-0.04 (8.5)
CEO_tenure		-0.02 (0.2)	0.7 (0.5)	-0.2 (0.2)
LO		0.3*** (0.1)	0.06 (0.15)	0.4*** (0.1)
GROWTH		6.0*** (2.0)	8.2** (3.5)	4.0 (2.7)
FOREIGN		0.9 (1.9)	-4.7 (5.7)	1.0 (2.1)
DYNAMISM		0.4* (0.2)	0.4 (0.4)	0.3 (0.2)
FIRM_AGE		0.2 (0.0)	-0.6 (0.5)	0.02 (0.05)
SIZE		2.7 (1.7)	6.0* (3.4)	2.0 (2.1)
Adjusted R ²	0.044**	0.31***	0.17*	0.32***

Note: * p < 0.1 ** p < 0.05 *** p < 0.01

Table 4: Testing mediation effects on EO (DV).

Variable	Step 1 Coeff. (SE)	Step 2 Coeff. (SE)	Step 3 Coeff. (SE)	Sobel test Z-value
<i>IV</i> : FAMILY	-4.610** (1.82)	-1.75** (0.78)	-3.337* (1.770)	-1.9*
<i>M</i> : DYNAMISM			0.730*** (0.21)	
Model fit	Ajusted R ² 0.044**	Ajusted R ² 0.033**	Ajusted R ² 0.129***	
<i>IV</i> : FAMILY	-4.610** (1.82)	-2.72*** (0.64)	-2.913 (2.024)	-1.68*
<i>M</i> : FOREIGN			3.787* (2.075)	
Model fit	Ajusted R ² 0.044**	Nagelkerke R ² 0.3	Ajusted R ² 0.62***	
<i>IV</i> : FAMILY	-4.610** (1.82)	-1.1*** (0.41)	-3.497* (1.837)	-1.8*
<i>M</i> : SIZE			4.406** (1.811)	
Model fit	Ajusted R ² 0.044**	Nagelkerke R ² 0.083	Ajusted R ² 0.082***	

Notes: * p < 0.1 * p < 0.05 ** p < 0.01

A constant has been estimated in Step 1, Step 3 and first row in Step 2 but is not included in the table.

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