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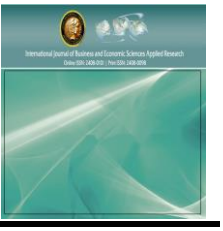

Fostering Innovation through Creativity Stimulation Methods in Croatia

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Abstract

Purpose *– The key question addressed in the paper is whether creativity fostering methods increase innovation output in Croatian firms.*

Design/methodology/approach *– By utilizing the Community Innovation Survey 2010 data and propensity score matching methods, we estimate the average treatment effect of the treated (i.e. firms that employ creativity stimulation methods). Within this framework, our measured outcome is the innovation activity of the firm and the treatment is the creativity stimulation method used by the firm.*

Findings *– The results confirm that the creativity enhancing methods have a positive impact on innovation activity in Croatian enterprises. The empirical analysis of average treatment effect of the treated reveals that the most effective measure seems to be training, followed closely by multidisciplinary working teams. Non-financial creativity enhancing methods seem to be least effective.*

Research limitations/implications *– The results follow some stylized facts related to Croatian enterprises. However, since this paper provides first attempt of the analysis of these issues, future research efforts are required to substantiate our findings.*

Originality/value *– The analysis of effectiveness of creativity fostering methods for innovation activity has proved that the innovation activity can be enhanced by employing each of the method analysed in the paper.*

Keywords: *creativity, innovation, Croatia*

JEL Classification: *O31*

1. Introduction

Firms that aim to grow through innovation need to encourage and unleash creativity of their employees. Starting with idea generation and further throughout innovation process, creative thinking is indispensable part of innovating. Thus, firms strive to encourage innovation by employing several creativity stimulating methods.

The nature of creativity is rather complex as it requires many resources, such as intellectual skills, knowledge, motivation, personality, thinking styles and environment (Sternberg, 2006). Sternberg (2006) pointed out environment as one of the components relevant for creativity, but he also advocates that decision to use all the six abovementioned resources is more important than possessing them. This indicates that creativity is not just an intrinsic characteristic that cannot be developed and encouraged. Shalley, Zhou and Oldham (2004) argue the employees' creativity is a function of personal characteristics, the characteristics of work context and interactions among personal and contextual characteristics. Through traditional channel - which according to Swann and Birke (2005) leads from creativity via innovation and productivity - to increases in business performance, firms are expecting to improve their relative position on the market. Both researchers and practitioners seek to find techniques that will foster and nurture creativity and hopefully through this process foster innovation as well. Without the processes of constant improvements in innovation, firms cannot expect to sustain their position on the globalized markets. Recent literature favours the notion that creativity can be stimulated, nurtured and even taught.

Fostering innovation is relatively more important in transition economies, for which the indicators on innovation activity reveal significant gap to more advanced market economies (Eurostat, 2013). The question is whether this gap can be narrowed by implementation of specific measures within the enterprises, and in particular within the innovative enterprises. Recent contributions in the literature on transition economies reveal that skill enhancement within the firm produces more results than improvements in general education. For example, Nazarov and Akhmedjonov (2012) suggest that further investments in education will not lead to improvements in firms' innovativeness, while on-the-job training will. Furthermore, Gashi and Adnett (2012) show that firms that undergo technological change are more likely to provide training and to a greater intensity. Thus, studies show that innovative firms seem to have recognized the importance of their employees in transition

economies as well as in market economies

In this paper we explore creativity enhancing methods used by Croatian firms, based on the Community Innovation Survey data 2010 (CIS, 2010). Our main interest is to evaluate whether the implementation of these methods affects innovation output in Croatian enterprises. The structure of the paper is following. Section 2 provides study context within the related literature and discusses the data sources used in empirical analysis. Section 3 explains estimation strategy. Section 4 presents the results and discussion. Last section brings conclusions.

2. Literature review and preliminary data analysis

Eurostat (2013) data shows that innovative enterprises as a percentage of all the enterprises in Croatia are below comparative data for EU-27 average. At the same time, promotion of innovation seems to be one of the key policy goals, emphasized in public debates. On the macroeconomic level, convergence is one of the most emphasized issues within the EU enlargement project. The transition economies are expected to catch-up the more advanced market economies and their firms should be able to compete on equal terms within the common market. The macroeconomic concept of convergence is transposed into the requirements for firms in the transition economies to increase their productivity and to develop new products. Since Croatia is the latest newcomer into the common market, such expectations are posed to the Croatian entrepreneurs as well. How to develop entrepreneurship and promote innovation-enabling business environment in catching-up economies is important research question analysed from various aspects (Vidic, 2013; Goniadis and Goniadis, 2011). Similar analysis for Croatia, however, is relatively scarce. In this paper, we want to address this issue from the perspective of enterprises and their activities to increase innovation. One of such actions could be to promote the creativity of their employees.

The creativity stimulation methods used by the enterprises might be various in nature and form. In the present paper, we restrict our analysis to following six methods which are available through the CIS 2010:

- Brainstorming sessions (brain)
- Multidisciplinary or cross-functional work teams (multi)
- Job rotation of staff (rotac)
- Financial incentives for employees to develop new ideas (fina)
- Non-financial incentives for employees (nefin)
- Training employees on how to develop new ideas (tren).

Although the choice of methods analysed is partially guided by the

data available for empirical analysis, it has to be emphasized that each of these methods has been widely discussed in the literature. We subsequently briefly discuss the most relevant findings related to the chosen creativity enhancing methods.

Brainstorming is one of the most popular and well-known techniques in business practice. It is a creativity exercise (Trott, 2005) for generating ideas within the group. This technique is often used in innovation development process, in particular in early stages. Since it is well-known and established, we would expect that it is also frequently used by Croatian enterprises.

Innovative firms widely rely on cross-functional teams when it comes to new product development, because it has been found that they speed-up the product development process (McDonough, 2000). It has even been argued that identified dedicated cross-functional teams are one of the critical success factors of innovation projects (Cooper, 1999). Cross-functional teams contribute to innovation projects success, but they are not easy to implement. This is primarily due to different approaches and goals of team members as well as possible conflicts that occur among business functions. Strategic alignment of functions, team accountability and organizational culture that encourages teamwork could contribute to successful implementation of cross-functional teams (Holland, Gaston and Gomes, 2000). However, these require developed organisation culture and are not easy to implement during the restructuring phases of transition economies.

Job specialization is frequently associated with boredom and monotony of performing limited number of operations daily (Ferrell and Hirt, 2000). In those situations employing job rotation schemes to ensure better understanding of activities performed in other departments (Jones, George and Hill, 2000), might spur employees' creativity. However, job rotation might have many potential disadvantages, if workers consider some jobs less attractive or valuable. Additionally, those might be related to the question of adequate wage-rate for performing work other than previously agreed-upon.

At the first glance, it could be suspected that within transition economies, financial incentives would be most welcomed by employees. Remuneration can potentially ensure accomplishment of various organization goals, including innovation. However, it doesn't necessarily lead to desirable results and it is questionable if it will result in more ideas, inventions, innovations (especially radical innovation). Literature even suggests negative effect of rewards on creativity (Amabile et al., 1996).

Therefore, Maella (2012) argued that financial reward scheme should not aim to achieve specific results but encourage desirable behaviour that is especially relevant for innovation and creativity. Zhou and Shalley (2003) point out that rewards should strive to recognize competences, attempts and accomplishments in creativity. Ederer and Manso (2013 published online) find that pay-per-performance that tolerates early failure enables innovation.

Apart from financial incentives, non-financial incentives such as public recognition, promotion to more interesting job position, decision making autonomy, job security, and transfer to attractive location are used for rewarding employees (Thompson and Strickland, 1996). For example, Oldham and Cummings (1996) find that encouragement from supervisors plays important role for fostering employee's creativity. Since these comprise of intangible and sophisticated measures, without prior analysis it is hard to speculate how widespread such measures are in transition economies. In particular, as some of the measures might be viewed as incentives by employers, but remained unrecognized as such by employees.

On the contrary, training methods can encompass specific needs related to the specific innovation development, and could be most directly recognized by the employees. Basudur, Wakabayashi and Graen (1990) provide evidence that training programs positively affect creativity of employees. Naturally, we expect that these are also used in Croatian innovative firms.

The above-mentioned methods are some of the most prominent tools for fostering creativity. Extensive literature provides evidence of their relevance for stimulating creativity, and eventually for having positive influence on enabling innovation. However, the implementation of these methods requires skills and competences. Given the nature of creativity and complexity of innovation process, positive results are not guaranteed. Therefore, it is important to explore whether these methods have proven to be beneficial for innovation outcome in Croatian enterprises. In the remainder of this section we look into implementation of creativity stimulation methods in Croatian firms.

The empirical analysis in the paper is performed on the level of individual firms. The original database used for the analysis was the Community Innovation Survey 2010 (CIS, 2010) for the period 2008-2010, as conducted by the Croatian Central Bureau of Statistics (CBS). CIS 2010 is conducted according to the same methodology in EU Member States, which enables comparison of certain indicators across European countries. In

Croatia, the CIS 2010 sample consists of 4500 enterprises. Due to the relatively high response rate[1], the sample used in the present analysis comprises of 3390 enterprises.

The experience of European innovators with creativity stimulation methods varies across countries. Eurostat data on successful implementation of creativity stimulating methods generally finds that percentage of Croatian enterprises using the method is close to the average of other European economies for which the data exists[2]. According to CIS data, most popular creativity stimulation methods across Europe are brainstorming sessions and multidisciplinary or cross-functional teams. The successful implementation of these two methods in Croatian innovative firms is somewhat lower. Brainstorming sessions are successfullly applied by 21 percent of innovators in Croatia and 34 percent in other European countries, while 18 percent of innovators in Croatia and 29 percent in other countries report successful implementation of multidisciplinary teams. As for other methods, Croatian firms report their successful implementation in the percentage higher than it is in other European countries. For example, if we consider the method of training employees, we will find that 24 percent of innovative Croatian enterprises have used this method successfully, comparing to the average of 22 percent in EU countries. The same applies to other methods, and we can conclude that innovative firms in Croatia generally do not lag behind EU countries in implementation of creativity stimulating methods. Thus, raising awareness of the existence of these methods does not seem to be a relevant policy recommendation.

Next, we explore presence of each of the methods in firms in Croatia based on detailed CIS sample data. It is worth noting that Figure 1 data depict implementation of creativity stimulation methods in innovative and non-innovative firms regardless of the implementation success assessment reported by respondents. Although CIS data enables the information on the successfulness of the implementation of specific creativity stimulating method, the assessment of effectiveness is based only on the respondent's perception. Instead of relying on such a measure, we restrain our analysis only to the issue whether specific method has been used in the enterprise or not during the three-year period the questionnaire relates to.

The data clearly shows that overall, innovative firms are more

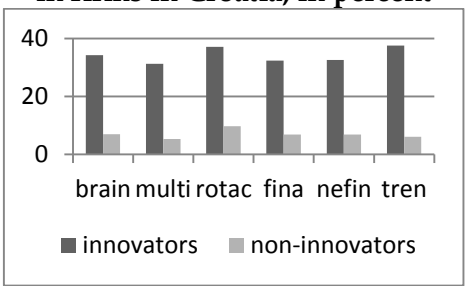
[1] More details on methodology can be found in Croatian Bureau of Statistics, Innovation Activities in Croatian Enterprises, 2008 – 2010, First release number: 8.2.2, 13 July, 2012 http://www.dzs.hr/.

[2] The data are available for EU countries, Norway, Serbia and Turkey.

likely to use creativity stimulating methods. The most implemented method in general is job rotation (22.12 percent) followed by training programs (20.29 percent). It appears that firms in Croatia still don't sufficiently recognize potentials of cross-functional teams for fostering creativity. This method is implemented in 17.05 percent of respondents. Furthermore, financial and non-financial incentives are not strongly favoured when it comes to stimulating creativity. Creativity stimulation seems to be built around more sophisticated methods in Croatia.

As for the innovators, data reveal that the most used methods are job rotation and training programs for stimulating creativity (Figure 1). Job rotations are widely used method in non-innovative firms as well. As for financial and non-financial incentives, they are almost equally popular methods for fostering creativity in both innovative and non-innovative firms. Furthermore, 12.5 per cent of all firms and 21.94 per cent of innovators implemented both financial and non-financial incentives simultaneously. As previously mentioned, cross-functional teams are the least used method in Croatian firms, both innovative and non-innovative.

Figure 1: Implementation of methods for stimulating creativity in firms in Croatia, in percent



Source: authors' calculations based on CIS.

The method to assess whether these activities of the Croatian firms have resulted in more innovation activity is discussed in following section.

3. Estimation strategy

The key question that we want to address in this paper is whether the enterprises that use creativity enhancing methods for their employees are having greater probability of innovation than enterprises that do not use these methods. As Figure 1 has shown, the preliminary statistics implies that this is the case. For the purpose of obtaining quantitative answer to this question, we estimate the average treatment effect on the treated. The basic concepts are following. If Y_0 is the outcome without treatment and Y_1 is the outcome with treatment, D is an indicator of the recipient under the treatment (thus equals 1 if under the treatment and zero otherwise), the

overall observed outcome is following:

$$Y = DY_1 + (1 - D)Y_0 \quad (1)$$

The treatment effect, which we cannot directly observe and thus must estimate with appropriate method, is:

$$\Delta = Y_1 - Y_0 \quad (2)$$

We would like to estimate whether there is a desired effect of specific creativity enhancing method, and whether it is significant. Thus, we are interested in average treatment effect of the treated (ATT), which theoretically is derived for N enterprises from the following:

$$E(Y_1 - Y_0 | D = 1, X) \quad (3)$$

The best theoretical approach for evaluation of such effect would be to have the access to the random sample of enterprises that either received treatment (i.e. used the creativity enhancing method) or not. Since we are not conducting the experiments, but rather rely on the existing data sources, we have to recreate the control group that would allow us to estimate the effect. To that end we rely on matching. When using matching procedure, we have to check if our sample consists of enterprises that are under treatment and those that are not (in our case we have the data on enterprises that used the creativity enhancing methods and those that have not used those from CIS). Another assumption is that we have the data on a set of variables X whose distribution is not affected by the decision (D) to use the creativity enhancing methods. In our case, we have the variables resulting from the CIS survey which correspond to questions answered both by the treated and control groups of enterprises. In that case, matching estimators match up the treated enterprises with observably (according to the X set of variables) similar untreated enterprises. In cases when there is a large set of X variables, we could have various points of similarity and dissimilarity. To reduce this to a single measure, propensity scores - Pr(D=1|X) - can be assessed following Rosenbaum and Rubin (1983) theorem.

The propensity score matching algorithm entails estimation of probabilistic or logistic function of the treatment variable, resulting from the specific observable characteristics of the program participants (X variables). In our case, the goal is to determine the factors behind the probability to utilize a specific creativity enhancing method specified in Section 2.

For each of the six treatment variables, a propensity score matching algorithm was applied using the same set of initial potential explanatory variables. Since there are no prior empirical estimates of these phenomena in Croatian literature, we have included a larger set of independent variables in our specifications in order to be able to detect the counterfactuals with similar characteristics. That implies

that we resolve to use all the possible variables. In terms of CIS questionnaire, this means all the answers that all the participants had to provide. Additional reason for this approach can be found in Heckman, Ichimura, and Todd (1997), who warn against omitting important variables in the procedure, since this can seriously increase bias in resulting estimates.

The dependent variable in propensity score matching algorithm is binary, with obtaining value 1 if the method was used in the enterprises (regardless of its successful implementation or not) and value 0 if the method has not been used. The choice of independent variables in our probit equations is guided by the data source (i.e. CIS), and consists of variables specified in Appendix A1.

For each of the six treatment variables, a separate probit model was used to identify propensity scores, due to the fact that propensity score matching algorithm requires that the balancing score property is satisfied[3]. The propensity scores were then used to identify the enterprises belonging to the control group and to estimate the average treatment effect of the treated based on the differences between treated and control groups. The outcome variable in our case is defined as overall innovation activity of the enterprise[4]. This is also dummy variable which obtains value 1 if enterprise had any type of the innovation activity:

- **Products innovation**: new or significantly improved products, new or significantly improved services
- **Process innovation**: new or significantly improved methods of manufacturing or providing services, new or significantly improved logistics, delivery or distribution methods for inputs, goods or services and new or significantly improved supporting activities for the processes
- **Ongoing innovation projects** (product and process innovation)
- **Organizational innovation**: new business practices for organising procedures, new methods of organising work responsibilities and decision making and new methods of organising external relations with other firms or public institutions
- **Marketing innovation**: significant changes to the aesthetic design or packaging of a good or service, new media or techniques for

[3] Estimated probit for each creativity enhancing method is shown in the appendix A2.

[4] The method used relies on rather strong assumption that all variables that influence treatment assignments (i.e. covariates in probit regression) and potential outcomes are observable and available in dataset (Caliendo and Kopeinig, 2005). Yet, there might be factors that affect both innovation and creativity, which are not covered by Croatian CIS dataset. To deal with this potential endogeneity issue, we would require a richer dataset.

product promotion, new methods for product placement or sales channels and new methods of pricing goods or services.

Due to the fact that this issue has not been analysed previously in Croatian literature, we have estimated the ATTs based on two methods: nearest neighbour matching and kernel matching. The nearest neighbour algorithm iteratively finds pair of subjects with the shortest distance. We also use Epanechnikov kernel function[5], which allowed us to perform post-estimation diagnostics. For example, to further elaborate the relevance of our independent variables selection, we have performed matching covariates balancing property test. The purpose of the test is to identify the differences between the treated and control group before and after the matching, with the desirable result that reduction of the bias in the difference of the mean between target and control group is large as a consequence of the performed matching. Similarly, even though the number of treated and control variables were large enough to utilize analytical standard errors, we have also checked whether bootstrapping of standard errors might result in less significant treatment effect. Since bootstrapping only confirmed the results obtained from analytical errors, we do not present additional data here as well.

4. Results and discussion

The results of average treatment of the treated effect estimated according to the nearest neighbour and kernel matching algorithms are presented in Table 1 and subsequently discussed.

The results confirm that using each of the creativity enhancing methods is positively associated with innovation activity in Croatian enterprises. To confirm these results, we have also performed sensitivity analysis to check if there are unobservable variables that affect assignment into treatment and outcome simultaneously. If such hidden bias existed, it might reduce the robustness of matching estimators (Becker and Caliendo, 2007). To examine this possibility, Mantzel-Haneszel bounds test was performed, which lets the researcher determine how strongly an unmeasured variable must influence the selection process to undermine the implications of selection process. Given that the estimated effect is positive, we are more interested in the possibility of overestimating the treatment effect and the presented Gamma values in Table 1 refer to that case. Our results typically imply that it would require high values of Gamma for the result not to be significant. Thus we conclude that the

[5] This has been obtained by following psmatch2 procedure in STATA 11.

estimated models provide enough evidence to draw some preliminary conclusions, although there are other factors that were not accounted for in the specification that might influence the results.

So, what can we infer from these estimates? First, it seems that we can fairly conclude that non-financial incentives to employees are the least likely to result in more innovation. The highest positive effect on innovation output comes from multifunctional teams and employee training. It can be speculated that within Croatian business-culture domain, methods such as training and job rotation, are well-established and recognized by the employees as those with strictly defined goal. Another well-established and recognized measure is related to financial incentives. Yet, our results seem to be in concordance with the

Table 1: Average treatment of the treated effect estimates

Method	Nearest Neighbour		Kernel Matching	
Treatment	Number treated/control	ATT (standard error)	ATT (standard error)	Γ (Q_mh+)
Brain	654/2398	0.162*** (0.033)	0.179*** (0.028)	> 5.9
Multi	568/377	0.194*** (0.035)	0.224*** (0.024)	> 7.0
Rotac	740/899	0.156*** (0.030)	0.177*** (0.021)	> 4.7
Fina	612/664	0.194*** (0.031)	0.193*** (0.021)	> 5.8
Nefin	613/634	0.131*** (0.032)	0.163*** (0.023)	> 5.9
Tren	675/755	0.189*** (0.030)	0.230*** (0.021)	> 8.3

Source: authors' estimates.

Notes: *** denotes significance at the level of 1 percent. For testing Mantzel-Haenszel bounds we report the value of Γ associated with p-values larger than 10 percent.

literature claiming that financial incentives are less appropriate for creative tasks (Ariely, Kamenica and Prelec, 2008), than for less creative tasks. Similar explanation could be related to the relative least effectiveness of the non-financial methods. Although they are frequently emphasized in the literature as being neglected, but still important social incentives (Heyman and Ariely, 2004), they might not be

clearly enough communicated to the employees. So, the effects of these methods might be smaller.

If we reconsider the data presented in Figure 1, we will notice that innovators use job rotation methods relatively less than non-innovators (i.e. both types of enterprises find this method favourable) considering all the methods that they do use. Yet, relatively least effective is non-financial stimulation, which has approximately the same relative usage ratio as financial stimulation. The fact that the ranking of effectiveness of methods used is different than rankings of relative usage of the same methods, points to the additional information obtained from the empirical estimates.

Even though we have speculated some of the reasons for the ranking of the effectiveness of the analysed methods, we have to emphasize that these are far from being firm conclusions. Additional research efforts, which are beyond the scope of the present paper, are required to be able to support these arguments.

5. Conclusions

The analysis of Croatian enterprises has revealed that the relative frequency of creativity stimulation methods resembles those in other European economies. Thus, it seems that Croatian enterprises are familiar with methods used by the enterprises in their geographical vicinity. Awareness of importance of such measures is thus established, so the main contribution of this paper is related to the effectiveness of the methods implemented.

The creativity enhancing methods have been considered as treatment variables in the empirical analysis, while the outcome has been the innovation activity of the firm. The analysis of effectiveness of such methods for innovation activity has proved that each of the method analysed in the paper has been associated with positive and significant effect on the innovation performance. This finding is not surprising as positive effects of these methods are proven in business practice and confirmed in studies in other countries. However, in the context of Croatian firms this is an important finding because it indicates that firms are capable to implement these methods adequately to foster innovation.

The empirical analysis of average treatment effect of the treated across two different estimation algorithms applied reveals that the most effective measure seems to be training, followed closely by multidisciplinary working teams. On the other hand, non-financial creativity enhancing methods seem to be least effective. Though, these rankings slightly differ when each estimation method is considered, it could be argued that the results that we have obtained follow some stylized facts related to

Croatian enterprises. However, since this paper provides first attempt of the analysis of these issues, future research efforts are required to substantiate our findings. One possible extension should take into consideration factors affecting simultaneously creativity and innovation, such as management style, exposure to various business practices, and general business environment. Another extension would be related to incorporating time factor into the analysis.

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Appendix

Table A1: Independent variables in propensity score matching

Variable	Definition
Gp	=1, if enterprise belongs to a group
Market	=1, if the enterprise established sales on EU and other international markets
Univer50	=1, if the share of employees with university degree is larger than 50 percent
Emp_ch	= employment change 2010/2008
Turn_ch	= turnover change 2010/2008
In-house and external skills available in the enterprise 2008-2010 period:	
Sgala1	=1, graphics, layout, advertising – within enterprise
Sgala2	=1, graphics, layout, advertising – external sources
Sdos1	=1, design – within enterprise
Sdos2	=1, design – external sources
Smed1	=1, multimedia – within enterprise
Smed2	=1, multimedia – external sources
Swds1	=1, web design – within enterprise
Swds2	=1, web design – external sources
Sswd1	=1, software development – within enterprise
Sswd2	=1, software development – external sources
Smkr1	=1, market research – within enterprise
Smkr2	=1, market research - external sources
Senap1	=1, engineering, applied sciences – within enterprise
Senap2	=1, engineering, applied sciences – external sources
Smsdm1	=1, mathematics, statistics, database management – within enterprise
Smsdm2	=1, mathematics, statistics, database management – external sources

Source: Central Bureau of Statistics, CIS.

Table A2: Probit estimates for propensity scores

	Dependent variables					
Variable	brain	multi	rotac	fina	nefin	tren
Gp		.53*** (.06)		.05 (.06)	.02 (.07)	.07 (.06)
Market		.22*** (.06)		.23*** (.06)	.09 (.06)	
Univer50	.39*** (.11)	.19 (.12)	.23** (.11)	.29*** (.11)	.22* (.12)	
Emp_ch			.02 (.01)	.01 (.01)	.02** (.01)	.02* (.01)
Turn_ch		-.00 (.00)				
Sgala1	.45*** (.08)	.13 (.09)				
Sgala2	.32*** (.08)				.08 (.07)	-.03 (.08)
Sdos1		.40*** (.08)		.25*** (.08)	.29*** (.08)	.38*** (.08)
Sdos2	.38*** (.08)		.28*** (.07)		.49*** (.08)	.35*** (.09)
Smed1				.20** (.10)	.39*** (.10)	.38*** (.10)
Smed2	.21** (.08)		.19** (.08)			.14 (.09)
Swds1			.17** (.08)	-.01 (.09)	-.01 (.09)	-.06 (.09)
Swds2	.23*** (.07)	.40*** (.06)				.10 (.08)
Sswd1	.66*** (.08)		.53*** (.08)	.57*** (.09)	.43*** (.09)	.50*** (.09)
Sswd2			.47*** (.06)	.51*** (.06)	.45*** (.07)	.35*** (.07)
Smkr1	.13* (.07)		.36*** (.06)	.29*** (.07)	.18** (.07)	.49*** (.07)
Smkr2	.57*** (.08)			.18** (.09)	.05 (.09)	.21** (.09)

Senap1	.27*** (.07)	.24*** (.07)	.24*** (.06)	.30*** (.07)	.31*** (.07)	.23*** (.07)
Senap2	.03 (.10)		.34*** (.10)	.16 (.10)	.17 (.10)	.33** (.10)
Smsdm1	.33*** (.08)	.73*** (.07)			.22*** (.08)	
Smsdm2		.51*** (.09)	.03 (.09)	.06 (.09)	.10 (.10)	-.02 (.05)
Constant	-1.66*** (.05)	-1.81*** (.05)	-1.36*** (0.04)	-1.61*** (.05)	-1.70*** (.05)	-1.57*** (.05)
Diagnostics						
N	3390	3303	3308	3306	3305	3306
Pseudo R2	.25	.22	.14	.15	.20	.20
LogL	-1249.28	-1180.51	-1514.82	-1343.25	-1275.17	-1343.37

Source: authors' estimates.

Note: Standard errors in parentheses. Coefficients marked *** are significant at level of 1%, ** at level of 5%, and * at level of 10%. Restricted to common support. The balancing property of the propensity score procedure is satisfied.

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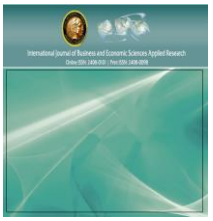

The Interrelation among Faithful Representation (Reliability), Corruption and IFRS Adoption: An Empirical Investigation

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Abstract

Purpose *– The degree of corruption, among other things, indicates the non-implementation of laws, weak enforcement of legal sanctions and the existence of non-transparent economic transactions. Therefore, the expected change in reliability (faithful-representation) resulting from the adoption of IAS/IFRS, does not depend solely on the adoption of IAS/IFRS but is also influenced by the degree of corruption in each country. The purpose of this paper is to examine whether the above statement is true.*

Design/methodology/approach *– The data were taken from DataStream database and the sample period consists of listed companies of fifteen European countries that adopted IAS/IFRS mandatorily. The time horizon is 10 years, from 2000 until 2009. The period between 2000 and 2004 is defined as the period before the adoption, while the period between 2005 and 2009 is defined as the period after the adoption. The reliability/faithful representation of financial statements -as defined by the Conceptual Framework- is detected through regression analysis.*

Findings *– The findings advocate that the adoption of IFRS/IAS seems to be not enough. It appears that the level of reliability of financial statements in every country does not depend solely on the adoption of IAS/IFRS but is also influenced by the degree of corruption in each country.*

Research limitations/implications *– The models that are used for the measurement of reliability have as an independent variable the short-term accruals. Given that, the models fail to take into consideration accounting treatments that concern non-current assets/liabilities.*

Originality/value *– The findings that are identified for counties with a high degree of corruption indicate a statistically significant reduction in reliability after the*

adoption of IAS/IFRS. These findings constitute a useful tool for the IASB and the European Commission as well as for the users of financial statements.

Keywords: IAS/IFRS Adoption, Faithful representation/reliability, Corruption, Conceptual framework

JEL Classification: M41, M48

1. Introduction

Following the decision taken in March 2002, the European Parliament decided to adopt the International Accounting Standards (IAS). Specifically, since 2005 all listed companies are required to prepare and present the consolidated financial statements in accordance with the International Financial Reporting Standards (IFRS). The decision regarding the implementation of the IFRS constitutes a significant and unprecedented change concerning the way financial statements are prepared and presented.

The ultimate purpose of the Committee of the International Accounting Standards Board (IASB) is to create high quality standards in order to produce financial statements of the highest quality. To achieve this objective, the IASB establishes those standards that lead to the increase of the degree of relevance, faithful representation, comparability, timeliness, verifiability and understandbility in financial statements. The IASB stresses that the financial statements must reflect the specific characteristics, as defined by the Conceptual Framework, so that the information provided is most useful.

As already mentioned, the IASB creates the standards as well as the Conceptual Framework, while essentially aiming to produce higher quality financial statements. The critical question that arises is whether this goal has been achieved; that is, whether the financial statements following the IAS/IFRS adoption are in fact, of higher quality. This question is directly related to the purpose of this paper. Specifically, this article investigates whether the adoption of IAS/IFRS is enough. Given that the degree of corruption indicates the non-implementation of laws, weak enforcement of legal sanctions and the existence of non-transparent economic transactions, it can be inferred that the expected change in quality resulting from the adoption of IAS/IFRS, does not depend solely on the adoption of IAS/IFRS but is also influenced by the degree of corruption in each country.

Based on the existing literature the quality is measured by different methods or, a combination of them, such as, by calculating discretionary accruals (Healy, 1985; Jones, 1991;

Dechow and Sloan, 1991; Dechow, Sloan, and Sweeney, 1995; Tsipouridou and Spathis, 2012), conservatism (Anwer, Neel and Wang, 2010; Ball, Kothari and Robin, 2000; Ball and Shivakumar 2005; Barth, Landsman and Lang, 2008; Chen et al., 2010), persistence of earnings (Bandyopadhyay et al., 2010; Kirschenheiter, 1997; Richardson et al., 2005) etc. An important characteristic and a significant contribution of this research is the fact that the quality measurement methodology used, examines the quality of financial statements, as defined by the Conceptual Framework. In contrast, the above measures of quality in some cases are not in line with the definition given by Conceptual Framework. A typical example that highlights this conflict is the measure of reliability. Literature supports that the degree of reliability is measured by the ability of current earnings to predict future earnings (Bandyo-padhyay et al., 2010; Kirschenheiter, 1997; Richardson et al., 2005). The problem arising through this way of measurement is that, it contradicts with the definition of reliability/faithful representation as defined by the Conceptual Framework. This conflict can be readily understood through the following example. Suppose a company makes use of fair value through the valuation method, which essentially introduces variability in the results by reducing their predictability. Given that the fair value is reflected without error, presenting faithfully the economic reality, the level of faithful representation based on the definition derived from the Conceptual Framework is very high, whereas based on the measure of predictability is very low (Riedl, 2010).Another element that highlights the conflict between existing methods of measuring quality and the degree of quality, as defined by the Conceptual Framework, relates to the measure of conservatism. The high degree of conservatism in the literature is presented as an indication of high quality financial statements (Anwer, Neel and Wang, 2010; Ball, Kothari and Robin, 2000; Ball and Shivakumar 2005; Barth, Landsman and Lang, 2008; Chen et al., 2010). In contrast, this feature is not considered desirable by the new Conceptual Framework - since it conflicts with the feature of neutrality - and therefore, not included in it.

The sample of this research consists of listed companies of fifteen European countries that have adopted IAS/IFRS mandatorily. Specifically, four different samples are created; a) the aggregate sample that includes all the countries b) the sample that consists of countries with low corruption, c) the sample that consists of countries with moderate corruption and d) the sample that

consists of countries with high corruption (Appendix 2).

The time horizon is 10 years, from 2000 until 2009. Specifically, the period between 2000 and 2004 is defined as the period prior the adoption, while the period between 2005 and 2009 is defined as the post adoption period.

The findings for the aggregate sample suggest a marginal increase in the reliability of the financial statements but, without being statistically significant. This shows that the level of reliability for the aggregate sample after the adoption seems to be unaltered. Moreover, in countries where the degree of corruption is low, the degree of reliability is higher, but still, this increase is not statistically significant. Additionally, the degree of reliability for countries with a moderate degree of corruption seems to be unchanged, as well. Finally and more importantly, the findings that are identified for countries with a high level of corruption indicate a statistically significant reduction in the degree of reliability. These findings advocate that the adoption of IFRS/IAS seems to be not enough. It appears that the level of reliability of financial statements in every country does not depend solely on the adoption of IAS/IFRS but is also influenced by the degree of corruption of each country.

The research findings constitute a useful tool for the IASB and the European Commission as well as for users of financial statements. On the one hand, the IASB and the European Commission will be able to know the degree of achievement of the objectives set initially and to take the necessary actions/improvements wherever is deemed appropriate. Furthermore, the wide range of the sample comprising of 15 countries that are examined in this research enables one to identify potential problems with the application of IAS/IFRS in specific countries (e.g.in countries where low levels of law enforcement are noticed) and to take the necessary measures. On the other hand, users are more equipped to make favorable decisions for their part.

2. Conceptual Framework

The conceptual framework of IAS/IFRS essentially defines the general principles which should characterize the process of preparing and presenting financial statements. In no case does it have the power of a standard since the basic purpose of its creation is to help and guide the IASB to develop or review existing and future IAS/IFRS. Furthermore, it directs those preparing the financial statements to correctly apply the standards and is an additional tool for handling accounting issues not covered by existing standards. At this stage it should be noted that if an existing standard conflicts with the conceptual framework, then the

standard shall prevail. Finally, it helps auditors and users to understand whether the financial statements and the information provided is consistent with IAS/IFRS.

The qualitative characteristics are divided into fundamental and enhancing. The fundamental features are designed to separate the information provided to users in the following parts: useful information or non-useful and/or misleading information. The two fundamental characteristics include relevance and faithful representation (KPMG, 2010). The conceptual framework highlights (paragraph 17) that in order for the information to be useful, it must be characterized by both of the aforementioned characteristics, i.e. relevance and faithful representation.

In addition, the IASB defines also four enhancing qualitative characteristics considered complementary to the fundamental characteristics. The main difference with the fundamental characteristics is that if the financial information is not characterized by the fundamental characteristics, then the enhancing characteristics alone cannot generate useful information to users. Specifically, the enhancing characteristics are comparability, timeliness, understandability and verifiability.

3. Literature Review

3.1 Reliability / Faithfull representation and Adoption of IAS/IFRS

Although IAS/IFRS gives equal emphasis between the feature of relevance and reliability through their conceptual framework, the same does not apply as far as the literature is concerned. On one side, a significant proportion of literature has dealt extensively with the characteristic of relevance and how this is reflected in the financial statements. In antithesis, the emphasis of the characteristic of reliability is very limited (Richardson et al., 2005).

The vast majority of the literature deals with the characteristic of reliability of accruals identified by finding the discretionary (DA) and non-discretionary accruals (NDA). Several researchers have created models for measuring the degree of reliability using this methodology (Healy, 1985; De Angelo, 1986; Jones, 1991; Dechow and Sloan, 1991; Dechow et al., 1995), which are then used as tools for further research. Moreover, the concept of reliability of accruals has been identified with the concept of quality of accruals directly related to the literature that deals with the quality of earnings.

Escaping from the basic idea of the above researchers, which is to identify the DA and NDA, recently some researchers identify the quality of accruals and earnings by

measuring the amount of error that arises from the relation between accruals and cash flows (Dechow and Dichev, 2002; McNichols, 2002).

In 2007, White, diverging significantly from the methodology of Dechow and Dichev (2002) and McNichols (2002), creates a new model that examines the extent to which the accruals at time t are converted into cash flow in year t +1. In comparison to the previous models, important differences lie in that the calculation of accruals is not based on their changes, but on the closing balances of the accounts. Moreover, the model does not have as an independent variable the overall operating cash flows, which acts as the cause for the introduction of error.

Beyond the research dealing with the reliability of accruals, only a very small part of the literature deals with the reliability of specific accounting items or financial statements as a whole. Cotter and Richardson (2002), in order to identify the reliability of Asset Revaluations, compare the valuation of intangible assets arising from independent appraisers, with estimates arising from the board of the company. The findings indicated that the valuations of plant and equipment that have been made by independent appraisers are more reliable. For other non-current assets, no difference in the degree of reliability of valuations has been detected. The authors detect the degree of reliability by examining the write-downs of an upward revaluation that took place in the past. They claim that the greater the reversal, the lower the reliability, as it implies that there was greater error in the initial revaluation.

In 2007 Lanito, detects the degree of reliability of IAS/IFRS in Finnish companies through questionnaires that target business managers and auditors of financial statements. The findings resulting from the responses, both for managers and auditors, recognize as reliable the information provided by several standards whilst the findings regarding those reliability standards requiring the exercise of judgment, are characterized as neutral.

Richardson et al. (2005) and Bandyopadhyay et al. (2010), measure the degree of reliability through the ability of current earnings to predict the earnings of the following period. This is based on the argument that the error arising from accruals is incorporated to the process of calculating the earnings, consequently weakening the relationship between successive earnings. In other words, the larger the error in the current earnings is, the lower the correlation to future earnings is as well, leading to a lower degree of persistence/predictive power. An important problem that arises is that this way of measuring the reliability is not consistent with the definition of reliability, as defined

by the conceptual framework of IAS/IFRS. It is alleged that this method may lead to conflicting findings concerning the degree of reliability, especially when the revaluation model is used. In particular, it is argued that the use of fair value introduces additional variation in earrings while reducing their predictive ability (Riedl, 2010). Therefore, based on the empirical model of Richardson et al. (2005), the degree of reliability would be characterized as low whilst by the definition given by the conceptual framework, the reliability is high (as long as the fair values are portrayed without error, presenting faithfully the economic reality).

Finally, the findings associated with the reliability and adoption of IAS/IFRS are identified in 2005 by Van Tendeloo and Vanstraelen, discovering while using the model of Jones (1991) that the financial statements of German firms that voluntarily adopt IAS/IFRS are characterized by higher degree of DA, compared with companies that do not adopt IAS/IFRS. In addition, Chen et al. (2010) examined 15 European countries and applied inter alia the modified model of Jones and Kothari et al. (2005), discovered opposite results in comparison to the findings of the Van Tendeloo and Vanstraelen (2005). Particularly, they find that the degree of DA is lower in firms adopting IAS/IFRS, which supports the increase in the quality of their financial statements. In addition, the same researchers examine the quality of accruals through the model proposed in 2002 by the Dechow and Dichev, identifying a reduction in standard deviation of the residuals of the model, which again supports the rise in quality.

3.2 Interaction between Corruption and the Degree of Reliability

As Ball (2006, p. 43) distinctly mentions, the uneven application/implementation of the standards constitutes the 'Achilles heel' for the IAS/IFRS. Specifically, the different degree of supervision by the authorities in charge of the proper implementation of the standards of each state as well as the distinctive characteristics governing each country, contribute to the creation of this particular problem. One of the characteristic which according to the literature influence the accounting system and the quality of the financial statements is the general culture of the country and the level of corruption and legal compliance (Leuz et al. 2003). Given that IAS/IFRS is a principle-based accounting system, the management in many cases has the freedom to choose an accounting treatment. This freedom ideally has as a result, the faithful representation of economic transactions and other events, in financial statements. In other words, the economic events are accounted

for and presented in accordance with their substance and economic reality and not merely their legal form. However, this is not the case in countries where corruption is high and the imposition of legal compliance is low. Specifically, in countries with such characteristics the management has no fear of legal sanctions and it may choose particular accounting treatments in order to manipulate the financial statements reducing to some extent the faithful representation/reliability of financial statements. Other characteristics that seems to influence the accounting system and are directly related to the level of corruption are, the existing political system (Leuz and Oberholzer-Gee, 2006), the extent of government involvement in businesses and the legal system (La Porta et al., 1998).

4. Hypothesis development

4.1 Adoption of IAS/IFRS and the degree of Faithfull representation/Reliability of Financial Statements

Based on the definition of faithful representation/reliability, as defined by the conceptual framework, the financial statements are said to be reliable when they do not contain any material error or bias and reliably reflect the economic events that they must present. In particular, the financial statements should be governed by five partial characteristics, to qualify as reliable. First, to present faithfully the economic events; secondly, they should not be the product of any prejudice whatsoever, that is to be neutral; third, to present the economic substance of economic events unconstrained by legal aspects; fourth, decisions taken by the management regarding uncertain events which require the exercise of judgment must be taken with caution and finally, the financial statements ought to be complete.

The purpose of the IAS/IFRS Committee was the creation and provision, especially to investors, of augmented levels of relevance in the financial statements. Given the interaction between the characteristics of relevance and reliability, the increase of the degree of relevance will be attained by increasing the reliability of financial statements. To achieve this objective, the IASB has taken the following actions: First, there was a reduction of alternative accounting methods (e.g. abolition of the LIFO method), which aims to reduce the degree of manipulation of results and thus, the increase of their reliability. Second, there was a focus on the economic substance of events, giving in many cases the option to management to choose the accounting treatment (e.g. introduction of fair value as the valuation method) resulting to the better reflection of economic reality in the financial statements. Finally, the detailed presentation of the principles relating to valuation,

recognition and publication of the financial statements, suggests that the degree of manipulation by the management is reduced and at the same time a rise in terms of completeness is observed.

Additionally, with the adoption of IAS/IFRS and the increase of the degree of comparability, especially at international level, investors are able to compare at a lower cost the financial statements, identifying omissions and/or errors in accounting statements easier. This leads both, managements and audit firms that audit the financial statements, to be more careful in the drafting and auditing of accounts, resulting in more reliable financial statements.

On the other hand, in some cases, the use of fair value and the exercise of judgment by the management may result in the rise of the degree of manipulation. Moreover, the difficulty of calculating the fair value can introduce additional estimation error. These elements can cause loss of reliability, but are not considered likely to lead to a reduction in the reliability of the financial statements in the period following the adoption of IAS/IFRS.

If one relies on the definition of reliability, it can be drawn that before the adoption of IFRS the financial statements were governed by a low degree of reliability, since due to the use of historical cost the accounting data did not adequately describe the economic reality, because the book values of a firm deviate significantly from the economic values. The deviation from the economic reality - an indication of low-level reliability - resulting from the use of historical cost is expected to be greater than the deviation caused by the use of fair value, upon adoption (which as mentioned above, in some cases can be manipulated or can be inaccurate). The fact that the elements that seem to reduce the reliability of financial statements, such as those mentioned in the previous paragraph, seem unlikely to prevail and lead to the reduction of the degree of reliability in the period following the adoption of IFRS in combination with the actions taken by the International Accounting Standards Board to increase the reliability, and result to the following hypothesis:

Hypothesis 1: The faithful representation/reliability of the financial statements of firms adopting IAS/IFRS is higher during the period following the adoption of IAS/IFRS in relation to the period before the adoption.

4.2 Interaction between Corruption and the Degree of Reliability

The high degree of corruption, among other things, indicates the non- implementation of laws, weaker enforcement of legal sanctions and the existence of non-transparent economic transactions. Therefore, the expected increase in reliability

(hypothesis 1) resulting from the adoption of IAS/IFRS, does not depend solely on the adoption of IAS/IFRS but is, also, influenced by the degree of corruption in each country.

In many cases, the choice of accounting treatment by the management is allowed by IAS/IFRS in order to better reflect the economic reality. But in countries where corruption is high and the imposition of legal sanctions and law enforcement is weaker, this option enables management to manipulate the results with greater ease and without fear of legal sanctions, thus reducing to some extent the reliability of financial statements. The conclusion is that the proper application of IAS/IFRS and the reliability of the financial statements are directly dependent on the degree of corruption that governs every country. The hypothesis which arises is the following:

Hypothesis 2: The improvement of the degree of reliability of the financial statements of companies adopting IAS/IFRS is higher in countries with low corruption.

5. Methodology

5.1 Measuring reliability - First Method

The first model used to measure the reliability has been developed by Kim and Kross (2005). Specifically, cash flows from operating activities and accruals at time t are set as the independent variables, whilst the cash flows from operating activities in t+1 as the dependent variable. The model which emerges is the following:

$$Cfo_{i,t+1} = a_0 + a_1 Cfo_{i,t} + a_2 Acc_{i,t} + u_{i,t+1} \quad (1)$$

$Cfo_{i,t+1}$ = Cash flows from operating activities in t+1 / Total assets at t,

$Cfo_{i,t}$ = Cash flows from operating activities in t / Total assets at t-1,

$Acc_{i,t}$ = DWC - DEP,

DEP = Depreciation / Total Assets at t-1,

DWC = change in net accounts Receivables / total assets at t-1, plus change in inventory / Total assets at t-1, plus change in other current assets / total assets at t-1, minus change in accounts payable / Total assets at t-1, minus change in taxes payable / total assets at t-1, minus change in other current liabilities / Total assets at t-1, minus change in deferred taxes / Total assets at t-1.

Ui,t+1 = residuals

Reliability is defined as the ability of the two independent variables to explain the cash flows from operating activities in t+1. This ability is identified by the coefficient of determination of the model (R^2). In other words, the identification of higher R^2 indicates a higher degree of reliability, that is, the earnings and the current cash flows can predict better the future cash flows and vice versa. The comparison of reliability between the two periods - before and after the adoption - is performed by comparing the R^2 of two independent

samples. The statistical significance of the difference between the two $R^2$is examined through a test used by Van der Meulen et al, in 2007, which was based on the analysis of Crammer (1987) (Appendix 1).

5.2 Measuring reliability - Second Method

The second model used to measure reliability is based on the model developed by White, in 2007. There are two important properties of this model. First, is that the calculation of accruals is not based on changes in the accounting items ('traditional' approach), as older models (Dechow and Dichev, 2002; McNichols, 2002; Kim and Kross, 2005, etc.), but on their closing balances. Secondly, a distinction between accruals and deferrals is made, escaping from the hitherto definition of accruals that integrated the cumulative accruals and deferrals.

The underlying logic of the model is to isolate the amounts recognized in the year t and which are disbursed to the next (t+1) (payable/accruals), the amounts recognized in the year t +1 and disbursed to i, t as well as the amounts disbursed in fiscal year t+1 and in relation to the upcoming year(prepaid/deferrals). Finally, White (2007) examines the ability of these three variables to explain the cash flows at t+1. A basic assumption of the model is that short-term assets and liabilities are recovered or settled, within twelve months.

The higher the capacity of the three independent variables in explaining the dependent variable is, the higher the degree of reliability of the financial statements. In other words, when the accruals (payable/accruals at time t and prepaid/deferrals at time t+1) explain the operating cash flows at time t+1, then the management estimations relating to accruals can be regarded as reliable. Moreover, White (2007) argues that the introduction of the independent variable $Cpcf_{i,t+1}$ introduces systematic measurement error in the regression (White, 2007, p. 18). Hence, he uses a proxy variable; the $Cpcf_{i,t}$. Finally, the explanatory ability of the independent variables is measured by the coefficient of determination of the model (R^2). As in the previous model the comparison of reliability between the two is performed by comparing the R^2 of two independent samples. Again, the statistical significance of the difference between the two R^2 is examined through the test used by Van der Meulen et al, in 2007 (Appendix 1).The model which emerges is the following:

$$Cfo_{i,t+1} = a_0 + a_1 Accr_{i,t} + a_2 Cpcf_{i,t} + a_3 Def_{i,t+1} + u_{i,t+1} \quad (2)$$

$Cfo_{i,t+1}$ = Cash flows from operating activities in t + 1 / Total assets at t,

$Accr_{i,t}$= Net accounts receivables / Total assets at t-1, minus other current liabilities / Total assets at t-1, minus inventory accruals / Total assets at t-1,

$Cpcf_{i,t}$ = operating income before depreciation at time t minus Accri,t plus Def i,t-1.

$Def_{i,t+1}$ = other current assets / Total assets at t, plus inventory deferrals / Total assets at t,

$U_{i,t+1}$ = residuals

6. Sample

The sample of this study consists of listed companies of 15 European countries, which according to the classification published by the FTSE Group in September 2009 (FTSE, Country Classification, 2009) are characterized as developed. The countries considered are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK. Moreover, three subsamples were created: a) countries with low corruption (Denmark, Finland, Sweden, Holland, Germany, and Ireland), b) countries with moderate corruption (United Kingdom, France, Belgium, Spain, and Portugal) and c) countries with high corruption (Greece and Italy). In order to categorise these countries to each subsample, the Corruption Perceptions Index published by Transparency International in 2010, was used.

The time period under examination in this research is period of 10 years consisting of the period prior (2000-2004) and the period after (2005-2009) the adoption of IAS/IFRS. Given that the effects of IFRS on the financial statements of companies that are mandatory IAS/IFRS adopters are the ones examined, firms which are either voluntary adopters of IAS/IFRS, or they adopt them at a time after 2005 (as listed on AIM London Stock Exchange - alternative investment market) are excluded from the sample. In other words, any firms whose first publication of their financial statements under IAS/IFRS was held a year other than 2005 are crossed out from the sample.

The data for the sample were provided by DataStream database. In addition, other than the aforementioned exceptions firms in the financial sector are also excluded (so that the findings can be directly compared with previous research), since the exclusion of financial firms from samples of previous research is almost ubiquitous. Additionally, according to the existing literature, companies with negative book value of capital are excluded. Among others, Collins et al. (1997) and Collins et al. (1999) and Brown et al. (1999) argue that the samples used for the measurement of relevance should incorporate only positive observations of book value of equity. In addition, 2% of the extreme values are deleted. The process of the creation of the final samples as well as the data per country, are summarized in Table 1 and 2.

Table 1: Sample selection for IFRS mandatory adopters

	(N) 2000 - 2004	(N) 2005 - 2009	(N) 2000 - 2009
Original sample	26876	23047	49923
Minus:			
Observations for companies / fiscal year different from 1/1-31/12	7495	6501	13996
Observations for companies in the financial sector	1615	1459	3074
Observations for companies with negative book value of equity	581	572	1153
Voluntary adopters	7711	6686	14397
Data not available	437	449	886
Outliers (2%)	136	191	327
Final sample	8901	7189	16090

This sample refers to the reliability measure resulting from regression $Cfo_{i,t+1} = a_0 + a_1Cfo_{i,t} + a_2Acc_{i,t} + u_{i,t+1}$. Observations arising from the other model vary, depending on the unavailable data.

Table 2: Final sample per country for the periods prior and post the adoption of IAS/IFRS

Country	**2000 -2004**	**2005 – 2009**	**Total 2000 - 2009**
Austria	56	30	86
Belgium	285	215	500
Denmark	420	232	652
Finland	404	400	804
France	1680	1403	3083
Germany	619	418	1037
Greece	908	890	1798
Ireland	164	84	248
Italy	703	715	1418
Luxembourg	40	29	69

Netherlands	420	399	819
Portugal	196	150	346
Spain	433	407	840
Sweden	928	862	1790
UK	1645	955	2600
Total Observations	8901	7189	16090

These data refers to the reliability measure resulting from regression $Cfo_{i,t+1} = a_0 + a_1Cfo_{i,t} + a_2Acc_{i,t} + u_{i,t+1}$. Observations arising from the other model vary, depending on the unavailable data.

7. Results

7.1 Descriptive Statistics

In Table 3 the descriptive elements of the sample are presented. A detailed description of the variables used is presented in the table. The correlation tables are presented in the third Appendix. The first correlation matrix concerns the period before the adoption of IFRS/IAS and the second the period after the adoption. It is observed that the negative (positive) correlation of current accruals(deferrals at t+1) and cash flows from operating activities at t+1is statistically significant for both periods. Nevertheless, these findings do not suggest any change (positive or negative) in reliability.

Table 3: Descriptive statistics

	2000-2004					2005-2009				
Variable / Model Reliability 1	Mean	Median	Q1	Q3	Sd	Mean	Median	Q1	Q3	Sd
Cfot+1	0,07	0,08	0,03	0,12	0,15	0,07	0.07***	0,03	0,12	0,11
Accr t	0,08	0,08	-0,01	0,18	0,20	0,08	0,08	-0,01	0,18	0,17
Cpcf t	0,07	0,06	-0,05	0,17	0,27	0.08***	0.08***	-0,05	0,19	0,22
Def t+1	0,07	0,03	0,01	0,10	0,11	0.06**	0.02***	0,00	0,10	0,10
Reliability 2										
Cfot+1	0,09	0,09	0,05	0,13	0,09	0.08***	0.08***	0,04	0,12	0,08
Cfo t	0,08	0,08	0,05	0,12	0,09	0.09***	0.09***	0,05	0,13	0,08
Acc	-0,05	-0,06	-0,09	-0,02	0,09	-0.04***	0.03***	-0,07	0,00	0,08

The model Reliability 1 refers to the regression: Cfoi,t +1year = a0 + a1Accri,t + a2Cpcfi,t + a3Defi,t +1year, and model Reliability 2 refers to the regression: Cfoi,t +1year = a0 + a1Cfoi,t + a2Acci,t. Variables: Cfoi,t +1 = Cash flows from operating activities in t + 1 / Total assets at t, Cfoi,t = Cash flows from operating activities in t / Total assets at t-1, Accri,t = Net accounts receivables / Total assets at t-1, minus other current liabilities / Total assets at t-1, minus inventory accruals / Total assets at t-1, Def i,t +1 = Other current assets / Total assets at t, plus inventory deferrals / Total assets at t, Cpcfi,t = operating income before depreciation at time t minus Accr it plus Def i,t-1, Acci,t = DWC - DEP, DEP = Depreciation / Total Assets at t-1, DWC = change in net accounts Receivables / total assets at t-1, plus change in inventory / Total assets at t-1, plus change in other current assets / total assets at t-1, minus change in accounts payable / Total assets at t-1, minus change in taxes payable / total assets at t-1, minus change in other current liabilities / Total assets at t-1, minus change in deferred taxes / Total assets at t-1, *** = 1% statistically significant , ** = 5% statistically significant , * = 10% statistically significant, T-test and Wilcoxon rank sum test have been used to test for differences means and median, respectively.

7.2 Empirical Findings

According to the first hypothesis, reliability of financial statements is expected to increase in the period following the adoption of IFRS/IAS. Moreover, this increase is expected to be larger in countries with a low degree of corruption. Tables 3 and 4 illustrate the findings on this matter.

7.2.1 Empirical findings measuring reliability - First Method

Using the first method, the change of reliability is detected by the linear model 1 and more specifically, by examining the change of the coefficient of determination (R^2). In case of increasing reliability, the R^2 of each regression is expected to be higher in the period after the adoption in relation to the period before the adoption. The results concerning the aggregate sample detect a marginal increase in the degree of reliability but are not statistically significant whatsoever. Specifically, with regards to the aggregate sample, the change of R^2 shows a marginal non-significant increase in reliability at the rate of 3% (Table 4). In addition, with regards to the low and moderate corruption samples, the results again are not statistically significant. In detail, for the low corruption sample (Denmark, Finland, Sweden, Holland, Germany, Ireland and Luxembourg) the difference between R^2 is 4% and not statistically significant, and for the moderate corruption sample (United Kingdom, France, Belgium, Spain and Portugal) no difference is detected between R^2 (Table 4).

Finally and most importantly, the degree of reliability is detected to be lower in countries with a high degree of corruption (Greece and Italy). Specifically, the change of R^2 shows a statistical significant decrease (at the level of 10%) in reliability at the rate of -10% (Table 4). Conflicting results

concerning Greece were detected from Naoum et al. in 2011. In detail, the authors detected an increase in quality of financial statements, suggesting higher reliability.

Table 4: Reliability 1

$$Cfo_{i,t+1} = a_0 + a_1 Cfo_{i,t} + a_2 Acc_{i,t} + u_{i,t+1}$$

Country	**a0**	**a1**	**a2**	**Ad. R²**	**Dif.R²**
All countries prior IAS/IFRS	0.023***	0,699***	-0,094***	51%	
All countries post IAS/IFRS	0,015***	0,680***	-0.052**	54%	+03%
Countries with low corruption-prior IAS/IFRS	0.027***	0.739***	0.012	52%	
Countries with low corruption-post IAS/IFRS	0.008	0.756***	-0.039	56%	+04%
Countries with moderate-corruption prior IAS/IFRS	0.028***	0.711***	-0.049**	52%	
Countries with moderate corruption-post IAS/IFRS	0.019***	0.685***	-0.049**	52%	0%
Countries with high corruption-prior IAS/IFRS	0.017*	0.680***	-0.147***	53%	
Countries with high corruption-post IAS/IFRS	0.020**	0.509***	-0.051	43%	-10%*

Variables : Cfoi,t +1 = Cash flows from operating activities in t + 1 / Total assets at t, Cfoi,t = Cash flows from operating activities in t / Total assets at t-1, Acci,t = DWC - DEP, DEP = Depreciation / Total Assets at t-1, DWC = change in net accounts Receivables / total assets at t-1, plus change in inventory / Total assets at t-1, plus change in other current assets / total assets at t-1, minus change in accounts payable / Total assets at t-1, minus change in taxes payable / total assets at t-1, minus change in other current liabilities / Total assets at t-1, minus change in deferred taxes / Total assets at t-1. The technique bootstrapping (Van der Meulen et. al 2007 and Crammer 1986) is used to control the statistical significance of differences in R^2. The Variance Inflation Factor (VIF) was calculated for all independent variables and the results do not indicate multicollinearity. *** = 1% statistical significance, ** = 5% statistically significant, * = 10% statistically significant. Countries with low corruption: Denmark, Finland, Sweden, Holland, Germany, Ireland. Countries with moderate corruption: United Kingdom, France, Belgium, Spain, Portugal. Countries with high corruption: Greece, Italy.

7.2.2 Empirical findings measuring reliability - Second Method

Using the second method, the change of reliability is detected by the linear model 2. In case of increasing reliability, the R^2 is expected to be higher in the period post the adoption in relation to the period prior the adoption. The results regarding the aggregate sample detect a not statistically significant increase in the degree of reliability. In detail, the change of R^2 regarding the aggregate sample shows a marginal non-significant increase in reliability at the rate of 2% (Table 5). In addition, with regards to the low and moderate corruption samples, the results again are not statistically significant. Namely, for the low corruption sample the difference between R^2 is 4% and not statistically significant, and for the moderate corruption samplethe difference between $R^2$is -1% and not statistically significant (Table 5).

As in previous method the degree of reliability is detected to be significantly lower in counties with a high degree of corruption. Using the latter regression the change of R^2indicates a statistical significant decrease (at the level of 10%) in reliability at the rate of -7% (Table 5).

The findings derived from both regressions suggest that the adoption of IFRS/IAS seems to be not enough. In other words, the level of reliability of financial statements in every country does not depend solely on the adoption of IAS/IFRS but is also influenced by the degree of corruption in each country. Specifically, in countries with low and moderate level of corruption, the level of reliability after the adoption of IFRS/IAS remains the same, while in countries with high level of corruption the level of reliability deteriorates. At this point it should be highlighted that the findings are not in line with one of the main purposes of IASB which was the increase of reliability/faithful representation.

Table 5: Reliability 2

$$Cfo_{i,t+1} = a_0 + a_1 Accr_{i,t} + a_2 Cpcf_{i,t} + a_3 Def_{i,t+1} + u_{i,t+1}$$

Country	a0	a1	a2	a3	Ad. R^2	Dif.R^2
All countries prior IAS/IFRS	0.026***	0.443***	0.459***	-0.295***	35%	
All countries post IAS/IFRS	0.016***	0.451***	0.490***	-0.333***	37%	+02%
Countries/low corruption-prior IAS/IFRS	0.027***	0.488***	0.484***	-0.356***	38%	

Countries/ low corruption-post IAS/IFRS	0.001	0.497***	0.533***	-0.304***	42%	+04%
Countries/moderate-corruption prior IAS/IFRS	0.022***	0.424***	0.440***	-0.292***	38%	
Countries/moderate-corruption post IAS/IFRS	0.029***	0.424***	0.455***	-0.395***	37%	-01%
Countries/high corruption-prior IAS/IFRS	0.032***	0.527***	0.607***	-0.506***	38%	
Countries/ high corruption-post IAS/IFRS	0.019***	0.390***	0.419***	-0.347***	31%	-07%*

Variables : Cfoi,t +1 = Cash flows from operating activities in t + 1 / Total assets at t, Accri,t = Net accounts receivables / Total assets at t-1, minus other current liabilities / Total assets at t-1, minus inventory accruals / Total assets at t-1, Def i,t +1 = Other current assets / Total assets at t, plus inventory deferrals / Total assets at t, Cpcfi,t = operating income before depreciation at time t minus Accri,t plus Def i,t-1. The technique bootstrapping (Van der Meulen et. al 2007 and Crammer 1986) is used to control the statistical significance of differences in R^2. The Variance Inflation Factor (VIF) was calculated for all independent variables and the results do not indicate multicollinearity. *** = 1% statistical significance, ** = 5% statistically significant, * = 10% statistically significant. Countries with low corruption: Denmark, Finland, Sweden, Holland, Germany, Ireland. Countries with moderate corruption: United Kingdom, France, Belgium, Spain, Portugal. Countries with high corruption: Greece, Italy.

8. Conclusions

The IASB creates the standards and the conceptual framework in an attempt to create higher quality financial statements. Throughout this article, the extent to which this objective has been achieved is examined. Specifically, whether the quality of the financial statements of firms adopting IFRS/IAS is superior to the period after the adoption of IAS/IFRS, as compared with the period before the adoption, is examined.

An important characteristic and a contribution of this research is the fact that the quality measurement methodology used, varies greatly from other existing methodologies that are identified in the existing literature. The quality of financial statements is examined in the light of the Conceptual Framework and specifically through the examination of Reliability which is one of the fundamental qualitative characteristics.

The sample consists of listed companies of fifteen European countries that have adopted IAS/IFRS mandatorily. The countries included in the sample are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK. Additionally, three other subsamples are created: a) countries with low corruption, b) countries with moderate corruption and c) countries with high corruption.

The time horizon is 10 years, from 2000 until 2009. Specifically, the period between 2000 and 2004 is defined as the period before the adoption, while the period between 2005 and 2009 is defined as the period after the adoption.

Using two alternatives measures in order to capture the difference between the degree of reliability before and after the adoption, the findings that are identified for the aggregate sample suggest a marginal increase in the reliability of the financial statements but, without being statistically significant. This indicates that the level of reliability for the aggregate sample after the adoption seems to be unaltered. Moreover, it is detected that countries with a low degree of corruption have increased the degree of reliability, but still, this increase is not statistically significant. Additionally, the degree of reliability for countries with a moderate degree of corruption seems to be unchanged.

Lastly and more importantly, the findings that are identified for counties with a high degree of corruption indicate a statistically significant reduction in the degree of reliability. These findings advocate that the adoption of IFRS/IAS seems to be not enough. It appears that the level of reliability of financial statements in every country does not depend solely on the adoption of IAS/IFRS but is also influenced by the degree of corruption in each country.

Finally, the results are subject to some limitations. Firstly, the models that are used for the measurement of reliability have as an independent variable the short-term accruals. That is, the models measure the ability of current accruals to explain the future cash flows. Given that, the models fail to take into consideration accounting treatments that concern non-current assets/liabilities. Secondly, the methodology depends on the comparison of R^2. While in the current article a lot of tests are utilized in order to check the significance of R^2, a part of the literature suggests that this kind of studies are plagued with endogeneity issues. These limitations could be taken into consideration as opportunities for future research.

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Appendix

1- Statistical significance of the differences of Factor Determination (R^2)

The methodology carried out in order to identify the statistical significance of the difference between two Coefficients of Determination (R^2) was held in two steps. Initially, the standard errors as well as variations of the coefficients of determination for each sample were calculated using the 'bootstrapping' technique. Then, following the statistical test used by Van der Meulen et al, in 2007, which was based on the analysis of Crammer (1987), the statistical significance concerning the differences in terms of R2, was identified.

Specifically, the comparison of R^2 between the two samples (prior and post the adoption), is performed through the following statistical test:

$$T=\frac{|R^2_{IFRS}-R^2_{LOCAL}|}{SE(R^2_{IFRS}+R^2_{LOCAL})}$$

Moreover, the standard error (SE) is equal to:

$$SE(R^2_{IFRS}+R^2_{LOCAL}) = \sqrt{VAR(R^2_{IFRS}+R^2_{LOCAL})}$$

Therefore, given that the two samples being independent, the following applies:

$$SE(R^2_{IFRS}+R^2_{LOCAL}) = \sqrt{VAR(R^2_{IFRS})+VAR(R^2_{LOCAL})}$$

2 - Corruption Index

Corruption Perceptions Index 2010- European Union and Western Europe

RANK	REGIONAL RANK	COUNTRY / TERRITORY	CPI 2010 SCORE
1	1	Denmark	9.3
4	2	Finland	9.2
4	2	Sweden	9.2
7	4	Netherlands	8.8
8	5	Switzerland	8.7
10	6	Norway	8.6
11	7	Iceland	8.5
11	7	Luxembourg	8.5
14	9	Ireland	8.0
15	10	Austria	7.9
15	10	Germany	7.9
20	12	UnitedKingdom	7.6
22	13	Belgium	7.1
25	14	France	6.8
26	15	Estonia	6.5
27	16	Slovenia	6.4
28	17	Cyprus	6.3
30	18	Spain	6.1
32	19	Portugal	6.0
37	20	Malta	5.6
41	21	Poland	5.3
46	22	Lithuania	5.0

50	23	Hungary	4.7
53	24	CzechRepublic	4.6
59	25	Latvia	4.3
59	25	Slovakia	4.3
67	27	Italy	3.9
69	28	Romania	3.7
73	29	Bulgaria	3.6
78	30	Greece	3.5

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3 - Correlation matrixes

Sample prior to adoption

	Cfo t	**Cfo t+1**	**Acc t**	**Accrt**	**Cpcf t**	**Def t+1**
Cfo t	1	0.690***	-0,453***	0.054***	0.378***	0.044**
Cfo t+1	0.742***	1	-0,012**	-0,052**	0.376***	0.049**
Acc t	0.450***	-0.352***	1	0,521***	0.223	0.034
Accrt	0.057***	0,026	0,576***	1	-0.694***	0.058***
Cpcf t	0.398***	0.368***	0,013	-0.635***	1	0.415***
Def t+1	0.042**	0.033*	0,099	0.209***	0.256***	1

Above the diagonal, Pearson's correlations are illustrated, while below the diagonal Spearman's correlations. Variables: Cfoi,t = Cash flows from operating activities in t / Total assets at t-1, Cfoi,t +1 = Cash flows from operating activities in t + 1 / Total assets at t, Acc t = DWC - DEP, DEP = Depreciation / Total Assets at t-1, DWC = change in net accounts Receivables / total assets at t-1, plus change in inventory / Total assets at t-1, plus change in other current assets / total assets at t-1, minus change in accounts payable / Total assets at t-1, minus change in taxes payable / total assets at t-1, minus change in other current liabilities / Total assets at t-1, minus change in deferred taxes / Total assets at t-1,Accr i,t = Net accounts receivables / Total assets at t-1, minus other current liabilities / Total assets at t-1, minus inventory accruals / Total assets at t-1, Def i,t +1 = Other current assets / Total assets at t, plus inventory deferrals / Total assets at t, Cpcfi,t = operating income before depreciation at time t minus Accri,t plus Def i,t-1. *** = 1% statistically significant, ** = 5% statistically significant, * = 10%.

Sample post to adoption

	Cfo t	**Cfo t+1**	**Acc t**	**Accrt**	**Cpcf t**	**Def t+1**
Cfo t	1	0.705***	-0,645***	-0,004	0.438***	0.034*
Cfo t+1	0.740***	1	-0,023**	-0.061***	0.383***	0,014
Acc t	0.342***	-0.436***	1	0.487***	0.002	0.063
Accrt	-0,006	-0.058***	0,345***	1	-0.732***	0.122***
Cpcf t	0.413***	0.359***	0,015	-0.707***	1	0.284***
Def t+1	0.037*	-0,008	0,066	0.186***	0.197***	1

Above the diagonal, Pearson's correlations are illustrated, while below the diagonal Spearman's correlations. Variables: Cfoi,t = Cash flows from operating activities in t / Total assets at t-1, Cfoi,t +1 = Cash flows from operating activities in t + 1 / Total assets at t, Acc t = DWC - DEP, DEP = Depreciation / Total Assets at t-1, DWC = change in net accounts Receivables / total assets at t-1, plus change in inventory / Total assets at t-1, plus change in other current assets / total assets at t-1, minus change in accounts payable / Total assets at t-1, minus change in taxes payable / total assets at t-1, minus change in other current liabilities / Total assets at t-1, minus change in deferred taxes / Total assets at t-1,Accr i,t = Net accounts receivables / Total assets at t-1, minus other current liabilities / Total assets at t-1, minus inventory accruals / Total assets at t-1, Def i,t +1 = Other current assets / Total assets at t, plus inventory deferrals / Total assets at t, Cpcfi,t = operating income before depreciation at time t minus Accri,t plus Def i,t-1. *** = 1% statistically significant, ** = 5% statistically significant, * = 10%.

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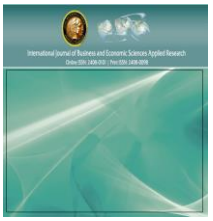

Firm performance: The role of CEOs' emotional and cognitive characteristics

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Abstract

Purpose *– The paper examines the relationships between CEOs' personal traits, emotions, attitudes and tolerance of ambiguity; and subsequently, the influence of CEOs' ambiguity tolerance in firms' performance.*

Design/methodology/approach *– Survey data were collected from 256 ICT firms established in Greece. Their CEOs completed questionnaires examining TOA, personal traits, emotions and attitudes in the workplace. Principal components analysis and ordinary least-squares regressions were used to explore the hypotheses of the paper.*

Findings *– Three factors characterize CEOs' emotions, namely pleasure, dominance and arousal; two factors their involvement, namely importance and interest; and, respectively, one their emotional intelligence namely, empathy/handling relationships. Further, locus of control; importance; arousal; empathy/handling relationships and interest affect decisively CEOs' tolerance of ambiguity, which in turn, seems to influence positively firms' performance.*

Research limitations/implications *– Further research is required in Greek ICT industry regarding the influence of CEOs'emotional and cognitive attributes in organizations' financial performance. Likewise, this research should be expanded to other industries.*

Originality/value *– The originality of this study lies in the finding that emotional and cognitive characteristics affect CEOs' TOA, which, in turn, influences significantly firms' performance. Another significant contributing factor is that the study is carried out in Greece, where few studies have been conducted in this area.*

Keywords: Ambiguity Tolerance, Attitudes, Emotions, Performance, Personal Traits

JEL Classification: D23, L25

1. Introduction

There is no doubt that the current business environment is one of the most challenging firms have ever faced. The downturn in the world economy and analogous increases in unemployment have resulted to lower consumer demand and tighter budgets. Given such dynamic environmental conditions, a firm's ability to adapt quickly is crucial to its success in achieving sustainable competitive advantage (Hitt et al., 1998). Further, it is acknowledged that CEOs' personal and cognitive attributes are key indicators of firm flexibility (Rajagopalan and Spreitzer, 1997) and firm performance (Nadkarni and Herrmann, 2010) especially during changing, complex and uncertain situations. Hence, in the current tumultuous business environment, CEOs' tolerance of ambiguity rises as a major skill able to facilitate organizations' change initiatives (Huber and Glick, 1995). However, although it is widely accepted that such individual-level emotional/cognitive factors (e.g. readiness to change, change receptivity, tolerance of ambiguity/uncertainty, openness to change) may enhance individual performance (e.g. Amenakis et al., 1993; Cunningham et al., 2002; McNabb and Sepic, 1995; Weber and Weber, 2001); there is a little consensus in the academic and practitioner literature whether such factors can influence positively and directly firm performance.

In this respect, the main aim of this paper is firstly, to examine the influence of CEOs' personal traits, emotions and workplace attitudes in their tolerance of ambiguity; and secondly, to investigate the influence of CEOs' ambiguity tolerance in firms' performance. We chose CEOs because on the one hand, they are acknowledged as firms' major decision makers (Calori et al., 1994) and on the other hand, their personal characteristics are reflected to their firms' strategies (Hambrick and Mason, 1984). Moreover, empirical evidence suggest that characteristics of CEOs affect strategic decision processes (Peterson et al., 2003) and strategic actions that have implications for firm performance (Nadkarni and Narayanan, 2007). We tested our model in data on the CEOs of Greek ICT firms. The management style of Greek firms is rather centralized, authoritative and dominated mostly by one powerful individual (Bourantas and Papadakis, 1996; Morgan, 1994). Further, Greek ICT industry is an extremely important sector for the suffering Greek economy with extremely high change rates in terms of complexity, novelty and competition (EITO, 2011). Our results extend previous researches by highlighting how CEOs' personal and cognitive characteristics influence firm performance by either enhancing or

inhibiting their tolerance of ambiguity in a complex and dynamic industry context.

2. Theory Development and Hypotheses

2.1 Tolerance of ambiguity

Tolerance of ambiguity is generally defined as a range of reactions to stimuli that are considered unfamiliar, complex, uncertain, or subject to multiple interpretations (McLain, 1993). Further, Budner (1962) suggests that there are typically three types of ambiguous situations: *novelty* (completely new situations); *complexity* (excessively complex situations); and *insolubility* (opposing situations).

The way an individual interacts with ambiguous situations (e.g. perceive, interpret, react, adjust) ultimately defines one's tolerance of ambiguity level. As a result of multiple variables (e.g. perceptions, personality traits, emotions, values, attitudes), the ambiguity tolerance construct is complex (Benjamin et al., 1996). Nevertheless, ambiguity tolerance is a variable that is often examined on a unidimensional scale. A person with low ambiguity tolerance experiences stress, reacts prematurely, and avoids ambiguous stimuli. At the other extreme, a person with high ambiguity tolerance perceives ambiguous situations as desirable, challenging, interesting and accepts their complexity or incongruity (Kirton, 1981). On the whole, literature suggests that tolerance of ambiguity plays a significant role in individual performance (Cook and Hunsaker, 2001).

Numerous attempts have been made to examine the relationship between tolerance for ambiguity and a number of personal, emotional, behavioral and working attitudes. Generally, tolerance of ambiguity is correlated with job satisfaction (Nicolaidis and Katsaros, 2011), organizational commitment (Judge et al., 1999), creativity (Tegano, 1990), decision making (Wilkinson, 2006), critical thinking (Facione et al., 1994), risk acceptance (Lauriola and Levin, 2001), and effective leadership (Lane and Klenke, 2004). Overall, managers with high ambiguity tolerance may exhibit higher performance in new situations by approaching organizational initiatives positively (Sawyer, 1990).

2.2 CEOs' personality traits, emotions, attitudes and tolerance of ambiguity

The CEO literature suggests that personal, emotional and psychological attributes of CEOs influence their strategic decisions (Hiller and Hmabrick, 2005). In more detail, they determine how intensively they will search for information, how they learn about external environmental and internal organizational evolutions, and which sources they rely on to obtain and

disseminate information (Miller and Toulouse, 1986). Nevertheless, all of our behaviour is somewhat shaped by our perceptions, personalities, emotions and experiences (Langton and Robbins, 2006).

Locus of control: It is a personal trait that refers to an individual's perception of the source of his or her fate (Langton and Robbins, 2006). Individuals with an internal locus of control *(internals)* believe that they control their destinies and thus, they are more likely to deal with a problem, once they come across it, during their effort to achieve a goal. One the other hand, individuals with an external locus of control *(externals)* believe that their lives are controlled by outside forces (e.g. luck, chance, destiny) and thus, they sense they have little control over their life (Rotter, 1975). A large amount of research has compared internals with externals. Internals exhibit greater performance when the work requires complex information processing, self-motivation, initiative, independent action and offers incentive reward for greater productivity (Miner, 1992). In contrast, externals tend to be less satisfied and involved in their jobs, more stressed and anxious (Benassi et al., 1988); and reluctant to take risks and work on self-improvement (Rotter, 1975). Within this context, Mamlin et al. (2001) suggest that generally top executives appear to be more internals. Overall, internally focused CEOs devote more effort to environmental scanning by using a wide array of recourses (Finkelstein and Hambrick, 1996) and thus, they seem to be more flexible, adaptable and competent.

H1: CEO ambiguity tolerance is positively related to internal locus of control.

Emotional attitudes: Generally, no study of organizational behavior could be comprehensive without considering the role of emotions in workplace behavior (Langton and Robbins, 2006). Emotions are generally viewed as key mechanisms that preserve personal values in ambiguous situations and signal the need for change (Lazarus, 1991). In this respect, emotions may intermediate as an adaptive mechanism during change by empowering employees (Nicolaidis and Katsaros, 2010). Literature suggests that employees' emotions may affect the process of motivation and influence a number of performance and satisfaction variables such as, commitment, intention to quit and level of effort (Basch and Fisher, 2000). In more details, positive emotions in workplace may enhance inter-personal collaboration and flexibility (Fredrickson, 1998); facilitate em-ployees to set higher and more challenging personals goals (Locke and Latham, 1990); and thus, increase the level of ambiguity tolerance (Nicolaidis and Katsaros, 2011). Authors indicate that almost all

emotions can be examined along a number of bipolar and independent dimensions. Literature suggests that the three prevailing dimensions are namely, *pleasure, arousal* and *dominance - level of uncertainty* (e.g Russel and Mehrabian, 1974; Tiedens and Linton, 2001). *Pleasure* refers to a feeling that is felt to be different from preference, liking, positive reinforcement and approach avoidance (Bearden et al., 1993). Most important, it is associated with objectives' fulfillment (Lazarus, 1991) and may enhance individual's urge to think, explore and expand personal boundaries and creativity (Fredrickson, 1998). *Arousal* is a feeling state that varies along a single dimension from sleep to frantic (Bearden et al., 1993). As authors suggest, excessive arousal provoked by a high level of ambiguity may lead individuals to become reluctant to react (Liu and Perrewé, 2005) and initiate deterioration in cognitive performance (Kaufman, 1999). Thus, a moderate level of emotional arousal is likely to be associated with a high degree of ambiguity tolerance (Katsaros and Nicolaidis, 2012). *Dominance* refers to the extent to which one feels unrestricted or free to act in a variety of ways during complex and ambiguous situations (Bearden et al., 1993). It is positively related to job satisfaction, organizational commitment (Ashford and Bobko, 1989), trust and organizational leaders' credibility (Schweiger and Denisi, 1991). On the whole, the dominance factor is determined by the level of ambiguity that any complex change engulfs. The above analysis signifies that pleasure arousal and dominance may influence positively tolerance of ambiguity.

H2: CEO ambiguity tolerance is positively related to pleasure, arousal and dominance.

Emotional intelligence: Emotional intelligence (hereafter EI) refers to the ability of an individual to perceive, appraise, and express emotions; to access or generate feelings when they assist thinking; to understand emotions; and to adjust emotions to promote intellectual growth (Mayer and Salovey, 1997). Similarly, Goleman (1998a, p. 317) defines EI as "the capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships" and suggests that it may influence work and organizational effectiveness. Further, research suggests that employees with high levels of EI are more adaptable to stressful events by employing better coping strategies (Bar-On, 2001); exhibit greater interpersonal and social skills relating to interacting with and influencing others (Mumford, Marks et al., 2000), and thus, may lead more effectively (Higgs and Rowland, 2002). Overall, given that change uncertainty is frequently associated with emotional conflict (Downing,

1997) and that emotions play an important role during complex situations (Walsh, 1995); it is proposed that EI can contribute positively to the effective management of change ambiguity (Cooper, 1997; Goleman, 1998b).

H3: CEO ambiguity tolerance is positively related to emotional intelligence.

Job Satisfaction: Job Satisfaction emphasizes on the task environment where an employee performs his/her work and the direct reactions to specific tangible aspects of the working environment (Mowday et al., 1982). It is mainly defined as the emotional and cognitive attitude held by an employee about different aspects of his/her work (Wong et al., 1998). More to the point, research has identified a positive relationship between job satisfaction and ambiguity tolerance (Judge et al., 1999) and suggests that job satisfaction plays a critical role in employees' acceptance of change ambiguity (Iverson, 1996; Lau and Woodman, 1995). Respectively, Wanberg and Banas' study (2000) showed that low levels of change ambiguity tolerance were associated with decreased job satisfaction and stronger intentions to quit. Overall, job satisfaction may facilitate management's flexibility, adaptability and readiness to change. Therefore, it constitutes a significantly affecting factor of tolerance of ambiguity.

H4: CEO ambiguity tolerance is positively related to job satisfaction.

Organizational commitment: It is mainly examined in terms of workers' identification with the organizational goals (May et al., 2002, p. 776), and in terms of attachment and loyalty (Armstrong, 2001, p. 171). Generally, organizational commitment is defined as the relative strength of an individual's identification with and involvement in a particular organization (Mowday et al., 1979, p. 226). There is evidence that organizational commitment plays an important role in employee's acceptance of ambiguity in the workplace (Cordery et al., 1993; Iverson, 1996). Relatively, Lau and Woodman (1995) argue that highly committed employees are more willing to accept organizational change ambiguity if it is perceived to be useful. That is, an individual committed to an organization accepts its values, is willing to exert effort on its behalf, and wishes to remain in the organization (Mowday et al., 1979). However, they note that a highly committed employee may resist to change ambiguity if he/she perceives it as a threat for his/her own benefit or harmful to the organization. Concluding, every organizational change requires management's commitment since management's role is considered pre-eminent, essential and/or fundamental (Lascelles and Dale, 1990; Savolainen, 1998).

H5: CEO ambiguity tolerance is positively related to organizational commitment.

Involvement: It is an attitude towards the work role and its context (The Blackwell Encyclopedia of Management). It is mainly defined as the employee's willingness to support the organization even if additional time and effort are required (Madsen et al., 2005). Literature suggests that employees' involvement is a key component of organizational commitment (Eby et al., 2000; Madsen et al., 2005); relates to their cognitive support during the change process (Oswald et al., 1994); may promote personal readiness for change (Armenakis et al., 1993) and thus, enhance tolerance of ambiguity. Scholars suggest that involvement can be examined along a number of bipolar dimensions that can be viewed as independent one from the other (e.g. Peter and Olson, 2002). Relevantly, McQuarrie and Munson (1991) support that involvement, can be examined by two prevailing bipolar dimensions namely, *importance* and *interest*. *Importance* refers to an important event, decision or problem that has a big effect or influence on people's lives or on future incidents (Longman Dictionary of Contemporary English, 2003). Relatively, Curren and Harich (1994) suggest that when individuals perceive an ambiguous situation as relatively important, they will transfer their own perceived feelings to the relevant event (i.e. managers will exhibit high involvement towards a change initiative). *Interest* concerns the personal interest that a person has in an event. Relatively, when someone is interested in an ambiguous situation, he/she will exhibit greater commitment, identification and involvement during its evaluation (McQuarrie and Munson, 1991). The above analysis signifies that CEOs' involvement may facilitate ambiguous situations appraisal and tolerance.

H6: CEO ambiguity tolerance is positively related to importance and interest.

H7: The interaction of CEO s' demographical characteristics; personal locus of control; emotions of pleasure, arousal and dominance; emotional intelligence; attitudes of job satisfaction, organizational commitment, and involvement; affect their ambiguity tolerance.

2.3 CEO characteristics and firm performance

Firm performance is a complex issue in the organizational literature, given that it suffers from conceptual problems regarding its definition, validity and measurement (Murphy, 1996). Thus, any evaluation of firm's performance must focus on its operative goals. It should be also noted that the terms "effectiveness" and "performance" are used interchangeably because problems related to their definition, measurement and explanation are nearly identical (March and Sutton 1997).

According to the rational goal model, firm performance can be measured through quantitative data that reflect its profitability and efficiency (e.g. Kotter and Heskett, 1992). These measures are nonbiased and particularly helpful for single-industry studies because of the uniformity in measurement across all organizations (Venkatraman and Ramunujam, 1986). Further, researchers propose Return on Equity (ROE; Viverita, 2008), Return on Assets (ROA; Crosson et al., 2008), Net Profit Margin (Mueller, 1990); Efficiency Ratio (Needles et al., 2007) and Total Asset Turnover (Bodie et al., 2004) as common measures of firm performance. Overall, it should be noted that no single measure may fully clarify all aspects of the term (Doyle, 1994).

Within this context, quite a few studies have examined the relationship between individual characteristics and firm performance (e.g. age, education, experience, leadership practices, CEO personality; Fasci and Valdez, 1998; Frith, 1998; Ozcelik et al., 2008). Nevertheless, there is a little consensus about the influence of individual-level factors to organizational performance. Firstly, Argyris (1964) and McGregor (1960) proposed that the way employees experience their work would be reflected in organizational performance. In the same vain, others researchers propose that certain individual-level factors (e.g. job satisfaction, commitment, motivation, citizenship behavior; Brewer and Selden, 2000; Kim, 2005), locus of control (De Brabander and Van Witteloostuijn, 1996), employee involvement (Jones and Kato, 2003) may positively affect organizational performance. Further, change management literature suggests that with the acceleration of globalization and environmental dynamism, readiness to change (e.g. individual's attitude towards change) have a positive effect on firms' financial (i.e., profitability, costs) and organizational (i.e., efficiency, productivity) outcomes (Goldhar and Lei 1995; Li et al., 2005; Rudd et al., 2007; Tan and Peng, 2003). Similarly, it is proposed that CEOs' personal and cognitive attributes is a key indicator of firm flexibility (Rajagopalan and Spreitzer, 1997) and performance (Nadkarni and Herrmann, 2010). Overall, re-searchers claim that CEOs with high ambiguity/uncertainty tolerance may exhibit higher performance in new and complex situations (Jonassen and Grabowski, 1993; Sawyer, 1990); and in parallel, that their performance is a major determinant of the success of an organization (Fiedler, 1996; Thorlindsson, 1987). Thus, the following hypothesis arises:

H8: CEO ambiguity tolerance influences positively firm performance

3. Methods

3.1 Setting

The economy of Greece is the 32nd largest in the world by nominal gross domestic product (GDP) and the 15th largest in the 27-member European Union (Eurostat, 2012). However, decades of unrestrained spending, cheap lending, extremely bureaucracy and corruption, and failure to implement necessary financial and structural changes; left Greece heavily exposed when the global economic crisis begun in 2008-2009 (€330 billion national debt, 144.9% of GDP, 2010; €420 billion national debt, 198.2% of GDP, estimation for 2012). Thus, on 2 May 2010, E.E. and the International Monetary Fund (IMF) agreed on a €110 billion loan for Greece, dependent on the implementation of harsh austerity measures. Further, in October 2011, E.E. leaders agreed on a second €130 billion bailout loan, conditional not only the implementation of another harsh austerity package, but also that all private creditors should agree to a restructure of the Greek debt, reducing the debt from a forecasted 198% of GDP in 2012 to only 120.5% of GDP by 2020. The second deal was approved by all parties in February 2012, and became activated one month later, after the last condition about a successful debt restructure of all Greek government bonds, had been met. Within this context, if Greece can manage to comply with all economic targets outlined in the bailout plan, a full return to the private capital markets will be possible again in 2015.

Regarding, the Greek ICT industry, we can support that though it is still in its infancy compared to other EU countries, it plays a vital role in the Greek economy and exhibits relevant resistance to the Greek financial crisis. In more details, Greek ICT sector's turnover reached €11.09 billion in 2008, €10.40 billion in 2009 and €9.6 billion in 2010 respectively. However, Greece, among 138 countries, holds only the 64th position in the Networked Readiness Index (World Economic Forum, 2011). NRI index examines the conduciveness of national environments for ICT development and diffusion (i.e. broad business climate, regulatory aspects, human and hard infrastructure needed), the degree of preparation for and interest in using ICT in their daily activities and operations by the three main national stakeholders (i.e. individuals, business sector, and government), and the actual use of ICT by the above three stakeholders. Thus, Greece needs to reinforce their market environment (90th) and improve their stakeholders' overall readiness to use new technologies (91st), while increasingly moving ICT usage and diffusion to the center of the national agenda (108th). In any case, it should be noted that the intense financial and structural transformations in the Greek

economy; the upcoming technological changes (e.g. transition to all-digital networks, next generation networks); the emergence of new services [e.g. combination of broadband (wired or wireless), digitalization of media content, falling costs of producing digital content]; the changes in the current market structure (e.g. market developments and associated changes in industry structure, changing consumer and/or citizen engagement, globalisation of markets and regulation, national digital communications strategies; ICT Regulation Toolkit, 2011); can potentially cause intense uncertainty, great ambiguity, extreme insecurity, and painful organizational changes that may ultimately affect negatively Greek ICT firms' overall performance.

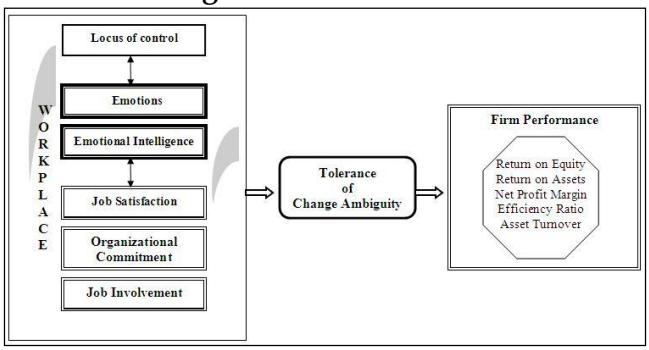
Finally, the international literature suggests that Greek culture is characterized by extremely high intolerance of uncertainty, ambiguity and complexity. Respectively, Hofstede (2001) research findings suggest, that within a sample of 56 nations, Greece has the highest uncertainty avoidance value (Greece: 112, nations mean average: 66,4). Uncertainty avoidance refers to a society's uncertainty and ambiguity tolerance; it ultimately refers to what extent its members feel either uncomfortable or comfortable in unstructured (unknown, surprising, different from usual) situations. Uncertainty avoiding societies are routine-oriented; adapt with difficulty to novel social and environmental evolutions and changes; and are less innovative (Shane, 1995). Similarly, other researches also support that high uncertainty avoidance (Adamides et al., 2003; Nicolaidis, 1992) and ambiguity intolerance (Nicolaidis and Katsaros, 2011) characterize the culture of Greek firms in terms of risk evasion and change avoidance. In the same vein, according to the WVS Cultural Map of the World (Inglehart and Welzel, 2010), Greece has the 69th highest Traditional/Secular-rational value among 253 nations (Greece: 0,77, nations mean average: -0.14). Traditional/Secular-rational value characterizes societies that emphasize the importance of authority, absolute standards, traditional family values; and in parallel, they value economic and physical security above all.

3.2 Purpose and Methodology

Taking into consideration the international literature, the current financial crisis that provokes increased ambiguity/uncertainty, the "*rigid*" national and business culture (norms and values), the importance of the ICT industry to the Greek economy, and the few relevant studies in Greece; the purpose of the research was to examine how CEOs' personal traits, emotions and attitudes form their tolerance of ambiguity; and subsequently, the

influence of CEOs' ambiguity tolerance in firms' performance.

Figure 1: Research model



The research was conducted, in close cooperation with the Greek Information Technology Firms Association, the second semester of 2010. The sample for this study was drawn from 480 ICT firms established in Greece. Overall, 256 CEOs participated to the research (response rate 53,33%). The first month we organized a relevant workshop to explain the rationale and significance of the research, along with its goals, supporting objectives and expected results. The next two months, we conducted a pilot test to examine the research features and functionality. In parallel, for the purpose of our research we created a relevant web page in order to receive data in electronic form. Consequently, we send a presentation of our research to all CEOs along with guidelines for the on line questionnaire. All through the research period, we provided full support (i.e. personal meetings, phone or e-mail) to the CEOs. In line with previous researches (e.g. Gullkvist, 2013; Hayashi, 2000; Katsaros et al., 2014; Tsirikas et al., 2012; Wooldridge, 2013), we used principal components analysis and ordinary least-squares regressions to explore the hypotheses of the paper. Table 1 summarizes the demographic characteristics of the participants in our research.

Table 1: Demographic characteristics of the sample

Managers			Firms		
	N	**Frequencies %**		**N**	**Frequencies %**
Sex			**Region**		
Male	190	74.2	East Macedonia/ Thrace	13	5.1
Female	66	25.8	Central Macedonia	102	39.8
Age			West Macedonia	5	2.0
18-24 years	9	3.5	Epirus	3	1.2
25-34 years	68	26.6	Thessaly	10	3.9
35-44 years	108	42.2	Ionian Islands	1	0.4
45 + years	71	27.7	West Greece	4	1.6
Marital Status			Central Greece	4	1.6
Married	173	67.6	Attica	89	34.8
Single	83	32.4	Peloponnese	3	1.2
Education			South Aegean	1	0.4
Secondary	20	7.80	Crete	4	1.6
University	131	51.2	Cyprus	16	6.3
Master	92	35.9	North Aegean	1	1.0
PhD	12	4.7	**Age**		
Other	1	0.4	1-5 years	50	19.5
Working experience (pr. position)			6- 10 years	50	19.5
1-5 years	90	35.3	11-15 years	62	24.3
6-10 years	68	26.7	16 + years	94	36.7
11+ years	97	38.0	**Employees**		
Total working experience			1-11	119	46.5
1-5 years	29	11.3	11-50	71	27.7
6-10 years	51	19.9	51-250	42	16.4
11+ years	176	68.8	250 +	24	9.4
Position			**Firm life circle**		
CEO	55	21.5	Initial	8	3.1
General Manager	39	15.2	Growth	149	58.2
Top-level Manager	162	64.3	Mature	87	34.0
			Decline	12	4.7
			Annual Turnover		
			€ <1 millions	113	44.1
			€ 1-10 millions	91	35.5
			€ 10-100 millions	33	12.9
			€ >100 millions	19	7.4

3.3 Measures

Regarding the tolerance of ambiguity measurement, we used the Tolerance-Intolerance of Ambiguity questionnaire developed by Budner (1962). The questionnaire includes 16 items and follows a scale from 0 to 100. A score between 44 and 48 is considered relevantly neutral, while scores below 44 indicate high tolerance to ambiguity and scores above 48 indicate a low one. Locus of control was examined through the well known questionnaire developed by Spector (1988). The questionnaire includes 16 semantic different items scored on a 1 to 6 scale. As far as the measurement of emotions in the workplace, we used the Dimensions of Emotions PAD questionnaire of Havlena and Holbrook (1986) (originally developed by Russel and Mehrabian, 1974). The PAD questionnaire is composed of 12 semantic different items scored on a +4 to –4 scale. There are three independent and bipolar dimensions namely, pleasure, arousal and dominance which valuate emotional attitudes. Emotional Intelligence was examined through the "What's your emotional intelligence at work?" questionnaire (Cook and Hunsaker, 2001). The questionnaire includes 25 semantic different items scored on a 1 to 5 scale; and it captures five independent and bipolar dimensions that evaluate EI namely, self-awareness, managing emotions, motivating oneself, empathy and handling relationships (Goleman, 1998a). For the measurement of job satisfaction, we used the 7-item scale Michigan Organizational Assessment Questionnaire developed by Cammann et al., (1979), which contains a three-item overall satisfaction subscale (Spector, 1997). Regarding the measurement of organizational commitment we used Organizational Commitment Questionnaire developed by Mowday et al., (1979) that is composed of 15 semantic different items, scored on a 1 to 7 scale. Finally, for the measurement of involvement, we used the McQuarrie and Munson's (1991) revised version of their Revised Personal Involvement Inventory (RPII). The questionnaire suggests that individual's involvement is based on the inherent needs, values and interests and it captures two independent and bipolar dimensions that appraise involvement namely, importance and interest (Bearden et al., 1993). Further, regarding the sample demographics and the control variables, we assessed three firms' (i.e. size, age, life circle) and three CEOs' (i.e. age, education, total working experience) characteristics respectively. Finally, firm performance was examined by five well established accounting-based measures namely, Return on Assets (ROA), Return on Equity (ROE), Net

Profit Margin, Efficiency Ratio and Total Asset Turnover (McDonald et al., 2008).

Table 2: Indicators of Organizational Effectiveness

Return on Equity (ROE)	Net Income/ Shareholder's Equity	It measures an organization's profitability by revealing how much profit a company generates with the money shareholders have invested.
Return on Assets (ROA)	Net Income/ Total Assets	It measures how profitable an organization is with respect to its total assets; how efficient management is at using its assets to generate earnings.
Net Profit Margin	Net Income/ Revenues	It measures how much out of every euro/dollar of sales an organization actually keeps in earnings.
Efficiency Ratio	Expenses/ Revenues	It measures expenses as a percentage of revenue and analyzes how well an organization uses its assets and liabilities internally.
Asset Turnover	Revenues/ Total Assets	It measures the amount of sales generated for every euro/dollar's worth of assets.

4. Analyses and results

We measure firms' performance using a three year average return (2008-2010) rather than a return for a specific year (2010). We believe this provides a better measure of their ongoing performance because it helps to reduce short-term fluctuations due to temporary external and/or internal events. Firms' balance sheet analysis revealed the severe financial reality that ICT firms experience in the current turbulent Greek economic environment.

Table 3: Indicators of Organizational Effectiveness (2008-2010) – ICT industry

	ROE (%)	ROA (%)	Net Profit Margin (%)	Efficiency Ratio	Asset Turnover
Mean	31.85	6.195	1.73	0.94	1.11
SD	84.55	11.50	28.86	0.20	1.00
Min	-152.0	-25.33	-170.33	0.51	0.09
Max	422.66	56.33	41.66	1.97	5.55
Mean values (2008-2010)					

The descriptive statistical results revealed that the tolerance of ambiguity index value is equal to 58,05 (sd:8,27). Thus, they reveal CEOs' intolerance of uncertainty and ambiguity in their business environment. Further, their locus of control degree is 4,17 (sd:0,52); hence, they consider that the future depends more on their own behaviour and actions, rather than luck or chance. Furthermore, CEOs' exhibit significant job satisfaction (mean: 5,85, sd: 0,85) and moderate organizational commitment (mean: 3,41, sd: 0,53). Table 4 summarizes the descriptive statistical results.

Table 4: Descriptive Statistical Results

Index	Mean	SD	Scale	Coefficient Alpha Reliabilities	Managers
Tolerance Of Ambiguity	58.05	8.27	100 - 0	0.81	Low ambiguity tolerance
Locus Of Control	4.17	0.52	1 - 6	0.78	Internal orientation
Job Satisfaction	5.85	0.85	1 - 7	0.77	Sufficiently satisfied
Organizational Commitment	3.71	0.53	1 - 7	0.79	Moderately committed

The first principal component analysis results revealed three factors that constitute CEOs' emotions in the workplace. The three factors have eigenvalues greater than 1 and account for 70,70% of the total variance. These factors are (i) *pleasure* (variance 47,91%), (ii) *dominance* (variance 11,96%), and (iii) *arousal* (variance 10,83%). High reliability

also characterizes the three factors. The Crobach coefficient alpha is 0,94, for the *pleasure* factor, 0,87 for the *dominance* factor and 0,67 for the *arousal* factor (moderate but acceptable level a>0,6 – see: Robinson et al., 1991; Kerlinger and Lee, 2000). On the whole, CEOs' emotions are vaguely positive. The factor of *pleasure* , on a -4 to +4 scale, has a value equal to 0,79(sd:2,00); the factor of *dominance* has a value equal to 0,72 (sd:1,85);and the factor of *arousal* has a value equal to 1,24 (sd:1,30). Finally, the correlations among the three factors are in general medium to low degree (0,420**< r <0,569**, **p<.01).

Table 5: Emotions - Factor Analysis Results

Questions	I. Pleasure	II. Dominance	III. Arousal
EQ1	.903		
EQ2	.900		
EQ4	.847		
EQ3	.833		
EQ11		.864	
EQ12		.845	
EQ10		.784	
EQ9		.675	
EQ8			.689
EQ7			.678
EQ5			.632
EQ6			.595
Eigenvalue	5.749	1.436	1.299
% Variance	47.91	11.96	10.83
Cronbach α	0.942	0.868	0.667
Mean and SD	0.79+2.00	0.72+1.85	1.24+1.30

The second principal component analysis results revealed two factors that describe CEOs' job involvement: (i) *importance* (variance 43,17%), and (ii) *interest* (variance 18,33%). The two factors had eigenvalues greater than 1 and accounted for 61,50% of the total variance. Further, high reliability characterizes the two factors. The Crobach coefficient alpha is 0,82 for the *importance* factor and 0,83 for the *interest* factor. On the whole, CEOs' involvement factors are considerably positive. The factor of *importance*, on a 1 to 6 scale, has a value equal to 5,85 (sd:0,85) and the factor of *interest* has a value equal to 4,89 (sd:1,08). Finally, the correlations among the two factors are in general

medium to low degree (r <0,428**, **p<.01).

Table 6: Involvement - Factor Analysis Results

Questions	I. Importance	II. Interest
IQ1	.826	
IQ2	.786	
IQ3	.771	
IQ6	.704	
IQ10	.653	
IQ7		.877
IQ8		.791
IQ4		.720
IQ5		.698
IQ9		.666
Eigenvalue	4.317	1.833
% Variance	43.17	18.33
Cronbach α	0.824	0.833
Mean and SD	5.85±0.85	4.89±1.08

Emotions - Factor Analysis Results. The third principal component analysis results revealed one mixed factor that describe CEOs' emotional intelligence, namely empathy/ handling relationships (variance 25,83%; questions 20,15,14,25,19,24). The Crobach coefficient alpha is 0,80 and the mean value, on a 1 to 5 scale, is equal to 3,85 (sd:0,62).

4.1 Hypothesis testing

We run ordinary least-squares (OLS) regressions in order to investigate the relationships between CEOs' personal traits, emotions, attitudes and tolerance of ambiguity (hereafter ToA); and subsequently, the influence of CEOs' ambiguity tolerance in firms' performance.

Locus of control emerged as significant predictor of ToA *(H1)*. That is, CEOs with internal locus of control exhibit significant tolerance towards ambiguity in their working environment (b= -3.325**, p<.01). Further, only one emotional dimension, the arousal factor emerged as a significant predictor of ToA *(H2)*. CEOs with high level of arousal appear to have increased level of ambiguity tolerance in their working environment (b= -0.894*, p<.05). Similarly, regarding CEOs' involvement, only the importance factor emerged as a significant predictor of ToA *(H5)*. CEOs with high level of importance appear to have increased level of ambiguity

tolerance in their working environment (b= -1.742**, p<.01).

In contrast, job satisfaction *(H3)*, organizational commitment *(H4)* and emotional intelligence (i.e. empathy/handling relationships factor) *(H6)* didn't emerge as a significant predictors of CEOs' ToA.

Regarding the hypothesis 7, one personality trait (i.e. locus of control), one E.I. characteristic (i.e. empathy/handling relationships), two attitudes (i.e. importance and interest) and three demographical characteristics (i.e. education, total working experience 6-10 and 11+) emerged as significant predictors of CEOs' ToA *(H7)*. Hence, with respect to *H5* and *H6*, the interaction of the above factors '*energizes*' the empathy/handling relationships and interest factors, which in turn, seem to influence CEOs' ambiguity tolerance. Further, three demographic characteristics emerge as significant predictors of ToA. CEOs with total working experience more than 6 years and university education tend to have lower ToA.

Table 7: Regression Analysis Results (H1-7)

	Dependent Var.: ToA						
Variables	*H1*	*H2*	*H3*	*H4*	*H5*	*H6*	*H7*
(Constant)	71.931	55.328	56,520	59,159	68.245	59,159	75.816
Predictors							
Locus of Control	-3.325**						-3.383**
Pleasure		(-,116)					
Arousal		-.894*					
Dominance		(-,360)					
Job Satisfaction			,262				
Commitment				-,226			
Importance					-1.742**		-2.553**
Interest							1.399*
Empathy/handling relationships						,228	.376*
Controls							
Firm Size							(1.233)
Firm Age							(0.655)
Firm life circle							(1.598)
CEO Age							(2.653)
CEO Education - University							3.238*
CEO Education – (Master and Phd)							(-2.653)
CEO Total working experience 6-10							6.374**

CEO Total working experience 11+							6.953*
F	10.069**	4.442*	.160	.047	7.291**	1.607	2.110**
N	223	223	223	223	223	223	221
R^2	.043	.020	.001	0.00	.032	0.07	0.284
*Standard errors are in parentheses (significance levels: *p<.05, **p<.01)*							

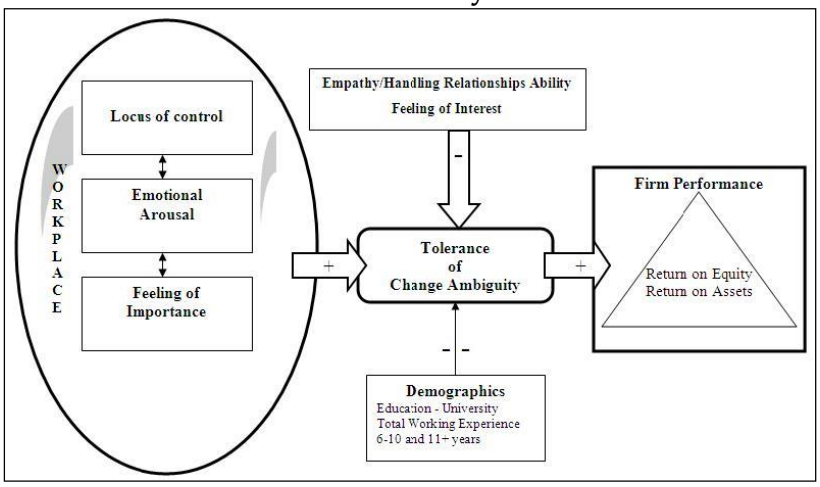
Finally, CEO ToA appears as a significant predictor of firm performance (ROE and ROA indicators; *H8*). Thus, CEOs with high level of ToA seem to be more efficient at using organizational equity and assets to generate earnings as well as to increase their firms' performance (ROE, b= -0.30*. p<.05*; ROA. b= -0.31**. p<.01**).

Table 8: Regression Analysis Results (H8)

			ToA		
Dependent Var.:	*H1*	*H2*	*H3*	*H4*	*H5*
(Constant)	58.616	59.553	57.754	48.043	59.340
RoE	-.300*				
RoA		-.305**			
Net Profit Margin			(-.063)		
Efficiency Ratio				(10.221)	
Asset Turnover					(-1.538)
F	4.526*	8.956**	2.185	2.655	1.549
N	221	221	221	221	221
R^2	0.07	0.13	0.035	0.043	0.025
*Standard errors are in parentheses (significance levels: *p<.05, **p<.01)*					

Figure 2 illustrates the factors that affect CEOs' tolerance of ambiguity in the Greek ICT industry and in parallel, the influence of CEOs' ambiguity tolerance in firms' performance (ROA and ROE indicators).

Figure 2: CEOs' characteristics and firm performance in the Greek ICT industry



5. Conclusions and Suggestions for Further Research

The present research provides empirical evidence that CEO tolerance of ambiguity may influence positively firm performance (Return on Assets and Return on Equity). In the same vain, it is claimed that CEOs of Greek ICT firms have moderate to low tolerance of ambiguity (hereafter ToA) in their working environment (ToA=58,05; sd:8,27). As it was aforementioned, a possible cause may be the rather inflexible national and business culture (norms and values). However, taking into account the dynamic nature of ICT environment, we may assume that the interpretation of the results is unsatisfactory and disconcerting. Thus, Greek ICT firms should to try to increase their CEOs' ToA.

The research findings, likewise Mamlin et al. (2001) revealed that CEOs have internal locus of control (hereafter ILoC) and also, a positive relationship between their ILoC and ToA. This provides further support to the international literature, which suggests that ILoC, may enhance performance in ambiguous situations (Begley and Boyd, 1987; Miner, 1992), flexibility and readiness to change (Benassi et al., 1988). Thus, with respect to Nicolaidis and Michalopoulos' (2004) study, we suggest that personal control (one of the five core dimensions of empowerment; Whetten and Cameron, 1995) may facilitate Greek banks administrations to increase their CEOs' ILoC. This could happen by applying a mix of the following three main practices: a) *fostering personal mastery experiences* that may help CEOs to master experience over ambiguous challenges, problems or difficulties, b) *providing resources* that

refers to technical and administrative support to CEOs, and c) *organizing teams* that refers to CEOs' participation in teams to accomplish things beyond their personal abilities (i.e. share information, knowledge diffusion, formulation and choice of solutions which they can either implement personally or in co-operation with others).

Further, statistical results indicate that the factor of importance is positively related to CEOs' ToA. Respectively, theoretical and empirical studies suggest that it is impossible to influence ones' perception or attitude if he/she considers it as relevantly unimportant (e.g. Curren and Harich, 1994; Hague and Flick, 1989). Consequently, we argue, that Greek ICT administrations should try to influence their CEOs' feeling of importance, by employing a collaboration/participation management style (Johnson and Scholes, 2002) that may a) enable CEOs to act as a bond between senior management and employees during ambiguous situations by playing a variety of roles (e.g. role model, mentor, translator, instigator, guardian; Floyd and Wooldrige, 1994), b) employ job enrichment practices to augment CEOs' work incentives, feelings of significance and ultimately, raise their responsibilities and their abilities to evaluate ambiguity in their working environment. (Hackman and Oldman, 1980), and c) establish formal processes of involvement development (e.g. reassuring, giving feedback, reducing close supervision, provoking compatibility between their values and organizational goals; Whetten and Cameron, 1995).

The paper suggests that CEOs' tolerance of ambiguity can be further increased if their emotional arousal can be influenced. Consequently, according to the physiological and developmental theories of emotion, Greek ICT administrations should try to influence positively their CEOs' emotional experiences towards the change process by a) shortening the period of time they need in order to adjust emotionally and cognitively, b) controlling the level of their emotional arousal to a certain point, especially during the initial stages of change when extreme uncertainty is experienced, and c) facilitating them to comprehend the overall necessity of the proposed change (e.g. what if scenarios, current competition, early communication of intentions, future vision; Nicolaidis and Katsaros, 2011).

Additionally, our research has revealed a negative relationship between CEOs' ToA and their empathy/handling relationships skill in the workplace as well as, their interest. As literature suggests, highly committed employees with positive emotions towards their current jobs may face change ambiguity and uncertainty negatively if they

perceive them as a threat for their own benefit or harmful to the organization (Mowday et al., 1979; Vakola and Nikolaou, 2005). Consequently, we argue, that ICT firms should try to influence their CEOs' cognitive and emotional attitudes by delivering the right "message" to them (Armenakis et al., 1999). This "message" may address CEOs' tolerance of ambiguity by emphasizing on changes' necessity, suitability and effective outcomes for them and the whole organization; as well as by concurrently noting their continuous support to face it effectively.

Finally, certain aspects of the results presented here should be interpreted in light of their limitations. There are no such earlier studies in order to evaluate the research findings through time. Respectively, since the data were collected through the use of a single survey at a single point in time, the results may be influenced by temporal and/or distinctive and/or unique settings. Additionally, the fact that Greek CEOs were surveyed and that the research was conducted in a single country may to some extent limit the applicability of the results to other contexts. Nonetheless, it should be noted that further investigation needs to be conducted for the Greek ICT industry, by examining concurrently other important perceptual, emotional and attitudinal moderators (e.g. stress, risk-taking, self-motivation, emotional intelligence, organizational citizenship, trust, self-efficacy, and readiness to change).

On the whole, this study has provided empirical evidence of a positive relationship between CEO tolerance of ambiguity and firm performance in Greek ICT industry. Further, the research findings confirm the importance of CEOs' perceptions, personality traits, emotions, attitudes and values in the workplace and they suggest that Greek ICT firms should focus on establishing positive, encouraging working climates and display greater concern for the role of their CEOs' emotional/cognitive characteristics during uncertain situations.

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Does Trade Tariff Liberalisation Matter for Intra-ECOWAS Trade?

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Abstract

Purpose *– The purpose of this paper is to examine the relationship between trade liberalisation and intra-regional trade in some selected ECOWAS member countries, with particular focus on the role of applied and most favoured nation import tariffs.*
Design/methodology/approach – *Data utilized were sourced from the World Bank's World Development and Governance Indicators, Mayer and Zignago (2006) distance index as well as the World Trade Organisation's World Integrated Trade System (WiTs). The sample period consists of 8 countries covering the years 1998 to 2011. Predicated on a gravity framework, system and difference generalised method of moments dynamic panel data estimators were relied upon.*
Findings *– The empirical results showed that trade liberalisation has contributed to intra-regional trade in the West African sub-region. The potency of trade liberalisation was relatively more pronounced through the use of most favoured nation import tariff compared to applied import tariff rates. Our results also showed that improved institutional quality and infrastructure are associated with higher intra-ECOWAS trade. Furthermore, using alternative measures of institutional quality and infrastructure as well as fixed and random effect estimators validated our findings.*
Research limitations/implications *– Data limitations led to the inclusion of only 8 out of the 15 ECOWAS member countries in the sample. The research was also limited to tariff barriers as measure of trade liberalisation. The same methodology can be applied as data becomes available while a consideration of non-tariff barriers could provide more insights on the dynamics of intra-ECOWAS trade.*
Originality/value *– The findings reinforce the notion that removal of trade restrictions particularly in the manufacturing sector, good governance and infrastructural developments enhance trade amongst ECOWAS countries.*

Keywords: Intra-ECOWAS trade, trade liberalisation, import tariffs, difference GMM and system GMM
JEL Classification: F13, F15, C3

1. Introduction

The Economic Community of West African States (ECOWAS) accord in 1975 led to the formal emergence of a regional body- ECOWAS- currently made up of 15 member countries: Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo[1]. In 1993, the ECOWAS Treaty was revised to speed up the integration process and to establish an economic and monetary union with a view to boosting economic growth and development in Africa (Diop et al., 2008). The thrust of this revision were: complete removal of customs duties and other non-tariff barriers on intra-ECOWAS trade, regional trade liberalisation through the setting up a CET, integrating economic and financial policies as well as the launch of a single monetary zone.

Intra-ECOWAS trade flows have remained low despite significant deployment of policy prescriptions towards a common monetary and economic union[2]. Existing evidence suggest that intra-ECOWAS trade has continued to increase albeit slight fluctuations over the years. In 1980, intra-regional export as a percentage of total exports was 10.1%, increasing to 10.7% by 1998 and declined thereafter to 9.6% in 2001 and increased marginally to 12.0% in 2010 (WDI, 2010). The prospect for significant trade amongst ECOWAS member countries has been constrained by amongst others, parallel or non-complementary production structures across member countries (Chete and Adewuyi, 2012). In addition, the question as to whether trade agreements such as the ECOWAS Common External Tariffs (CETs) within the broad-based ECOWAS Trade Liberalisation Scheme (ETLS) embarked upon are drivers of accelerated growth and enhanced regional cooperation amongst West African countries.

The benefits of intra-regional trade include: (i) enlarged regional markets which provide incentives for private cross-border and foreign direct investments flows, especially for large-scale investments in manufacturing and service projects which are subject to economies of scale; (ii) expanded intra-ECOWAS trade should generate faster growth and income convergence particular

[1]Eight ECOWAS member countries- Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal and Togo- formed the West African Economic and Monetary Union (WAEMU otherwise known as UEMOA) whereas Liberia, Sierra Leone, Guinea and Cote d'Ivoire forged an economic alliance under the Manu River Union (MRU).

[2] These include the Common External Tariffs (CETs), ECOWAS Trade Liberalisation Scheme (ETLS), Free movement of persons, common infrastructural development, right of residence and establishment, common currency amongst others.

within the context of attaining and sustaining the ECOWAS convergence criteria[3]. It is against this background that West African economies are, especially in the 21st century, fast embracing intra-regional trade and using it as a tool for development; with the hope that this will ultimately not only foster mutual socio-economic, political, security and cultural cooperation but obviate the long-term dependence of West African countries on developed markets.

A key element of the union, ECOWAS Trade Liberalisation Scheme (ETLS), is an incentive geared at gradual to complete removal of trade restrictions amongst member countries. This is expected to, through trade induced market opportunities; foster regional economic development which in turn generates employment of more labour and capital to meet regional market needs. However, existing evidence suggests that the ECOWAS trade liberalisation scheme has been marked by the unwillingness of many countries to implement its provisions relating to elimination of tariff and non-tariff barriers to trade and the functioning of a compensation mechanism (Ajayi, 2005). Nonetheless, intra-ECOWAS trade has increased marginally within the ECOWAS sub-region as indicated by the trend in intra-ECOWAS trade as a percentage of total trade[4].

A contributory factor to this trend is the adoption the ECOWAS CET towards the second half of the last decade aimed at creating a common market. The ECOWAS-CET composed of four tariff bands- 0 (essential social goods), 5% (goods of primary necessity, raw materials and specific inputs), 10% (intermediate goods) and 20% (final consumption goods). A two-year transition period was slated to finalise the ECOWAS CET framework, while full adoption was expected by the end of 2011 (Revised Treaty, ECOWAS Executive Secretariat, Abuja, Article 3). Largely, some progress has been recorded in the reduction of external tariffs in West Africa, with tariff rates in mostly all the ECOWAS countries compressed. For instance, Ghana which recorded an average tariff rate of 40.0 per cent on manufactured products now records a low tariff rate of 8.9 per cent in 2000. Likewise Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal

[3]ECOWAS convergence criteria are: Primary criteria- (i) Budget deficit/GDP ratio=4%, (ii) Inflation rate = 5%, (iii) Ceiling on central bank financing of budget deficit/previous years' tax revenue=10% and, (iv) Gross external reserves = 6 months of import cover. Secondary criteria- (i) Domestic arrears, (ii) Tax revenue/GDP ratio = ≥ 20%, (iii) Wage bill/Tax revenue = ≤35%, (iv) Public investment/Tax revenue = ≥20%, (v) Positive real interest rates and, (vi) Real exchange rate stability = ± 5%.

[4] It increased from 3.1% in 1970 to 10.6% and 8.9% in 1990 before trending up to 11.1%, 10.1% and 12.2% in 1998, 2003 and 2009, respectively.

and Togo currently have simple average import tariffs of 12% within the range of 0-20% (Oyejide, 2004).

In order to boost intra-ECOWAS trade performance, several measures have been adopted to reduce anti-export bias. At the same time eliminating trade restrictions as well as significant reduction and/or total elimination of export taxes in most ECOWAS countries as enshrined in the Uruguay rounds of negotiations which led to the 1995 General Agreement on Tariffs and Trade (GATT), and subsequent World Trade Organisation (WTO) have been significant given its consequent trade-expansion effect. Table 1 in the appendix clearly shows that intra-ECOWAS trade is clearly dominated by Nigeria, Ghana, Côte d'Ivoire and Senegal. Sierra Leone, Guinea and Gambia have the smallest share of export flow across the sub-region.

A number of constraints have been identified as hampering the expected intra-ECOWAS trade expansion effect of the trade liberalisation (ECOWAS CET). Prominent among them is the notion that some countries belong to more than one regional arrangement, language barrier, divergences in macro-economic fundamentals of member countries, weak institutions, poor governance and infrastructure amongst other. Notably, a careful inspection of the data reveals that the increases recorded in intra-ECOWAS trade coincided with efforts at promoting trade liberalisation through the reduction and removal of tariff and non-tariff barriers to trade in the sub-region. In addition, anecdotal argument suggests that there is huge potential for intra-regional trade and investment in the sub-region which could in turn stimulate regional output growth.

Several determinants of intra-regional trade have been established in the literature. These range from economic variables, such as differences in factor endowments and complementarities in trade structures, to policy variables such as tariffs and non-tariff barriers (NTBs). Other aspects such as geographical location may serve as a natural non-tariff barrier to accessing particular markets, but like other market failures may be overcome through effective and targeted government intervention (Cali, 2009). In addition to border barriers, other constraints that increase the transaction costs of trade transport and fixed-line telephone services which are limited, unreliable with notoriously high charges especially for international calls (Hatzenberg, 2010, p. 3). Information is essential to facilitate efficient market outcomes; lack of readily available information at reasonable cost will hamper market efficiency as a result of high transaction costs (*ibid.*). At the same time, the rule of law remains a critical component of government's role in regional integration. While non-tariff

measures such as institutional quality, good governance and infrastructure are perceived to be important constraints to trade in the West African sub-region, limited attempts have been made to systematically quantify their actual impact on intra-ECOWAS trade.

The outcome of trade policy harmonisation amidst adequate provisions for critical non-tariff measures in the West African sub-region is expected to have far reaching effects on the resulting patterns and dynamics of intra-ECOWAS. The primary objective of this paper, therefore, is to examine the implications of the ECOWAS trade liberalisation scheme for intra-ECOWAS trade. In addition, the study seeks to identify some of the major obstacles to trade between countries within the West African sub-region. This is crucial, if appropriate policy measures towards increasing intra-ECOWAS trade flows and attaining a common monetary and customs union.

The rest of this paper is organised as follows: the next section contains a review of the literature, while section 3 presents the data, model specification and methodology. The results of empirical analysis and robustness checks are presented in section 4 while Section 5 concludes.

2. Literature Review

This section briefly provides an outline of the studies conducted on and related to the effects of trade liberalisation on intra-regional trade with particular attention to West Africa. We first elucidate the analytical connection between trade liberalisation and intra-regional trade following which a review of empirical results is presented.

2.1 Trade Liberalisation and Intra-Regional Trade: Theoretical Review

The connection between trade liberalisation and intra-regional trade can be traced to the literature on regional integration attributable to the work of Viner (1950), who suggested that the effects of regional integration on trade can be either trade creating or trade diverting. While latter provides ample opportunities for efficient producers in the region to expand production (and benefit from economies of scale) to the advantage of consumers and the detriment of less competitive producers; the former occurs when the removal of tariffs within the region leads to goods hitherto imported from cheaper sources being replaced by more expensive suppliers within the region which can be sold for less because they no longer have to pay any import duty.

Analysis of the volume and composition of international exchange have predated the development of the monopolistic competition model of trade (Bowen, Hollander and Viaene, 1998). The gravity model can be traced to the 1950s. The model primarily relates bilateral trade to countries' incomes,

population and distance from each other, and has succeeded in accounting for variances of bilateral trade flows. The theoretical linkage between trade liberalisation and intra-regional trade can be predicated on the gravity model rooted in Newton's law of gravitational force between two objects. The model astutely provides an exposition of the linkage between volume of trade, capital flows and migration (Ogunkola, 1998; Zannou, 2010). It relates intra-regional trade between countries as a function of GDP, population and distance. Although some of the early applications of the model were not grounded in theory, subsequent researches have strengthened its theoretical foundation (Serlenga and Shin, 2013).

Regional Trade Agreements (RTAs) is important for trade creation and formation of a custom union. An important outcome of RTAs, through trade liberalisation, is to enable more efficient producers in a region to expand output via economies of scale to the advantage of consumers and the detriment of less competitive producers (Keane, Cali and Kennan, 2010). These gains are only feasible should trade restrictions be removed and harmonised. This would entail the complementarities of strong institutions, good governance, adequate infrastructure and integrating tariffs and non-tariff barriers in a bid to increase intra-regional trade flows[5]. Keane et al. (2010) identified other important determinants of intra-regional trade to include hard infrastructure like roads, energy, information communication technology and the physical networks required to support trade, as well as soft infrastructure such as institutions, related to the governance of trade (ibid.)[6].

The standard framework for the analysis of the direction of trade and, more specifically, of the potential and realised trade flows, involves the application of the gravity model (See Babatunde, 2006; Ajayi, 2005; Ogunkola, 2006; Ok, 2010; Adam, 2012; Ravi 2013). The gravity model has proven to be the most accurate tool for the explanation and prediction of bilateral trade flows (Freinkman, et al 2004) and is analytically convenient and easy to augment with the so-called emerging determinants. The theoretical foundations of the gravity model gave rise to models rooted in the spirit of Heckscher-Ohlin model

[5] This includes the development of regional NTMs to increase intra-regional trade flows, such as harmonised standards to facilitate trade, as well as Rules of Origin (RoO) which are required to avoid trade deflection (Keane et al., 2010).

[6] This may for instance be viewed from the need for requisite infrastructure being available for trade flows between landlocked and exporting countries within the same region.

(Deardorff 1997) and differentiated product-monopolistic competition (DPMC) model (Helpman and Krugman, 1985; Helpman, 1987). Because trade in differentiated products pertains primarily to trade in manufactures, this model describes only manufactured trade flows.

A vast pool of literature assessing the potential impact of trade liberalisation on intra-regional trade has been predicated on neoclassical trade models. The gains from increased trade arise from countries being able to pursue comparative advantage based on having different factor endowments (as in the Heckscher-Ohlin model). New trade theory not only considers neoclassical market structures to incorporate features such as increasing returns, imperfect competition, technology transfers, trade externalities, but dynamic effects as well. This includes links between trade liberalisation, total factor productivity growth, and capital stock accumulation.

Further extensions of the neoclassical models are the factor price equalisation and specific factor model. Notably, analysis these models suggest that trade liberalisation leads to welfare improvement but the gains are quite small considering the experience of countries which shifted to open development strategies (Robinson and Thierfelder, 2002). New trade theory not only considers neoclassical market structures but incorporates increasing returns, imperfect competition, technology transfers, trade externalities, and dynamic effects as well. This includes links between trade liberalisation, total factor productivity growth, and capital stock accumulation.

Empirical studies of intra-regional trade in ECOWAS incorporating elements of new trade theory with the gravity model invariably find that trade creation greatly dominates trade diversion and, usually, there is no trade diversion at all since the increased growth of RTA members leads to expanded trade both within the RTA and between member countries and the rest of the world (Babatunde, 2006). Yet, these models have failed to account for important elements that support regional trade liberalisation such as institutional quality and infrastructure.

2.2 The Empirical Outcomes

While there exist an extensive empirical literature that examines the determinants of intra-ECOWAS trade and its linkages to investment flows, studies explicitly dealing with the relationship between trade liberalisation and intra-ECOWAS trade is scanty. A strand of the literature examining the RTAs and intra-regional trade within African regional groupings and related issues include studies by Ogunkola, 1998; Oyejide, 2004; Carrere, 2004; Keane et al., 2010; Agbodji, 2008, amongst others. Others have examined the importance and/or role of

infrastructure within the context of regional integration and overall economic development (Ndulu, 2006; Mbekeani, 2010; Calderon and Serveen, 2010; Ajakaiye and Ncube, 2010). These studies have stressed the critical role of infrastructural development towards boosting intra-regional trade and development.

Many of the recognised constraints to intra-ECOWAS trade are on the supply side of economic activity and this includes poor governance, weak institutions and infrastructure deficit amongst others undermine production capacity. The most important NTBs hindering regional trade in the East and Southern African region include custom procedures and administrative requirements, technical standards and lack of physical infrastructure and this increases the cost of intra-regional trade (Hatzenberg, 2011; Viljoen, 2011). The importance of rule of law cannot be downplayed as the World Bank (2011) argued that well functioning judicial systems and courts help businesses expand their networks and markets. The World Economic Forum of 2010 noted that some of the constraints for doing business in West Africa include access to finance, corruption, weak and burdensome tax laws as well as infrastructure deficit.

Ogunkola (1998) investigated the potential benefits of trade liberalisation to West African via increased intra-regional trade flows using a gravity model. The findings showed that the effects of ECOWAS trade liberalisation on intra-regional trade flows have been minimal and this may be party explained by the absence of institutions and governance which play a vital role towards trade liberalisation efforts. As noted by Keane et al (2010), non-tariff barriers are impediments to intra-SADC trade. Meyer (2010) noted that technical barriers to trade are not an important issue in regional trade agreements in Sub-Saharan Africa while Zannou (2010) highlights depreciation of exchange rates and openness of economies as important determinants of intra-ECOWAS trade.

Ok (2010) in an assessment of intra-EU trade using the gravity model revealed that these income, competitiveness and distance were significant factors in explaining intra-EU trade. Anderson (2010) carried out a comprehensive review of empirical applications of the gravity model and concluded that more accurate estimations and interpretation of spatial relations based on the gravity model have emerged. Ravi (2013) found that intra-regional trade in the Gulf Cooperation Council (GCC) is still at a modest level, where the trade intensity exhibited negative signals. This suggests that the GCC is yet to achieve a high level of intra-regional trade, primarily due to high oil revenue inflows.

Adam (2012) in an evaluation of intra-ECOWAS trade concluded that the potential for trade amongst West African countries was enormous if regional integration efforts are deepened and the costs arising there from are minimised. This is particularly imperative in regional arrangements characterized by socio-economic diversities of member countries. In this regard, Ackah et al., (2013) tried to measure the associated trade cost for ECOWAS countries and infer their impact on trade flows within the region. Several other studies have considered such associated cost in the context of intra-regional trade (see, Banik and Yoonus, 2012; Chete and Adewuyi, 2012; Serlenga and Shin, 2013).

The outcome of the review suggests the need for applying relatively more advanced estimators as well as addressing growing concerns for trade liberalisation, infrastructure, institutions and governance in this crucial nexus. Moreover, these issues in the context of ECOWAS sub-region are scarcely pursued. Evidently, the focus has been on validating the gravity model without adequate attention to certain variables that may in fact reverse the nature and/or magnitude of the observed relationship. Given current developments such as the recently concluded EPA consultations between ECOWAS and the European Union which saw ECOWAS withdrawing from the agreement, it has become important to seek alternative agreements particularly given the fact that opening European markets to ECOWAS exports was at the heart of the multilateral discussions. This study is an attempt to contribute to the debate on intra-regional trade in ECOWAS.

3. Data, Model Specification and Methodology

3.1 Data

Our sample consists of 8 countries and they are Benin, Cote d'Ivoire, Gambia, Ghana, Nigeria, Senegal, Sierra Leone and Togowhile data utilised is between 1998 and 2011 (see Table 2 in the Appendix for a detailed description, measurement and sources of the variables utilised)[7]. The summary statistics and correlation analysis for selected ECOWAS are presented in Tables 1 and 2. The average value of intra-ECOWAS trade (intra) is about $21 billion, indicating reinforcing anecdotal evidence suggesting persistent increase in intra-ECOWAS trade over the years. The average distance is 370.9 km while the average real exchange rate of the ECOWAS was 628.5 to $1. The average number of fixed and mobile phone users per 100

[7] The countries included in the analysis are Benin, Cote d'Ivoire, Gambia, Ghana, Nigeria, Senegal, Sierra Leone and Togo. The other ECOWAS countries were excluded due to insufficient data on disaggregated most favoured nation and applied import tariff rates obtained from the World Integrated Trade System (WiTs).

inhabitants is 1.46 while that of the internet (measured by internet users per 100 inhabitants) stood at 3.21. The mean value of the institutional quality variable (rolest and cocest) was a weak -0.70 and -0.67 and 2.81 indicating weak institutions and high case of corruption in the West African sub-region. There is considerable variation in the minimum and maximum applied and MFN tariff rates on manufactured, agricultural and primary products with variances ranging between 14.4% and 37.5.

Table 1: Descriptive Statistics for Selected ECOWAS countries

Variable	N	Mean	Std. Dev.	Min.	Max
rgdp	112	2.10E+10	4.54E+10	4.87E+08	2.44E+11
pop	112	2.61E+07	4.36E+07	1225044	1.62E+08
rer	112	628.555	824.793	0.677	2951.764
dist	112	370.891	854.523	4.291	3350.319
intra	112	794431.4	1471705	525.397	7924339
atrap	112	14.609	3.341`	10.59	25.42
atrmp	112	14.341	3.449	10.31	24.75
atrpp	112	16.599	4.763	11.82	45.29
mfntrap	112	13.943	4.698	10.91	33.29
mfntrmp	112	13.722	4.429	10.53	28.64
mfntrpp	112	14.606	6.063	11.76	49.32
tele	112	1.463	0.843	0.239	3.574
internet	112	3.206	5.085	0.015	28.43
rolest	112	-0.698	0.527	-1.652	0.163
cocest	112	-0.665	0.393	-1.447	0.34

Correlation analysis result showed that a relatively low and negative linear association existed between intra-ECOWAS trade and applied and MFN tariffs on agriculture, manufactured and primary commodeties in the sample countries. The infrastructure (internet) and institutional quality variable were positively correlated with the volume of intra-ECOWAS trade recording 35% and 4%, respectively. An approxi-mate 50% positive correlation between intra-ECOWAS trade 9intra) and real gross domestic product (rgdp) while population and distance were 47% and 42% linearly associated with the volume of intra-ECOWAS trade. The negative correlation of 29% between real exchange rate (rer) and intra-ECOWAS trade (intra) suggests that the exchange rate policy synchronicity is a valid driver of trade amongst member countries of the sub-region.

Table 2: Pairwise Correlation Matrix for Selected ECOWAS Countries

	rgdp	pop	rer	dist	intra	atrap	atrmp	atrpp	mfntrap	mfntrmp	mfntrpp	tele	internet	rolest	cocest
rgdp	1														
pop	0.877	1													
rer	-0.243	-0.271	1												
dist	0.910	0.979	-0.240	1											
intra	0.496	0.465	-0.290	0.419	1										
atrap	-0.217	0.040	-0.221	-0.004	-0.222	1									
atrmp	-0.225	-0.007	-0.242	-0.038	-0.241	0.990	1								
atrpp	-0.061	0.293	-0.065	0.217	-0.028	0.763	0.667	1							
mfntrap	-0.046	0.221	-0.298	0.180	-0.072	0.963	0.941	0.815	1						
mfntrmp	-0.076	0.172	-0.309	0.134	-0.101	0.972	0.965	0.748	0.992	1					
mfntrpp	0.032	0.329	-0.254	0.283	0.001	0.874	0.817	0.926	0.952	0.907	1				
tele	-0.260	-0.360	-0.446	-0.318	-0.214	0.171	0.245	-0.221	0.126	0.178	-0.009	1			
internet	0.658	0.403	-0.293	0.433	0.354	-0.232	-0.202	-0.268	-0.152	-0.158	-0.126	0.202	1		
rolest	-0.314	-0.409	-0.368	-0.401	-0.106	0.088	0.134	-0.162	0.065	0.098	-0.020	0.442	0.047	1	
cocest	-0.288	-0.407	-0.229	-0.406	0.043	-0.050	-0.020	-0.194	-0.081	-0.057	-0.136	0.280	-0.005	0.852	1

3.2 Model Specification

The theoretical linkage between trade liberalisation and intra-regional trade, through logical deduction, traced to the gravity model rooted in Newton's law of gravitational force between two objects. The model astutely provides an exposition of the linkage between volume of trade, capital flows and migration. In other words, it deploys a platform for the volume of trade between or amongst countries as a function of GDP, population and distance. Thus, the effect of trade policies on intra-ECOWAS trade can be analysed by augmenting the model with relevant policy variables. This study relies on an augmented gravity model in the spirit ofAnderson (2010) and also recognises the role of trade policy, institutions and infrastructure on the volume of intra-ECOWAS trade following Babatunde (2006) and Serlenga and Shin (2013). Thus the model specifies intra-ECOWAS trade flows as a function of traditional and other emerging variables:

$$INTRA_{it} = f(X_{it}, Y_{it}) \quad (1)$$

where $INTRA_{it}$ is intra-ECOWAS exports between country (i) and country (j) at time (t), Y_{it} is a vector of traditional determinants of intra-ECOWAS trade- real GDP (RGDP), real exchange rate (RER), population (POP), common language (ANGLO and FRANCO), distance (DIST); X_{it}, is a vector of emerging driving factors made up of infrastructure (INFRA), institutional quality (INSTQ), applied import tariff rates (all products-ATRAP, manufactured products-ATRMP and primary products-ATRPP), most favoured nation tariff rates (all products-MFNTRAP, manufactures-MFNTRMP and primary products-MFNTRPP). The subscripts i, j denote countries while t represents time period.

According to Ajayi (2005), the inclusion of political factors could contribute valuable information to understanding trade relations within ECOWAS especially in view of the political instability of some member countries. Consequently, Babatunde (2006) extends the model by examining the impact of political stability on export performance within ECOWAS. The study found this index to be wrongly signed and insignificant. This strongly suggests the use of broad governance indicators that account for institutions and governance and thus justifies our inclusion of these variables. As rightly noted in Babatunde's study, sensitivity analysis may be carried out using the International Country Risk Guide data on political climate since they provide data on corruption, quality of government and rule of law.

Trade between countries is estimated to be proportional to their combined economic mass (measured by GDP per capita) and inversely proportional to their distance apart in the basic form of the gravity model. Thus, a higher income level signifies

greater potential supply from the exporting country and increased demand in the importing country, leading to a positive effect on trade. However, a large population is expected to increase the ratio of domestic to foreign market production, which should allow greater output diversification. The result is expected lower potential demand in the importing country and lower potential supply from the exporting country, leading to an overall decrease in imports. The combined effect of GDP per capita is, however, positive. In addition, distance is expected to increase transport costs which in turn impedes intra-ECOWAS trade flows.

The volume of intra-ECOWAS trade is expected to rise as real output, openness and population of West African countries increase. An increase in real exchange rate, indicating depreciation of the local currency unit against the US dollar, creates disincentives to trade and is thus expected to negatively affect intra-ECOWAS trade. Better infrastructure and institutional quality are expected to boost trading activities amongst ECOWAS countries since this implies lesser bureaucracy and enhanced communication capacity while import tariffs are expected to be negatively related to intra-ECOWAS trade (see, Ajayi and Ncube, 2010). *Apriori*, the longer the distance amongst ECOWAS member countries, the lower the level of intra-regional trade while common language between countries is expected to increase trading activities between countries. Lower import tariffs are expected to increase intra-ECOWAS trade.

3.3 Estimation Technique

The models adopted and adapted to this study are estimated using the system and difference GMM estimators proposed by Holtz-Eakin, Newey and Rosen (1988), Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998)[8]. While the difference GMM estimators is predicated on transformation of independent variables via differencing and uses the GMM, the system GMM on the other hand augments this approach by assuming that the first differences of instruments are uncorrelated with the fixed effects. This allows the introduction of more instruments and can profoundly improve efficiency (Roodman, 2009b). The model may contain specific effects and therefore, to suppress the effects, the model is converted to first difference. This implies that the country-specific effects is neutralised since it does not vary with time. The resulting equation is:

[8] Both estimators are suited for regressions featuring independent variables that are not strictly exogenous, fixed effects, heteroscedasticity, and serial correlation within but not across individuals (Roodman, 2009a).

$$\Delta INTRA_{it} = \beta_1 \Delta INTRA_{i,t-1} + \beta_2 \Delta Y_{it} + \beta_3 \Delta X_{it} + \Delta \varepsilon_{it} \quad (2)$$

The fixed effects are encompassed in ε_{it}; the error term, assumed to be white noise and consists of the unobserved country-specific effects, v_i and the observation specific error, e_{it}.That is, $\Delta \varepsilon_{it} = \Delta v_i + \Delta e_{it}$; and $\varepsilon_{it} = v_i + e_{it}$ for $i = 1, \dots, N \; and \; t = 2, \dots, T$. Although the optimal weighting matrix for the estimator has been shown to result in an asymptotically efficient two-step GMM estimator[9], Monte Carlo simulations have shown that efficiency gain is typically small and that the two-step GMM estimator has the disadvantage of converging to its asymptotic distribution relatively slowly (Bond, Hoeffler and Temple, 2001)[10]. Thus, we rely on the one-step GMM estimator, with standard errors that are not only asymptotically robust to hetero-scedasticity but have also been found to be more reliable for finite sample inference (see Blundell and Bond, 1998).

4. Discussion of Empirical Results

For the system GMM, the equations in levels and first differences are estimated as a system, with the applied import tariff rates instrumented by the second and third lag of its difference. Likewise the mfn tariffs is instrumented either by its own lagged differences or by both lagged levels and differences. This is in view of the fact that limiting the number of lags used as instruments in the GMM estimations keeps the instrument count low and improves the Hansen J test for joint validity of those instruments (Roodman, 2009b). All variables in the difference GMM estimations are differenced and the first difference of the import tariffs is instrumented by its own 2 lag in levels, one excluded exogenous variable (ivstyle instrument)-gdp per capita and all exogenous variables included in the specification. Instructively, the second-order correlation in all specifications does not reject the null hypothesis of no autocorrelation while the p-values of the Sargan test of over identifying restrictions does not reject the null hypothesis that the instruments are exogenous in any equation.

Table 3 depicts the empirical result from our model. All estimated models are based on small sample adjustment and the t-statistic is reported. The one-step estimation procedure is relied upon since the resulting standard errors are consistent with panel-specific

[9] See Hansen (1982) and Chamberlain (1987) for a description of asymptotic efficiency with conditional moment restriction and large sample size properties of GMM estimators.

[10] They further argued that in finite samples, the asymptotic standard errors associated with two-step GMM estimators can be seriously downward biased, and thus form an unreliable guide for inference.

autocorrelation and heteroskedasticity and avoid the downward bias that characterises the standard errors of the two-step estimation. The result or model 1 in the first column reveals that real output exerts a positive and significant influence on the intra-ECOWAS trade while it has an infinitesimally small negative effect on while distance and common language have a positive and negative impact respectively on trade within the region. Lowering MFN tariffs on manufactured and primary products led to a high increase in the volume of trade among ECOWAS member countries. This conforms to earlier findings by Babatunde (2006) even though the study relied on aggregate tariffs. Unexpectedly, a 1% increase in MFN tariffs on agricultural products led to a 35.4% in intra-ECOWAS TRADE. In model 2, applied tariff rate on agricultural products is a negative function of intra-ECOWAS trade but is statistically insignificant. However, real exchange rate depreciation had a negligible negative effect on intra-ECOWAS trade while common language coefficient was negative and statistically significant at 10%.

In model 3, infrastructure measure proxied by the number of telephone lines per 1000 inhabitants is introduced but had an unexpected negative influence on regional trade. This finding was contrary to Ajakaiye and Ncube (2010) whose study suggested otherwise. This may be attributed to poor connectivity issues between and amongst the various service providers which in turn reduced its positive effect on intra-ECOWAS trade. However, increased investment in telephone lines in West Africa increased trade amongst ECOWAS member countries by about 0.29% and 0.26% in models 5 and 6, respectively in line with the findings of Mbekeani (2010).The institutional quality index as captured by the rule of law estimate were both insignificant with a positive and negative coefficients in models 5 and 6, respectively.

Notably, MFN tariffs, which countries have bounds to impose on imports of others unless such a country is part of a broad preferential trade agreement are all negative and statistically significant in model 6. This suggests that reducing restrictions on agric and manufactured and indeed primary products will increase the volume of trade in intra-ECOWAS countries.

Table 3: System GMM Result

Dep. Var.: Intra	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
rgdp	0.355*** (0.187)	0.140 (0.180)	0.430** (0.200)	0.204 (0.177)	0.298 (0.216)	0.337** (0.170)

pop	-0.270 (0.251)	-0.013 (0.267)	-0.292 (0.254)	-0.154 (0.250)	-0.121 (0.305)	-0.232 (0.214)
rer	-0.001* (0.0002)	-.0003** (0.000)	-0.001* (0.0002)	-0.0001 (0.0001)	-0.001* (0.000)	0.001* (0.0002)
dist	0.374* (0.098)	0.039 (0.076)	-0.016 (0.095)	0.255* (0.091)	-0.021 (0.085)	0.074 (0.063)
comlang	-0.984* (0.235)	-0.282*** (0.158)	-0.532* (0.177)	-0.472* (0.175)	-0.420** (0.167)	-0.499* (0.186)
atrap		-0.350 (0.892)			-0.560 (0.928)	
atrmp		0.255 (0.751)			0.435 (0.781)	
atrpp		0.061 (0.115)			0.086 (0.120)	
mfntrap	35.352* (9.695)					11.180*** (6.594)
mfntrmp	-27.316* (7.483)					-8.644*** (5.097)
mfntrpp	-7.978* (2.190)					-2.527*** (1.488)
tele			-0.533* (0.200)		-0.288** (0.126)	-0.263** (0.110)
rolest				0.527** (0.214)	0.049 (0.154)	-0.059 (0.138)
Diagnostics						
Obs	104	104	104	104	104	104
No. of Instruments	61	104	61	61	91	104
F-stat	0.000	0.000	0.000	0.000	0.000	0.000
AR(1) Test	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) Test	0.442	0.762	0.507	0.913	0.433	0.631
Sargan Test	0.091	0.783	0.178	0.234	0.559	0.715

*Notes: (i) *, ** and *** denote significance at the 1%, 5% and 10% level. (ii) Robust Standard errors in parenthesis ( ) and P-values in [ ]*

The difference GMM estimation output is presented in Table 4. The result from model 1 in column 1 indicates that reducing applied tariff rates on agricultural producers increases intra-ECOWAS trade while a 1% increment in applied tariff rate and manufactures and primary goods induce a 2.63% and 0.26% increase in intra-ECOWAS trade. This seems quite fizzling at a first stance since one would expect a negative impact. Model one also reveals that more people increased the volume of intra-trade and this may be due to the increased output accustomed by the availability of more and relatively cheap labour.

In model 2 in the second column, liberalising trade through reduction in MFN tariffs on manufactured and primary products exert a positive impact on the intra-ECOWAS trade. An increase in the number of telephone lines installed precipitate at 1.56% increase in intra-ECOWAS trade as communication between trading partners are cased and thus barriers to trade minimised. An improvement in governance as measured by the rule of law estimate increased trade amongst West African countries by 2.75% and 1.31% in models 5 and 6, respectively.

Table 4: Difference GMM Output

Dep. Var.: Intra	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
rgdp	-0.679 (0.550)	0.371 (0.411)	0.291 (0.599)	1.239** (0.494)	-0.143 (0.516)	-0.623 (0.427)
pop	8.585* (2.823)	1.429 (2.219)	1.492 (3.231)	0.115 (2.462)	4.756*** (2.796)	0.922 (2.310)
rer	-0.001 (0.001)	-0.000 (0.000)	-0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)	0.000 (0.001)
dist	0.549 (0.435)	0.715*** (0.410)	-0.015 (0.512)	-0.204 (0.466)	0.223 (0.417)	-0.721*** (0.413)
atrap	-2.877* (1.056)				-2.264** (0.973)	
atrmp	2.632* (0.907)				2.073** (0.833)	
atrpp	0.256** (0.128)				0.204*** (0.119)	
mfntrap		19.276** (7.799)				13.13*** (7.871)

mfntrmp		-14.862** (6.047)				-10.044 (6.108)
mfntrpp		-4.362** (1.750)				-3.016*** (1.763)
tele			1.557** (0.784)		-0.197 (0.204)	0.102 (0.134)
rolest				-2.749* (0.569)	-0.606 (0.402)	-1.307* (0.418)
Diagnostic Tests						
Obs	104	104	104	104	104	104
No. of Instruments	39	96	26	40	65	53
F-stat	0.000	0.000	0.000	0.000	0.000	0.000
AR(1) Test	0.022	0.000	0.727	0.067	0.000	0.000
AR(2) Test	0.558	0.048	0.411	0.725	0.201	0.081
Sargan Test	0.321	0.696	0.974	0.501	0.148	0.468

*Notes: (i) *, ** and *** denote significance at the 1%, 5% and 10% level. (ii) Robust Standard errors in parenthesis ( ) and P-values in [ ].*

For robustness, we estimate fixed and random effects models and compare with the one-step system and difference result. The fixed effect result in Table 5 shows that liberalising agriculture and manufacturing sector through import tariff reduction will boost the level of intra-regional trade in West Africa. The coefficients of population and real exchange rate carried the expected positive and negative signs, respectively similar to Ogunkola's (1998) findings. This suggest that an increase in population increases labour force which in turn contributes to aggregate output and surplus for exports while an appreciation of the currency makes more funds available to finance imports and thus promotes intra-regional trade amongst west African countries.

Notably, MFN tariffs applied to primary and manufactured goods turn out to be negative in model 2; suggesting the positive impact of liberalising trade regimes on intra-ECOWAS trade. However, MFN tariff on agricultural products had a positive impact while distance and real exchange rate were found to be negatively related to the volume of trade carried out within the West African sub region. This underscores the effect of geographical proximity towards trade and the need for increased synchronicity of exchange

rate policies towards enhanced trade within the sub-region. Our findings also showed that an increase in the number of telephone lines per hundred inhabitants provided in the sub region will lead to an increase in intra-regional trade within the ECOWAS. This finding was however found to be statistically insignificant while an improvement in the regulatory environment through enhanced institutional quality led to an improvement in intra-ECOWAS trade. The model diagnostics are satisfactory.

Table 5: Estimation Output of Fixed Effect

Dep. Var.: Intra	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
constant	-7.50E+01	53.906	-32.344	-15.494	-33.263	-41.165
rgdp	0.172 (0.525)	0.369 (0.419)	0.879*** (0.466)	1.223* (0.461)	0.715 (0.435)	0.763 (0.522)
pop	5.095** (2.544)	3.249 (2.182)	1.500 (2.419)	-0.061 (0.344)	1.452*** (2.285)	2.046 (2.565)
rer	-0.002* (0.001)	-0.001*** (0.001)	-0.001*** (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
dist	0.243 (0.431)	0.948** (0.404)	0.044 (0.432)	-0.077 (0.416)	0.749*** (0.405)	0.092 (0.409)
atrap	-1.876*** (1.105)					-1.218 (1.058)
atrmp	1.720*** (0.950)					1.201 (0.908)
atrpp	0.183 (0.133)					0.764 (0.129)
mfntrap		38.053* (6.851)			32.431* (7.220)	
mfntrmp		-29.486* (5.324)			-25.091* (5.615)	
mfntrpp		-8.540* (1.532)			-7.301* (1.611)	
tele			0.145 (0.170)		0.196 (0.146)	0.248 (0.160)
rolest				-1.240* (0.408)	-0.894** (0.409)	-1.507* (0.416)

F-Stat	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-Sq	0.7054	0.6548	0.7838	0.6628	0.6056	0.6334

*Notes: (i) *, ** and *** denote significance at the 1%, 5% and 10% level. (ii) Standard errors in parenthesis ( )*

The random effect model presented in Table 6 was relatively more robust compared with the fixed effect model. However, applied tariff rate on manufactured, agricultural and primary products were insignificant but carried the expected negative sign. This is a clear departure from MFN tariffs as all its coefficients carried the expected negative sign and were statistically significant. This implies that the liberalising trade within ECOWAS would be more effective if the MFN rates were reduced as trade flows seem to be more responsive to changes in MFN import duties particularly on manufactured and primary products. Infrastructure and institutional quality as measured by telephone lines and rule of law estimates exerted a positive influence on intra-ECOWAS trade. This reinforced our earlier findings as the effects were also statistically significant. The traditional determinants were all statistically significant and conformed to theoretical expectations in all the specifications tested using random effect.

Table 6: Estimation Output of Random Effect

Dep. Var.: Intra	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
constant	-26.276* (4.133)	-18.723* (4.522)	-20.537* (2.946)	-22.811* (2.597)	-11.862** (4.949)	-21.673* (4.321)
rgdp	1.175* (0.226)	0.944* (0.178)	1.070* (0.170)	1.056* (0.166)	1.142* (0.180)	1.396* (0.228)
pop	0.941** (0.391)	0.688** (0.331)	0.661** (0.309)	0.862* (0.274)	-0.007 (0.354)	0.365 (0.413)
rer	-0.001* (0.000)	-0.002* (0.000)	-0.001* (0.000)	-0.001* (0.000)	-0.002* (0.000)	-0.002* (0.000)
dist	-0.631* (0.170)	-0.314 (0.194)	-0.301** (0.152)	-0.495* (0.132)	-0.183 (0.188)	-0.571* (0.167)
comlang	-1.441* (0.170)	-1.638* (0.168)	-1.471* (0.340)	-1.424* (0.186)	-1.577* (0.161)	-1.363* (0.170)

atrap	0.548 (1.068)					0.733 (1.026)
atrmp	-0.474 (0.904)					-0.652 (0.870)
atrpp	-0.052 (0.137)					-0.069 (0.132)
mfntrap		25.905* (7.862)			30.628* (7.509)	
mfntrmp		-20.046* (6.101)			-23.736* (5.829)	
mfntrpp		-5.835* (1.761)			-6.882* (`1.681)	
tele			-0.017 (0.151)		-0.405* (0.121)	-0.377* (0.132)
rolest				-0.304 (0.198)	-0.399** (0.165)	-0.322*** (4.321)
F-Stat	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-Sq	0.9314	0.9381	0.9261	0.9318	0.9469	0.9384

*Notes: (i) *, ** and *** denote significance at the 1%, 5% and 10% level. (ii) Standard errors in parenthesis ( )*

Our final robustness consideration entailed using alternative measures of infrastructure and institutional quality. We used the control of corruption estimate for the latter and internet access for the former. There is abundant anecdotal evidence suggesting that time consuming and inefficient border procedures, as well as corruption in some cases, may well be more important in inhibiting intra-regional trade (Hartzenberg, 2010) The result is presented in table 7. To overcome the downward bias that characterises the standard errors of the two-step estimation, we relied on one-step estimation procedure since the standard errors are consistent with panel-specific serial correlation and heteroskedasticity.

Model 1 in column 1 shows that wider internet access and coverage has not led to an increase in trading amongst ECOWAS member countries. However, model 2 shows that improvement in terms of control of corruption led to approximately 0.70% increase in the volume of intra-ECOWAS trade. In Models 3, 4, and 5, improved internet facilities and connections led to a significant increment in trade amongst ECOWAS member countries. While

better control of corruption had an expected positive and significant impact on intra-ECOWAS trade in models 2 and 6, it was either negatively related to intra-ECOWAS trade or insignificant in the other models. The potency of trade liberalisation was only evident in model 8 and its impact was through MFN tariffs on manufactured and primary products. This lends support to our previous findings and further highlights the critical role of reducing MFN import tariffs towards promoting intra-ECOWAS trade.

Table 7: System GMM Result Using Alternative Measures of Infrastructure and Institutional Quality

Dep. Var.: Intra	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
rgdp	0.387*** (0.218)	0.210 (0.173)	0.248 (0.233)	0.353*** (0.188)	0.937** (0.457)	0.101 (0.416)	-0.278 (0.442)	0.378 (0.417)
pop	-0.434 (0.313)	-0.117 (0.244)	-0.093 (0.337)	-0.302 (0.244)	-0.589 (2.404	2.982*** (2.385)	5.553** (3.369)	1.946 (2.304)
rer	-0.001*** (0.001)	-0.002*** (0.001)	-0.001* (0.000)	-0.001* (0.000)	-0.001** (0.001)	0.002 (0.001)	-0.001** (0.001)	-0.001 (0.001)
dist	0.208** (0.087)	0.234* (0.081)	0.060 (0.087)	0.163** (0.068)	0.218 (0.434)	0.063 (0.427)	0.713*** (0.418)	0.783*** (0.442)
comlang	-0.216 (0.179)	-0.514* (0.171)	-0.276 (0.171)	-0.298 (0.183)				
atrap			-0.677 (0.964)				-0.792 (1.087)	
atrmp			0.511 (0.814)				0.764 (0.932)	
atrpp			0.103 (0.124)				0.035 (0.137)	
mfntrap				10.456 (6.664)				18.365** (7.952)
mfntrmp				-8.125 (5.153)				-014.163** (6.165)
mfntrpp				-2.347 (1.503)				-4.157** (1.784)

internet	-0.031*** (0.017)		-0.028*** (0.016)	-0.034** (0.016	0.040*** (0.020)		0.018 (0.025)	-0.016 (0.016)
cocest		0.698* (0.220)	0.114 (0.182)	-0.018 (0.166)		0.572*** (0.331)	-0.632 (0.453)	0.008 (0.314)
Diagnostic Tests								
Obs	104	104	104	104	104	104	104	104
No. of Instrument								
F-stat	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(1) Test	0.110	0.140	0.742	0.035	0.207	0.033	0.471	0.950
AR(2) Test	0.805	0.301	0.740	0.02	0.181	0.115	0.435	0.061
Sargan Test	0.184	0.263	0.525	0.741	0.232	0.092	0.363	0.673

*Notes: (i) *, ** and *** denote significance at the 1%, 5% and 10% level. (ii) Robust Standard errors in parenthesis ( ) and P-values in [ ]*

5. Conclusion

West Africa has strived to attain a common regional block through the pursuit of various ECOWAS-driven protocols, schedules and agreements and this has led to significant improvements in the volume of transactions in goods and services between member countries. Despite these improvements, a major component towards attaining full regional integration through the formation of a free trade area and custom union is yet to be achieved. The common external tariffs that is meant to see ECOWAS member countries reduce and realign their tariff structures to the 5 CET bands is yet to be achieved even as the broad based Economic Partnership Agreement (EPA) negotiations between ECOWAS and European Union (EU) remains a mirage in terms of full commitment particularly on the part of some ECOWAS member countries. Article 3 of the ECOWAS treaty calls for the liberalisation of trade by the abolition, among Member States, of customs duties levied on imports and exports, and the abolition among Member States, of non-tariff barriers in order to establish a Free Trade Area (FTA) at the community level. This engendered the pursuit of a FTA through the establishment of the ECOWAS Trade Liberalisation Scheme (ELTS) with the ultimate

objective of creating a common market, increasing intra-regional trade and boosting economic activity amongst others.

This study set out to empirically assess the impact of trade liberalisation on the volume of intra-regional trade in West Africa. The paper utilise dynamic panel data estimation techniques on data spanning 1998 to 2011 gathered for 6 selected ECOWAS member countries. This was guided strictly by data availability concerns; particularly applied and MFN tariffs imposed on agricultural, manufactured and primary products. The empirical analysis indicate that liberalising the manufacturing and primary product sectors will boost intra-ECOWAS trade while in the case of the agricultural sector we find otherwise in some models. Nonetheless our finding also makes a case for reducing restrictions in the agricultural sector. Our results also suggest that the role of infrastructure and efficient institutions cannot be downplayed given the critical role they play towards enhancing intra-ECOWAS trade.

The implication of our finding highlight the need for West African countries to reduce and/or eliminate trade restrictions given its importance in a globalised world as cumbersome bureaucratic processes, rigid custom procedures, ineffective port operations and inadequate infrastructure dampen the benefits of regional trade liberalisation. Our robustness test also buttressed the critical role of strengthening domestic institutions and making provision for intra-regional infrastructure. Liberalisation of trade in agricultural and manufactured products should be expeditiously pursued. However concerted efforts need to be made by ECOWAS member countries to ensure that protection is not embedded in long lists of sensitive products. This may douse the worries of domestic producers who may be concerned about increased competition. Suggestions for future research include consideration of tariffs at a more disaggregated level and use of non-tariff barriers. Also, increasing the sample size (time and country) could also improve the reliability of findings and will aid conducting sensitivity analysis with respect to subsample of countries and distinct periods.

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Appendix

Table 1: Intra-ECOWAS Export Flows (1980-2009) US$ Millions

Country	1980-84	1985-89	1990-94	1995-99	2000-03	2005-2009
Benin	1.30	2.04	3.05	3.40	2.70	4.30
Burkina Faso	4.30	4.49	4.94	4.94	5.87	7.47
Cote d'Ivoire	61.25	78.42	125.5	164.31	175.82	186.30
Gambia	2.56	1.03	1.84	0.50	0.08	3.01
Ghana	5.87	4.55	23.61	19.82	27.35	37.32
Guinea	0.37	0.51	1.22	0.79	0.47	2.50
Mali	8.01	6.29	2.12	1.46	1.72	2.45
Niger	11.16	4.75	11.30	12.02	15.20	18.31
Nigeria	72.29	68.58	130.73	187.87	265.45	373.54

Senegal	17.20	16.92	16.39	25.47	33.17	52.18
Sierra Leone	0.08	0.02	0.00	0.00	0.23	3.21
Togo	7.56	3.76	7.86	5.14	22.13	45.21

Source: Computed from statistics contained in the IMF Direction of Trade and Statistics and The World Bank's World Integrated Trade System (WiTs)

Table 2: ECOWAS Common External Tariffs

Categories	Duty Rate (%)	Goods Description
0	0%	Essential social goods.
1	5%	Goods of primary necessity, raw materials and specific inputs.
2	10%	Intermediate goods.
3	20%	Final Consumption goods.

Table 3: Variable Description and Sources of Data

s/n	Acronym	Definition	Description	Source
1	RGDP	Real gross domestic product	US dollar	The World Bank's World Development Indicators (WDIs)
2	EXR	Nominal exchange rate	Local currency unit per US dollar	The World Bank's World Development Indicators (WDIs)
3	POP	Population	Total number of people in a country	The World Bank's World Development Indicators (WDIs)
4	OPEN	Openness	Sum of exports and imports divide by GDP (computed)	The World Bank's World Development Indicators (WDIs)
5	RER	Real exchange rate	Local currency unit per US dollar deplated by domestic prices (computed)	The World Bank's World Development Indicators (WDIs)
6	COMLANG	Language	Dummy variable: 1 for english-	Values assigned

			speaking, 0 otherwise	
7	DIST	Geographical Distance	Distance between country of origin and destination	Index developed by Mayer and Zignago (2006)
8	INTRA	Trade between selected ECOWAS countries, showing origin and destination	Total trade between country (i) and (j) in US dollar	The World Bank and World Trade Organisation's World integrated trade system (WiTs)
9	ATRAP	Applied tariff rates on all products	Percentage (%)	The World Bank and World Trade Organisation's World integrated trade system (WiTs)
10	ATRMP	Applied tariff rates on manufactured products	Percentage (%)	The World Bank and World Trade Organisation's World integrated trade system (WiTs)
11	ATRPP	Applied tariff rates on primary products	Percentage (%)	The World Bank and World Trade Organisation's World integrated trade system (WiTs)
12	MFNTRAP	Most favoured nation tariff rate on all products	Percentage (%)	The World Bank and World Trade Organisation's World integrated trade system (WiTs)
13	MFNTRMP	Most favoured nation tariff rate on	Percentage (%)	The World Bank and World Trade Organisation's World integrated

		manufactured products		trade system (WiTs)
14	MFNTRPP	Most favoured nation tariff rate on primary products	Percentage (%)	The World Bank and World Trade Organisation's World integrated trade system (WiTs)
15	TELE	Telephone	Fixed and mobile phone users per 100 inhabitants	The World Bank's World Development Indicators (WDIs)
16	INTERNET	Internet	Internet users per 100 inhabitants	The World Bank's World Development Indicators (WDIs)
17	ROLEST	Rule of law estimate	Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance)	The World Bank's World Governance Indicators (WGIs)
18	COCEST	Control of corruption estimate	Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance)	The World Bank's World Governance Indicators (WGIs)

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On the complex dynamics of a bounded rational monopolist model

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Abstract

Purpose *– The main purpose of this paper is to investigate the dynamic behavior of a bounded rational monopolist with a general nonlinear demand and quadratic cost functions reflecting diseconomies of scales.*

Design/methodology/approach *– We suppose that locally the monopoly firm uses a gradient mechanism and looks at how the rate of growth of the quantity affects the variation of profits.*

Findings *– We prove that the nonzero steady state is exactly the level of production that maximizes profits, as can be seen in the classic microeconomic theory. However, complex dynamics can arise.*

Research limitations/implications *– For some values of a parameter there is a locally stable equilibrium which is the value that maximizes the profit function. Increasing these values, the equilibrium becomes unstable, through period-doubling bifurcation.*

Originality/value *– The result indicates that a limited reaction of the monopolist to changes in profits can stabilize the quantity produced. On the other hand turbulences in the market are generated by an overreaction.*

Keywords: Monopoly, Difference Equation, Equilibrium, Stability, Chaotic Behavior

JEL Classification: C61, C62, D42

1. Introduction

The canonical approach of the monopoly theory is essentially static and the monopolist has full rationality: both perfect computational ability and large informational set in such a way that she can determine both quantity and price to maximize profits. However, in the real market producers do not know the entire demand function, though it is possible that they have a perfect knowledge of technology, represented by the cost function. Hence, it is more likely that firms employ some local estimate of the demand. This issue has been previously analyzed by Baumol and Quandt, 1964; Puu, 1995; Naimzada and Ricchiuti, 2008, Askar, 2013. Naimzada and Ricchiuti evaluate a discrete time dynamic model with a cubic demand function without an inflexion point and linear cost function.

In recent years, many researchers have demonstrated that economic agents may not be fully rational. Even if one tries to perform things correctly, it is important to utilize simple rules previously tested (Kahneman et al., 1986; Naimzada and Ricchiuti, 2008). Efforts have been made to model bounded rationality to different economic areas: oligopoly games (Agiza, Elsadany, 2003; Bischi et al., 2007); financial markets (Hommes, 2006); macroeconomic models such as multiplier-accelerator framework (Westerhoff, 2006). In particular, difference equations have been employed extensively to represent these economic phenomena (Elaydi, 2005; Sedaghat, 2003).

In this paper, the equilibrium state of a bounded rational monopolist model is studied. It is assumed a general demand and quadratic cost functions and that locally the monopoly firm uses a gradient mechanism and looks at how the rate of growth of the quantity affects the variation of profits. We show that complex dynamics can arise and the stability of the nonzero equilibrium state is discussed. The complex dynamics, bifurcations and chaos are displayed by computing numerically Lyapunov numbers and sensitive dependence on initial conditions.

2. The model

The inverse demand function has a general form, it is downward sloping and concave:

$$p = a - bq^n, n \in Z, n > 2 \quad (1)$$

where p indicates commodity price, q indicates the quantity demanded and a and b are positive constants. The downward sloping is guaranteed if:

$$\frac{dp}{dq} = -nbq^{n-1} < 0 \quad (2)$$

that is if b>0.

The quantity produced, q, is positive and non-negative prices are achieved if

$$q < \sqrt[n]{\frac{a}{b}} \quad (3)$$

We suppose that the cost function is quadratic

$$C(q)=cq^2 \quad (4)$$

Moreover, we assume the general principle of setting price above marginal cost, p - c > 0, for each non negative q; that is, a > c. The main aim of the firm is to maximize the following profit function

$$\Pi(q)=(a-bq^n)q-cq^2 \quad (5)$$

This function is concave and gives the following first order condition:

$$\frac{d\Pi}{dq}=a-2cq-(n+1)bq^{n-1}=0 \quad (6)$$

The marginal profit is strictly decreasing with range in the interval $(-\infty,a]$, therefore Eq. (6) has a unique solution q^* in this interval and the profit has a maximum at q^*. If $\Pi(q^*)>0$ a positive equilibrium production is guaranteed.

To achieve increasing profits, it is assumed that locally the monopoly firm, using a gradient mechanism, looks at how the rate of growth of the quantity affects the variation of profits. A positive (negative) variation of profits will induce the monopolist to change the quantity in the same (opposite) direction from that of the previous period. No changes will occur if profits are constant. This mechanism can be represented as follows:

$$\frac{q(t+1)-q(t)}{q(t)}=k\frac{d\Pi}{dq(t)},\ t=0,1,2,... \quad (7)$$

where k>0 is the speed of adjustment to misalignments. Substituting Eq. (6) in (7), we obtain the following one-dimensional nonlinear difference equation:

$$q(t+1)=q(t)+kq(t)\cdot [a-2cq(t)-(n+1)bq^n(t)] \quad (8)$$

3. Dynamical Analysis

3.1 Equilibria and stability

If

$$f(q)=q+kq[a-2cq-(n+1)bq^n] \quad (9)$$

the fixed points of Eq. (8) are the solutions of the equation $f(q)=q$, and then the nonzero fixed point is the solution q^* of Eq. (6). Since

$$\frac{df}{dq}\left(q^*\right)=1+kq^*\frac{d^2\Pi}{\partial q^2}(q^*) \quad (10)$$

the steady state is locally stable if:

$$\left|1+kq^*\Pi''(q^*)\right|<1 \quad (11)$$

or, equivalently,

$$0<k<\frac{2}{-q^*\Pi''(q^*)} \quad (12)$$

It follows that:

Proposition. Map (8) has a unique nonzero steady state $q(t) = q^*$ which is exactly the quantity that maximizes profits. It is locally stable if $0 < k < \frac{2}{-q^* \Pi''(q^*)}$

3.2. Numerical simulations

The previous result indicates that a limited reaction of the monopolist to changes in profits can stabilize the quantity produced. On the other hand turbulences in the market are generated by an overreaction. To shed some light on what really happens in the market we employ a numerical analysis. Fixing the other parameters of the model as follows: $a = 4, b = 0.6, c = 0.5$, then, for $n = 6$, $q^* \approx 0.948$, $k^* \simeq 0.104$. The dynamic map (8) satisfies the canonical conditions required for the flip bifurcation (Abraham et al., 1997) and there is a period doubling bifurcation if $k = k^*$. When $k < k^*$ the fixed point is attracting, when $k > k^*$ it is repelling. Therefore, there is a change in the nature of dynamics when $k = k^*$, a unique asympto-tically stable period two-cycle arises.

We graphically show how the behavior of the map (8) changes for different values of the reaction coefficient, k. (Kulenovic, Merino, 2002).

In Figure 1, we show the map (8) when k = 0.09. From Eq. (13), the steady state is asymptotically stable.

In Figure 2, we show the particular set of parameters that determines a period two-cycle, actually, with k = 0.12. Further growth of k leads the attractor to follow a typical route of flip bifurcations in complex price dynamics: a sequence of flip bifurcations generate a sequence of attracting cycles in period 2^n, which are followed by the creation of a chaotic attractor.

In Figure 3, a cycle of period four is shown. To clarify the dynamics depending on k, we have reported a bifurcation diagram in Figure 4. It shows different values of quantity for different values of k, particularly between 0 and 0.18. It is easily illustrated that we move from stability through a sequence of a period doubling bifurcations to chaos.

In Figure 4 are represented also the Lyapunov numbers of the orbit of 0.01, for k = 0.17, versus the number of iterations of the map (8). If the Lyapunov number is greater of 1, one has evidence for chaos. To demonstrate the sensitivity to initial conditions of Eq. (6), we compute two orbits (100 iterations of the map) with initial points $q_0 = 0.01$ and $q_0 + 0.0001$, respectively.

The results are shown in Figure 5. At the beginning the time series are

indistinguishable; but after a number of iterations, the difference between them builds up rapidly.

Figure 2: Cycle of period 2, for a =4, b=0.6, c= 0.5, n=6 and k= 0.12

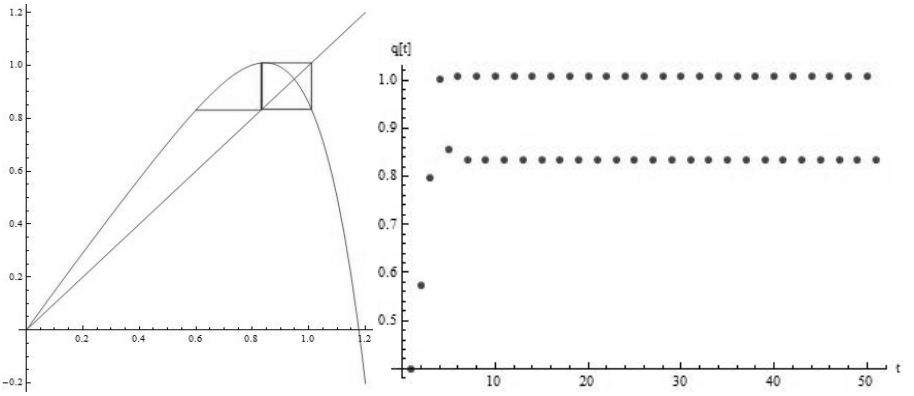


Figure 3: Cycle of period 4, for a =4, b=0.6, c= 0.5, n=6 and k= 0.134

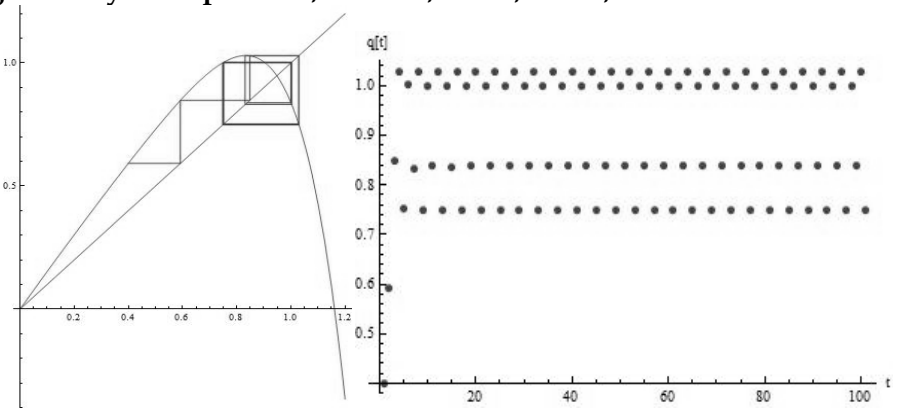


Figure 4: For n=6, bifurcation diagram with respect to the parameter k against variable q, for q_0=0.01 and 550 iterations of the map (8) (left) and Lyapunov numbers of the orbit of 0.01, for k =0.17, versus the number of iterations of the map (8) (right).

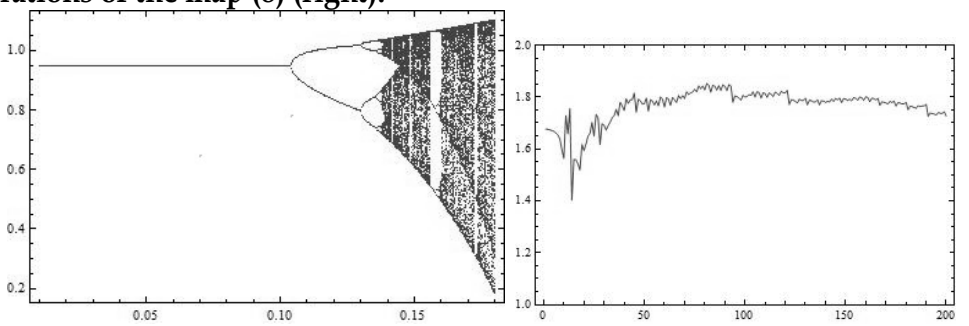
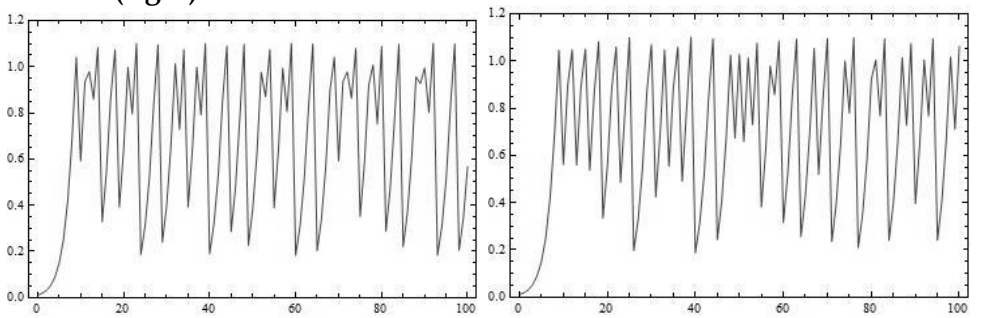


Figure 5: For n = 6, sensitive dependence on initials conditions: q plotted against the time, parameter value k=0.17 and initial condition q_0 = 0.01 (left), q_0 = 0.0101 (right).



4. Conclusion

In this paper, we have analyzed the effects on the equilibrium of a monopoly when the monopolist has bounded rationality. We employ a discrete time dynamical model such as that used by Askar 2013; however, we use a quadratic cost function and we suppose that locally the monopoly firm uses a gradient mechanism, looks at how the rate of growth of the quantity affects the variation of profits. We prove that for some values of a parameter there is a locally stable equilibrium which is the value that maximizes the profit function. Increasing these values, the equilibrium becomes unstable,

through period-doubling bifurcation. The complex dynamics, bifurcations and chaos are displayed by computing numerically Lyapunov numbers and sensitive dependence on initial conditions. The result indicates that a limited reaction of the monopolist to changes in profits can stabilize the quantity produced. On the other hand turbulences in the market are generated by an overreaction. The case of demand and cost functions of a more general form and comparing the results is left for future research.

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The causal link between Trade Openness and Government Size: Evidence from the five largest economies in Africa

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Abstract

Purpose *– The purpose of this paper is to examine the causal link between trade openness and government size for the five largest economies in Africa taking into account the role of compensation hypothesis in an economy.*

Design/methodology/approach *– Time series data for five countries covering the period 1970 to 2010 was used for the analysis. The data was obtained from Penn table and World development indicator (WDI). The causality test adopted for this study is based on the ECM framework. This was done for each of the five countries selected.*

Findings *– Empirical evidence show a positive causal link between trade openness and government size for Nigeria and Algeria. In the case of South Africa negative causality was found while there was no causality for Angola and Egypt. Therefore, the government of these countries need to spend productively in order to cushion the effect of exposure to risks.*

Research limitations/implications *– The need to consider the sustainability of growth due to increasing demand for African countries to diversify their economy in order to take advantage of its export potential and enjoy the gains of trade led to the consideration of the five largest economies in Africa. However, the same causality approach can be applied for other African countries.*

Originality/value *– The results tend to support the existence of compensation hypothesis for Nigeria and Algeria.*

Keywords: Compensation-Hypothesis, Algeria, Angola, Egypt, South Africa, Nigeria

JEL Classification: F41, H11

1. Introduction

The compensation hypothesis as proposed by Cameron (1978) marks the first theoretical link on the relationship between trade openness and government size. This hypothesis suggests that there is a positive causal relationship running from trade openness to government size. This assertion is adduced from the fact that as a country becomes increasingly open to bilateral and multilateral trade, there is likelihood of greater exposure to external risk, thus informing the need to increase the size of government to serve as a source of social insurance to the citizenry.

Empirical studies testing the validity of this hypothesis range from country-specific (time series) to cross-country (cross-sectional) analysis. The submission of these studies has been mixed. For example; the cross-country study by Rodrik (1998) which was the first investigation of this issue, reveal a positive causal link between trade openness and government size. Cross-country study by Alesina and Wacziarg (1998); Garen and Trask (2005); Benarroch and Pandey (2009) and Ram (2009) all point to a negative association between openness and government size. Further, country-specific studies like Molana, Montagna and Violato (2004) and Aydogus and Topcu (2013) also found a negative link between openness and government size. However, country-specific studies like Khalid (2005); Shahbaz, Rehman and Amir (2010); and Aregbeyen and Ibrahim (2014) for Saudi Arabia, Pakistan and Nigeria respectively found a positive nexus between openness and government size. The findings of these studies cast doubt on the result of the cross-country studies that largely suggest a negative relationship between openness and government size. Perhaps, a country-specific study on some of the countries used in the cross-country studies would give an insight on the exact link between these two variables.

In Africa, there is increasing demand for countries to diversify their economy in order to take advantage of its export potential and enjoy gains of trade such as: market expansion for local goods; receipts of foreign exchange; creation of employment; and generate sustainable inclusive growth to alleviate poverty. The export stances of most countries in Africa suggest that there is need for countries to increase their trade volume and pursue an export promotion policy. However, as countries increasingly promote an export-oriented policy, there is high possibility for these countries to be exposed to high external risk caused by turbulence in international market. In order for African countries to cushion such effect, government would have to provide more employment and

income to dampen the impact of this risk on the economy.

According to World Bank report (2013), the five largest economies in Africa using GDP (measured in billions of dollars) are: Nigeria ($521.803), South Africa ($ 350.630), Egypt ($271.973), Algeria ($210.183) and Angola ($121.704). An observation of the trends of government size and trade openness for these countries revealed that government size (measured by government consumption as a % GDP) in 2005 stood at 5.96%, 6.02%, 12.32%, 19.21%, and 8.96% while trade openness was 50.75%, 55.25%, 71.25%, 128.72, and 64.16% for Nigeria, South Africa, Algeria, Angola, and Egypt respectively. Government size increased in 2010 to 17.1%, 8.03% and 14.96% for Nigeria, South Africa and Algeria while that of Angola and Egypt decreased to 17.25% and 8.5% respectively. Trade openness for the same period was 78.65%, 55.01%, 72.44%, 125.91% and 47.48% for Nigeria, South Africa, Algeria, Angola and Egypt respectively.

Theoretically, it is expected that as a country increases its trade volume, government size is also expected to increase in order to help cushion the risks caused by and/ or induced by turbulence in product and commodity markets. This issue has attracted significant discussions but with little empirical evidence. Therefore, this study reconsidered openness-government size nexus for these countries in Africa between 1970 and 2010. These countries were selected because their diversification index and Gross Domestic Product (GDP) revealed that they are more prone to international market turbulence. The rest of the paper is organized as follows: section 2 presents a review of the literature on trade openness–government size nexus. It is followed by the discussion of the estimation procedure and data used for the study in section 3. Section 4 discusses empirical results, while the last section concludes with policy implications.

2. Literature Review

The theoretical relationship between trade openness and government size, referred to as the compensation hypothesis, can be traced to Cameron's (1978) paper. Since then, many studies have tested the validity of the hypothesis. These studies included both cross-country and specific country studies. In line with the argument presented in section 1, the review of some existing literature is divided into cross-country studies and country-specific studies (see, Table 1).

Rodrik (1998) demonstrated that there is link between trade openness and government size. The study argued that government consumption as a measure of government size appeared as a risk-reducing role for countries that are

exposed to external shocks depending on the extent of the country's exposure to trade (measured as the share of trade in GDP). The paper concluded that the positive link between government size and trade openness holds for a large cross-section of countries in low and high-income countries. The author opined that irrespective of the number of control variables included in a model to show this relationship, a positive association between trade openness and government size is expected.

Islam (2004) investigated the link between government size and economic openness for six member countries of the Organizations for Economic Co-operation and Development (OECD) namely: Australia, Canada, England, Norway, Sweden, and the United State of America. The empirical results support the submission of Rodrik (1998) for the USA and Canada but negative for the other four countries. Garen and Trask (2005) in their study used non-budgetary measures to proxy government size and showed a positive but not very robust relationship between openness and government size.

Using the Autoregressive Distributed Lag [ARDL] bounds testing approach to cointegration, Swee Kueh, Chin-Hong and Chiew-Meu (2008) examined the association between trade openness and government expenditure for the Association of Southeast Asian Nations [ASEAN] countries namely: Indonesia, Malaysia, Philippines and Thailand between 1974 and 2006. Their results suggested a positively significant long-run link between government expenditure and trade openness for all the sampled countries.

Nahidi, Parvizkhanlou and Badri (2014) assessed the relationship between trade openness, financial openness and government size in seven Economic Cooperation Organization (ECO) countries (Azerbaijan, Iran, Kazakhstan, Kyrgyz Republic, Pakistan, Tajikistan and Turkey) for the period 2000 to 2009. His empirical result corroborates the submission of Cameron (1978) and Rodrick (1998). In Contrast, the result on the linkage between financial openness and government size was negative.

Contrarily, using cross-sectional data comprising Latin American, Sub-Saharan Africa, South East Asia and OECD countries, Alesina and Wacziarg (1998) examined the relationship between among trade openness, country size and government size for the period 1960 to 1989. Their results revealed that country size is negatively related to government size, and trade openness for most of the countries considered. In the same vein, Alvarez, Pascual and Romero (2003) utilized a simple analysis of correlation coefficients to investigate the nexus between trade

openness and public expenditure in the EU-15 from 1998 to 2000 and found a negative association. Furthermore, Liberatti (2006) examined the link between trade openness, financial openness and government size for 16 European countries, USA, Canada, and Australia and confirmed a non-robust negative relation between trade openness and government size.

Benarroch and Pandey (2009) also examined the relationship between trade openness and government size (measured by government consumption as share of GDP). Their results revealed that a negative and significant relationship the two variables. Using cross country data for 54 countries covering the period 1960 to 2000, Ram (2009) also supported the confirmation of a negative relationship between government size and trade openness. Although the consideration of cross-country heterogeneity through fixed effects model revealed no evidence of negative connect but concluded that a positive relationship between openness and government size does not arise due to the intervening role of country size.

For country-specific studies, measuring trade openness by the sum of exports and imports as a share of gross domestic product and government size by public expenditure on goods and services as a proportion of GDP, Molana *et al.* (2004) found no causal relationship between trade openness and government size for Spain covering the period 1948-1998. They, however, attributed their results to the unsuitable measurement of the variables used in their analysis. However, Rivas, Sort and Rodríguez (2009) reported a significant positive long-run bond between government size (public expenditure as a percentage of GDP) and trade openness for Spain during the period 1960-2000.

Khalid (2005) made use of Vector Error Correction Model (VECM), to examine the long-and-short run relationship between trade openness and government size in the Kingdom of Saudi-Arabia. He found the existence of a positive and significant long-run relationship between the variables while a uni-directional causal link that runs from government size to trade openness was observed.

Utilizing the Fully Modified Ordinary Least Square (FMOLS) and Error Correction Mechanism (ECM), Shahbaz, Rehman and Amir (2010) analysed the existence of a long- and short-run nexus between trade openness and government size in Pakistan between 1971 and 2006. The results of this study are in consonance with the findings of Rodrik (1998) and Khalid (2005).

Aydogus and Topcu (2013) used residual based cointegration and the standard causality test to investigate the long-run and causal relationship

between trade openness and government size in Turkey between 1974 and 2011. The study found a negative connection between trade openness and government size.

Using the bounds testing approach to cointegration within an ARDL framework, Aregbeyen and Ibrahim (2014) investigated the nexus between trade openness and government size by disaggregating government expenditure into total government expenditure as a share of GDP; recurrent expenditure as a share of GDP; and capital expenditure as a share of GDP. Their result revealed that total government expenditure in GDP and recurrent expenditure as share (percent) of GDP had positive and significant relationship with trade openness in the long run but capital expenditure as percentage share of GDP does not. The standard causality test result supports these findings. They concluded that compensation hypothesis holds for Nigeria.

Summarily, the studies reviewed indicate that understanding the relationship between government size and trade openness is critical to the overall growth and sustainable development of any country. In addition, the hypothesis regarding the relationship between government size and trade openness has no discernable direction of causality in terms of whether the country is developed or developing. Finally, the results obtainable are sensitive to the measurement of government size and estimation technique adopted.

Table 1: Summary of some Empirical Findings

Author/year	Study Area	Methodology	Measurement of government size	Findings
Rodrik, 1998	23 OECD	Semi-logarithmic regression	Government consumption as a share of GDP	Positive link holds for a large cross-section of countries in low and high-income countries.
Alesina and Wacziarg, 1998	133 countries	OLS regression	Government consumption as a% of GDP; Govt. current expenditure as a% of GDP; Govt. spending on education as a % of GDP; Govt. spending on defence as a % of GDP; Govt. consumption net of	Negatively insignificant links between: Government consumption as a% of GDP and trade openness; and Govt. consumption net of defence/education. Positively significant links between: govt. current

			defence/education as a % GDP; public investment as a% of GDP.	expenditure and trade openness; public investment and trade openness; and Govt. spending on education and trade openness.
Benarroch and Pandey, 2009	96 countries	Panel regression (fixed effect)	Government consumption	Negatively insignificant relationship between government size and trade openness.
Ram, 2009	154 countries	Panel regression (pooled and fixed effect)	Government consumption as a % of GDP	Pooled regression support a negative link between government size and trade openness; while fixed effect revealed a positive link between the two variables.
Nahidi et al., 2014	Economic Cooperation Organization (ECO) countries	Panel regression	Government consumption as a % of GDP	Positive and significant relationship between government size and trade openness.
Molana et al., 2004	23 OECD	VAR	Government consumption as a % of GDP	Found no causal link between government size and trade openness for most countries
Khalid, 2005	Saudi Arabia	VECM	Government consumption as a % of GDP	Long run relationship between trade openness and government size; and uni-directional causal link running from trade openness to government size
Shahbaz, Rehman and Amir, 2010	Pakistan	Fully-modified OLS and ECM	Total government expenditure as a % of GDP	Positive relationship between government size and trade openness.
Aydogus and Topcu, 2013	Turkey	Engle and Granger residual based	General government final consumption expenditure as a % of GDP.	No link between government size and trade openness.

		cointegration		
Aregbeyen and Ibrahim, 2014	Nigeria	ARDL bound testing approach to cointegration	Total government expenditure as a % to GDP; recurrent expenditure as a % GDP; and capital expenditure as a % of GDP	Positive link exist between: total expenditure and trade openness; and recurrent expenditure and openness. While no link was found between capital expenditure and trade openness.

Source: Author's Compilation

3. Estimation Procedure and data

The functional form proposed by Aregbeyen and Ibrahim (2014) was augmented by including GDP per capita as a control variable to account for its possible effect on trade openness in line with Wagners' hypothesis. The causality test adopted for this study is based on the ECM framework. This approach is adopted because of the dynamic nature of the link between government size and trade openness in which static regression adopted by most cross-country studies is not captured. This approach involves three steps; first, is to determine the stationarity of the time series data for each country; second, is to conduct cointegration using Johansen and Juselius (1990) procedure and the third, is the estimation of the parsimonious model to ascertain the direction of causality. ECM approach involves the estimation of the over-parameterized model and then eliminates lags with estimated parameter that are highly insignificant. The parsimonious model derived from this process must be the model with the lowest value of Schwarz Information Criterion (SIC). Time series data for five countries covering the period 1970 to 2010 was used for the analysis. The variables of interest are: trade openness (the sum of exports and imports on Gross Domestic Product – GDP); government size measured by the share (percent) of government consumption in GDP; and GDP per capita in international dollars at constant prices.

Following Aregbeyen and Ibrahim (2014), the nexus between trade openness and government size can either be unidirectional or bi-directional. Thus, this is expressed below as:

$$openc = f(govcon) \qquad (1)$$

Where: *openc* is trade openness (the sum of exports and imports on Gross Domestic Product – GDP) and *govcon* is government size measured by the share (percent) of

government consumption in GDP. Augmenting equation (1) by including GDP per capita as control variables give:

$$openc = f(govcon, rgdpl) \quad (2)$$

Expressing equation 2 in logarithm form gives:

$$\ln openc = f(\ln govcon, \ln rgdpl) \quad (3)$$

From equation (3) the ECM estimated for each country is expressed as:

$$\Delta \ln openc_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta \ln govcon_{t-i} + \sum_{i=1}^{n} \alpha_2 \Delta \ln rgdpl_{t-j} + \pi_{et-1} + \mu_t \quad (4)$$

$$\Delta \ln govcon_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta \ln openc_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta \ln rgdpl_{t-j} + \mu_{et-1} + \nu_t \quad (5)$$

4. Empirical Results

The result of the unit root test based on Augmented Dickey-Fuller (ADF) presented in Table 2 reveal that all the series for analysis were integrated of order one I(1).

Table 2: Result for Augmented Dickey-Fuller (ADF) Unit Root Tests

Variables	AGO	ALG	EGY	NIG	SA
LNCG	-6.899* (1)	-6.383* (1)	-6.613* (1)	-6.789* (1)	-6.373* (1)
LNOPENC	-8.492* (1)	-5.073* (1)	-5.588* (1)	-7.981* (1)	-5.173* (1)
LNRGDPL	-6.918* (1)	-9.155* (1)	-4.756* (1)	-4.839* (1)	-9.145* (1)

Note: The graphical view of the data show that they all have constant and trend; therefore the ADF test that include constant and trend was adopted. The null hypothesis is that the variable has unit root. * denote significance at the 5% level and the figure in the parenthesis indicate the order of integration.
AGO = Angola, ALG = Algeria, EGY = Egypt, NIG = Nigeria, SA = South Africa

After establishing that all the series are integrated of order one, the Johansen and Juselius cointegration test was conducted to check if the linear combination of these series is stationary. An optimal lag length and one (1) was relied upon based on Akaike information Criterion (AIC) and Schwarz Information Criterion (SIC). The results of the cointegration relationship are presented in Table 3. The results show that there is at least one cointegrating equation for each country specification.

Table 3: Cointegration Test Results between Pairs of Variable for the five countries

Model	Null Hypothesis	Alternative Hypothesis	Trace Statistics	5% critical level	Max-Eigen Statistic	5% critical	No of cointegrating Equation

AGO	R=0*	R=1	35.159	29.797	31.535	21.132	1
	R≤1*	R=2	3.624	15.494	3.589	14.265	
	R≤2*	R=3	0.036	3.841	0.0356	3.841	
ALG	R=0*	R=1	28.656	24.276	19.251	17.797	1
	R≤1*	R=2	24.276	12.321	6.382	11.225	
	R≤2*	R=3	3.0237	4.129	3.024	4.129	
EGY	R=0*	R=1	34.569	24.276	24.172	17.797	1
	R≤1*	R=2	10.397	12.321	8.702	11.225	
	R≤2*	R=3	1.695	4.129	1.695	4.129	
NIG	R=0*	R=1	25.863	24.276	23.031	17.797	1
	R≤1*	R=2	2.832	12.321	2.683	11.225	
	R≤2*	R=3	0.149	4.129	0.149	4.129	
SA	R=0*	R=1	34.432	29.797	23.393	21.132	1
	R≤1*	R=2	11.039	15.495	11.028	14.265	
	R≤2*	R=3	0.011	3.841	0.011	3.842	

Note: R represents the number of cointegrating vectors.

4.1. Causality

This study adopted the ECM framework to test the causal link between trade openness and government size. The results for each country are presented in Tables 4 to 8. The causality test for Angola as shown in Table 4 revealed that openness does not granger 'cause' government size when government size is the dependent variable. When openness is made the dependent variable, there is evidence of causal link running from government size to openness. The implication of this is that higher government size causes lower openness indicating that the size of government consumption impedes on trade balance of the economy.

Table 4: Causality Test Based on Error Correction Model Between openness and government size for Angola

Equation: $\Delta LNCG$ **'cause'** $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			**Dependent variable:** $\Delta LNOPENC$		
Variables	**Coefficient**	**t-Stat.**	**Variables**	**Coefficient**	**t-Stat.**
Constant	0.001	0.040	Constant	0.025	1.035
$\Delta LNOPENC_{t-1}$	0.265	1.357	$\Delta LNGOVCON_{t-1}$	-0.254	-2.993*
$\Delta LNRGDPL_{t-1}$	-0.852	-5.399*	$\Delta LNRGDPL_{t-1}$	-0.718	-2.485**
ECT_{t-1}	-0.195	-8.039*	ECT_{t-1}	-0.088	-1.057
DW-Stat: 1.734			DW-Stat: 2.102		

Note: * and ** depict significance at 1% and 5% levels

The result for Algeria as presented in Table 5 show a bi-directional causal relationship between trade openness and government size. When government size is made the dependent variable, a positive causal link supporting the compensation hypothesis was found. This suggests that the Algerian governments' responsiveness to cushion the effect of high trade is effective. However, when trade openness is made the dependent variable, one lag period of government size exerts a negative impact on openness suggesting that government consumption had negative impact on the component of trade openness (export and import).

Table 5: Causality Test Based on Error Correction Model Between openness and government size for Algeria

Equation: $\Delta LNCG$ **'cause'** $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			**Dependent variable:** $\Delta LNOPENC$		
Variables	**Coefficient**	**t-Stat.**	**Variables**	**Coefficient**	**t-Stat.**
Constant	0.009	0.696	Constant	0.011	0.597
$\Delta LNOPENC$	0.246	2.461**	$\Delta LNGOVCON$	0.518	2.275**
$\Delta LNRGDPL_{t-1}$	-0.382	-1.556	$\Delta LNOPENC_{t-1}$	0.251	1.687
ECT_{t-1}	-0.148	-2.461**	ECT_{t-1}	-0.124	2.362**
DW-Stat: 2.181			DW-Stat: 1.789		

Note: ** indicate significance at 5% levels

The causality test result for Egypt as presented in Table 6 reveal a negative uni-directional causal relationship running from government size to openness. This implies that government consumption size in Egypt impacted negatively on trade openness during the period covered in this study.

Table 6: Causality Test Based on Error Correction Model Between openness and government size for Egypt

Equation: $\Delta LNCG$ **'cause'** $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			**Dependent variable:** $\Delta LNOPENC$		
Variables	**Coefficient**	**t-Stat.**	**Variables**	**Coefficient**	**t-Stat.**
Constant	0.011	1.346	Constant	-0.003	-0.161
$\Delta LNOPENC$	-0.006	-0.158	$\Delta LNGOVCON_{t-1}$	-1.412	-3.282*

$\Delta LNRGDPL$	-0.589	-3.757*	$\Delta LNOPENC_{t-1}$	0.330	2.210**
ECT_{t-1}	-0.523	-3.323*	ECT_{t-1}	-0.291	-3.080*
DW-Stat: 1.924			DW-Stat: 2.090		

Note: * and ** depict significance at 1% and 5% levels

The result for Nigeria in Table 7 shows a positive bi-directional causality between these two variables indicating government's positive response to external shocks caused by turbulence in international markets. This result corroborates the findings of Aregbeyen and Ibrahim (2014).

Table 7: Causality Test Based on Error Correction Model Between openness and government size for Nigeria

Equation: $\Delta LNCG$ **'cause'** $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			**Dependent variable:** $\Delta LNOPENC$		
Variables	**Coefficient**	**t-Stat.**	**Variables**	**Coefficient**	**t-Stat.**
Constant	0.082	1.744***	Constant	0.039	1.355
$\Delta LNOPENC$	0.615	2.685**	$\Delta LNGOVCON$	0.255	2.752*
$\Delta LNRGDPL_{t-1}$	1.073	1.603	$\Delta LNRGDPL$	0.778	1.853***
ECT_{t-1}	-0.136	-2.478**	ECT_{t-1}	-0.286	-2.997*
DW-Stat: 2.243			DW-Stat: 2.404		

Note: *, ** and *** indicate significance at 1%, 5% and 10% levels respectively

The causal relationship between openness and government for South Africa presented in Table 8 indicates a negative uni-directional causality running from trade openness to government size. This suggests that higher trade openness causes lower government size. This also indicates that the South African government has not been able to cushion the effect risk associated with export-oriented polies pursued by government.

Table 8: Causality Test Based on Error Correction Model Between openness and government size for South Africa

Equation: $\Delta LNCG$ **'cause'** $\Delta LNOPENC$					
Dependent variable: $\Delta LNGOVCON$			**Dependent variable:** $\Delta LNOPENC$		
Variables	**Coefficient**	**t-Stat.**	**Variables**	**Coefficient**	**t-Stat.**
Constant	0.009	0.696	Constant	0.010	0.537
$\Delta LNOPENC$	-0.246	-2.461**	$\Delta LNOPENC_{t-1}$	0.360	2.440**

$\Delta LNRGDPL_{t-1}$	-0.382	-1.555	$\Delta LNGOVCON$	-0.528	-2.549
ECT_{t-1}	-0.148	-1.619	ECT_{t-1}	-0.184	-2.203**
DW-Stat: 2.181			DW-Stat: 1.785		

Note: ** indicate significance at 5% level

5. Conclusion

This paper employs the ECM framework to examine causal link between trade openness and government size for the five largest economies in Africa. Evidence of a positive causal relationship running from trade openness to government exists for Algeria and Nigeria implying that the compensation hypothesis holds. Notably, these are oil-producing countries with high exposure to risks occasioned by volatility of international crude oil market. This suggests that these two countries need to expand government size through the pursuit of export diversification in order to cushion the effect of their exposure to oil cycle risks.

The negative causal link found in the case of South Africa suggests that increased openness has not induced the expected increase in government size. This does not conform to the postulate of the compensation hypothesis. Likewise in the case of Angola and Egypt no evidence of causal link running from openness to government size was found but a negative causality from government size to openness exist for both countries indicating non-responsive of the government of Angola and Egypt to fluctuation in trade openness. Conclusively, the compensation hypothesis holds for Nigeria and Algeria while the negative causality found in the case of South Africa suggest the need for urgent action by the government in order to sustain its growth level.

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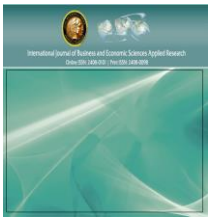

A model for predicting Inactivity in the European Banking Sector

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Abstract

Purpose *– The paper will addresses the issue of inactivity and will try to detect its causes using econometric models. The Banking sector of Europe has been under transformation or restructuring for almost half a century.*
Design/methodology/approach *– Probit models and descriptive statistics have been used to create a system that predicts inactivity. The data was collected from Bankscope.*
Findings *– The results of the econometric models show that from the six groups of indicators, four have been found to be statistically important (performance, size, ownership, corporate governance). These findings are consistent with the theory.*
Research limitations/implications *– The limitation is that Bankscope does not provide any longitudinal data regarding ownership, management structure and there are some many missing values before 2007 for some of the financial ratios and data.*
Originality/value *– The paper's value and innovation is that it has given a systemic approach to find indicators of inactivity.*

Keywords: Banks, Europe, Inactivity

JEL Classification: G15, G32, G33

1. Introduction

Since the end of 1950's Europe has created a mechanism of change and integration, the European Union. The banking sector of Europe had to comply with or to adapt to this political and economic change. This macro (political and economic) environment change has created a larger number of transformation drivers (deregulation and legal isomorphism, product inflation and complexity, stock market development). Europe was and is diverse and the banking system across Europe hasn't the same characteristics (ownership, legal framework, etc.) and path of development (in some countries there are a large number of banks while in other only a few).

During this transformation period some banks have faced problems or changed their strategy. The result is inactivity. Inactivity can take many forms or has many causes (merger & acquisition (MA), liquidation, default-bankruptcy, etc.). Having in mind the diversity of the European banking system, many scholars have argued that there is convergence trend in Europe (Casu and Girardone, 2010; Murinde, Agung and Mullineux, 2004; Schmidt, Hackethal and Tyrell, 2001) and other countries (Brau et al., 2014). The basic argument is that the convergence on the legal – regulatory system of Europe has enough momentum. Others (Rughoo and Sarantis, 2014; Gibson and Tsakalotos, 2013; European Central Bank, 2012; Busch, 2002) challenge this hypothesis.

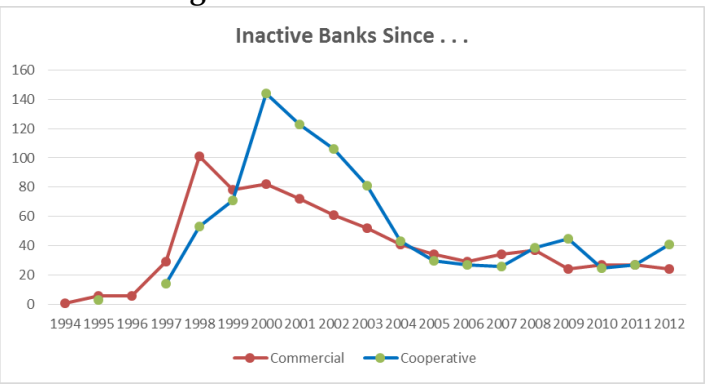
The paper attempts to address the issue of inactivity, to locate the causes of inactivity and create a system that can predict inactivity. To do that an analysis of the banking system is done and a probit model has been created.

2. The Banking System of Europe

The banking system of Europe has gone through two decades of turbulence. Through the 1990's a wave of mergers, liquidations and bankruptcies has swept the sector. This wave was at its peak the last years of the 1990's and the 2000-2004 period. Since then the number of exits from the sector has been relatively stable (see, Figure 1).

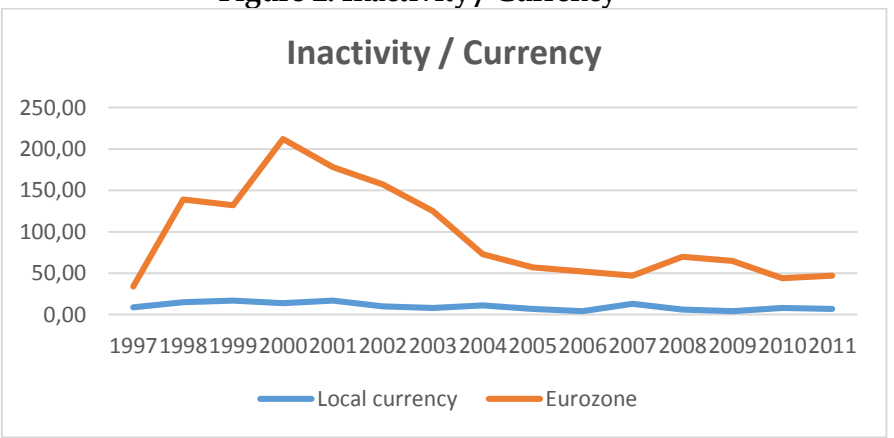
It is notable that the cooperative banks suffered more than the commercials. This fact can be attributed to their smaller size, ownership structure, management efficiency, etc. The crises of 2002 doesn't seem to have any effect on the trend and the number of inactive banks per year is lowering until 2006. Small increase is observed during the crisis of 2008, but the number is stabilized the years that follow 2009. The explanation for these results on inactivity can be explained if the causes of inactivity are studied in the paper.

Figure 1: Inactive Banks



The analysis of the exits form the sector (see Figure 2) shows that the majority of the exits are caused by mergers (80.57%, see Table 1). The main reason is the adoption of Euro, which took place on 1 January 1999. The vast majority of M&As have occurred during the pre-Euro period (1998-2001). This event was a game changer. The Euro has created a larger market and banks tried to adapt to the new market (see, Figure 2). European banks seem to be seeking a new strategic advantage (size and alliances – geographical expansion).

Figure 2: Inactivity / Currency



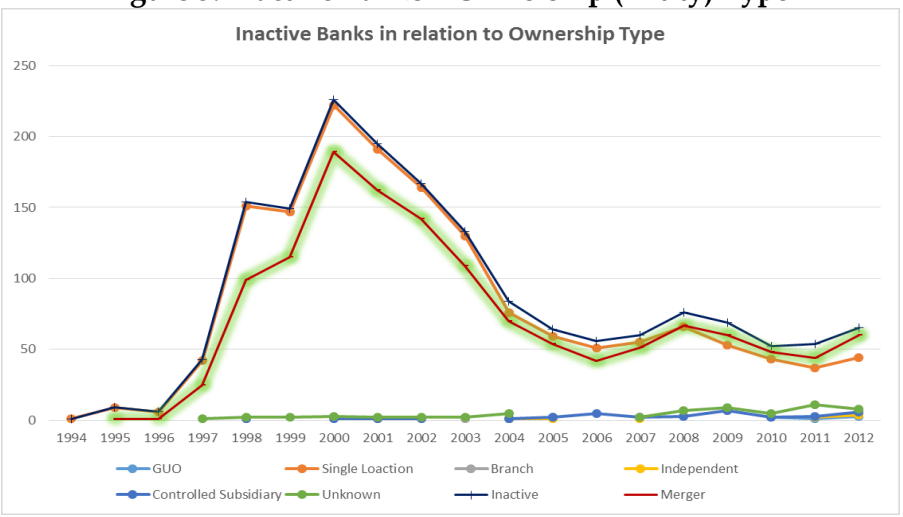
Bankruptcies take place in three distinctive periods (1999-2002, 2008-2009 and 2011-2012). These periods are the same with the ones that scandals or crises took place, and they must be direct or indirect result of these failures (in regulation, ethics, corporate governance, risk management, financial management, etc.).

Table 1: Causes of inactivity in the European Banking Sector

	Dissolved, In Liquidatiuon	Merger	Bankruptcy	Total
Number	308	1339	15	1662
%	18,53%	80,57%	0,90%	100,00%

The analysis of the ownership and banks' entity show that the banks that were recorded as inactive during the last two decades were mostly banks that their activity was focused in a single country (see Figure 3). This trend is observed from 1994 to 2004. This period is within Euro adoption period as a common currency. From that point on inactivity appears to have other targets (since the main cause is M&As) or is caused by the consolidation of subsidiaries. The driver of inactivity of M&As during the whole period of analysis. Especially, for the period after the 2002 crisis, M&As seem to be the main driver (although at a lower level number of inactivity).

Figure 3: Inactive Banks – Ownership (Entity) Type

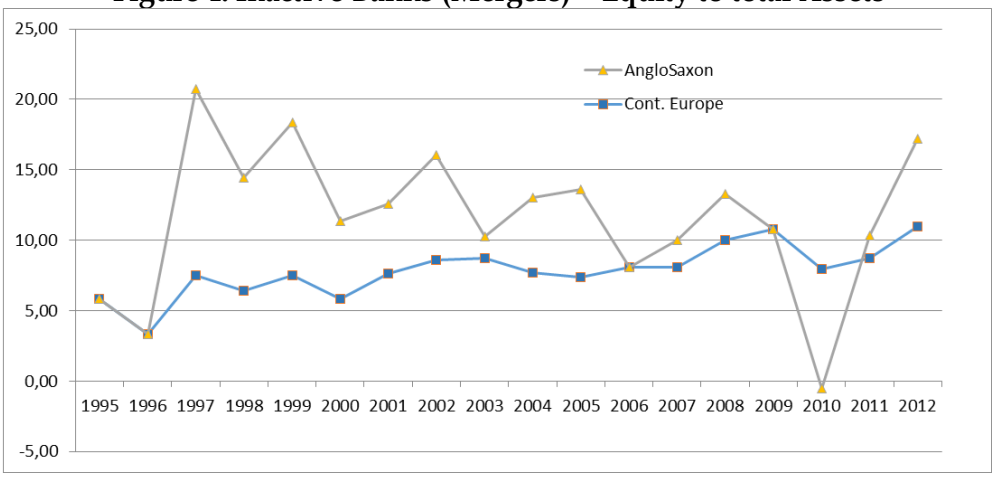


GUO - Global Ultimate Owner (ownership of at least 50.01%)

The merger wave of 1998-2004 may have two separate causes. The first one (before 2001) is the consolidation of capital – assets and the acquisition of market share or achievement of competitive

advantage, due to the greatest bull market ever and the continuous development of the financial sector. The second (after 2001) one can be attributed to the uncertainty of the market after the crises of 2001-2002.

Figure 4: Inactive Banks (Mergers) – Equity to total Assets



The causes can be analyzed using performance and size indicators like Return on Assets (ROA) and Equity to Total Assets (ETA) ratios. High ROA M&As are an indication of the incentive that drove to inactivity. High ROA is attractive for hostile takeovers. It is hypothesized that in Continental Europe countries the incentive is the drive to cumulate the size (see, Figure 4) of the bank in order to acquire a competitive advantage or a better chance to survive.

The merger – liquidation wave of 1998-2004 has create a different market (from 4.500 banks in Europe in 1994, in 2012 only 2.873 remained). A third of the banks (36,73%, see, Table 2) didn't manage to adapt to the new environment or their strategy to the challenges of the market was to seek safety in size and in cooperation with other banks. This hypothesis is supported by the fact that the vast majority of the banks that were merged or dissolved, were single location banks (meaning that the smaller banks in equity and capital were the targets for mergers) (see, Table 3).

The wave didn't affect at the same extend all countries. Germany, Italy France, Spain, Luxemburg and UK had the largest reduction in the number of active banks (see, Table 3). Especially, in Germany and Italy the percentage of financial market restructuring is very high (16.25% and 6.07%, respectively).

Table 3: Dissolves – Mergers by Country

Country	No of Dissolves - Mergers	% of Dissolves - Mergers	Reduce of No of Banks in each country
AUSTRIA	26	1,6%	0,57%
BELGIUM	42	2,5%	0,93%
BULGARIA	6	0,4%	0,13%
CYPRUS	5	0,3%	0,11%
CZECH REPUBLIC	16	1,0%	0,35%
DENMARK	25	1,5%	0,55%
ESTONIA	6	0,4%	0,13%
FINLAND	5	0,3%	0,11%
FRANCE	171	**10,3%**	**3,78%**
GERMANY	736	**44,3%**	**16,25%**
GREECE	13	0,8%	0,29%
HUNGARY	12	0,7%	0,27%
IRELAND	14	0,8%	0,31%
ITALY	275	**16,5%**	**6,07%**
LATVIA	9	0,5%	0,20%
LITHUANIA	4	0,2%	0,09%
LUXEMBOURG	71	**4,3%**	**1,57%**
MALTA	2	0,1%	0,04%
NETHERLANDS	26	1,6%	0,57%
POLAND	23	1,4%	0,51%
PORTUGAL	14	0,8%	0,31%
ROMANIA	8	0,5%	0,18%
SLOVAKIA	11	0,7%	0,24%
SLOVENIA	11	0,7%	0,24%
SPAIN	65	**3,9%**	**1,44%**
SWEDEN	7	0,4%	0,15%
UK	60	**3,6%**	**1,33%**
Total	**1.663**	**100,0%**	**36,73%**

Although the data used per se do not reveal the nature of these mergers, Martynova and Renneboog (2006) have shown that a small portion of merger activity involves transatlantic parties (bidders or targets). Even the majority of Intra-European activity is not cross border. On the contrary the majority of the merger activity in Europe (about 80%) is observed within national borders. "Fragmented and mostly domestically-oriented European companies resorted to takeover deals

as a tool to survive the tougher regional competition created by the new market" (Martynova and Renneboog, 2006). The findings of the two researchers strengthens the argument that the merger activity in Europe aimed at achieving competitive advantage, to create economies of scale and to obtain larger market share.

Financially, the dissolved or merged banks presented a wide spectrum of values on the selected three ratios (Total Capital Ratio, Equity to Net Loans and Growth of Gross Loans). No pattern seems to present itself (eg. Low TCR values). A hypothesis is that there are market formulating factors that differ from country to country (eg. Growth of gross loans is quite different from country to country).

The map of the financial sector in Europe after fifteen years of turbulence (positive or negative) has changed dramatically, but the factor of spatial dispersion of the sector remains the same. Germany has the largest number of banks (almost the 40% of the total number), followed by Italy (18,62%), France (7,45%), Austria (6,68), UK (4,8%) and Spain (4,18). The largest economies of the EU have the largest number of banks. In terms of total equity (TE) and interest income on loans (IIL) the European market has different variance. Using these ratios as classification factors, France (26%) has the largest banking sector in Europe, followed by Germany (14,25%). The concentration of equity capital and income from loans is different from the concentration of banks (as institutions). That means that there is a difference in size and hence a difference in importance.

As expected, ownership is more dispersed in the Anglo-Saxon corporate governance system. Only 5,33% of the banks have ownership concentration higher than 50,01%, whereas in the Continental Europe system ownership concentration above the threshold of 50,01% is 18,97%. This finding is in accordance with the one that Franks et el. (2008) reported (UK ownership concentration is 18%, Germany 43% and Italy 68%). On the other hand the difference of ownership concentration between North and South is also substantial. Countries that were ranked to the Anglo-Saxon corporate governance system seem to have the majority of their banks to be controlled subsidiaries (77,51%). PIGSs' banks are very close to the average of every type of ownership[1].

Another important factor for the evolution of the financial sector is the corporate governance structure. Bankscope provides data about the committees working in every bank,

[1] Bankscope does not provide historical data for ownership. The only data given is for the last year of entry and can only be used to classify the sample and to make panels.

through data given for the members of the board of directors. Using this information an index was constructed. The index of Good Corporate Governance Practices is calculated as the sum of the number of committees (remuneration, nomination, risk management, etc.). Such indexes are used widely (see e.g. Lazarides and Drimpetas, 2011).

Table 4 presents the average of the Good Practice Index for every dimension of the study. The highest numbers are calculated for the banks which have a major controlling shareholder or they are controlled subsidiary. One finding worth mentioning is the high average for the Continental Europe corporate governance system (mainly because some committees are legally mandatory) whereas for the Anglo-Saxon corporate governance system (voluntary adoption of good practices) the average of the index low.

In order to test the hypothesis that there was a change in financial management during the last eight (8) years, a number of ratios have been selected and calculated (see Table 5). NLTA's analysis shows that the banks of countries of the Continental Europe corporate governance system have higher average than the ratios calculated for the Anglo-Saxon countries. Continental Europe countries' are more exposed to loan risk. There was no significant change through time. Hence, the legal, events (scandals) or other initiatives didn't have significant impact in improving this ratio, but it seems that has an impact on the GGL ratio. The ratio seems to be getting smaller through time. The banks reduced their loan growth, in order to maintain the level capitalization of their business.

Table 4: Good Practice Index

Good Practices Index	Cont. Europe CG	Anglo Saxon CG	Total
0	279	48	327
1	94	6	100
2	132	6	138
3	34	2	36
4	14	5	19
5	16		16
6	2	1	3
7	1		1
Average	**1,075**	**0,735**	**1,039**
Total	**572**	**68**	**640**

The ratio ETA (Equity / Total Assets) in the Anglo-Saxon, South and PIGS countries is significantly higher than in the ones of the Continental Europe. The central Europe's economies have lower levels of ETA. The same can be said for the ENL, Tier and TCR ratios. Banks with higher ENL, ETA, Tier and TCR ratios are considered to be better situated to handle risks (operational, credit risk) and have better capital adequacy and they have lower levels of leverage. These ratios do not appear to change significantly through time in every spatial dimension used in this paper but there are differences among the different geographical groups. (e.g. the return ratios (ROA and REP) reveal significant differences between Anglo-Saxon and Continental Europe countries (the difference may be attributed to higher leverage levels in central Europe banks)).

The recent developments of the 2008-2009 crises have created a spatial division of Europe. The financial market handles risk by trying to detect it. Fitch is one of the main ranking agencies. Table 10 and 11 depict the way that Fitch ranked and approached the European financial market. On average the PIGS banks were ranked 14 times and ranked lower than Not PIGS banks. Furthermore, Fitch focused more on the Anglo-Saxon countries banks (15,29 average times). The fact of higher count of rankings can be explained by the interest of the market participants (due to more developed and efficient markets) and their total assets (22% of the total assets of the European banking sector). Overall, the countries that have a large banking sector (in terms of assets and equity) receive better rankings (see, Table 10).

Table 5: Active Banks, Ratios

Ratios*	No	Not PIGS	PIGS	North	South	Cont. Europe CG	Anglo Saxon CG
NLTA	2833	60,24	56,82	54,70	58,88	57,94	40,99
NLTA 3	2841	57,75	55,80	54,48	60,12	56,28	50,01
NLTA 8	2846	57,53	55,75	54,85	58,81	56,30	48,82
ETA	2848	10,55	13,86	10,02	12,91	10,37	16,86
ETA 3	2865	10,52	14,50	10,08	12,78	10,36	17,13
ETA 8	2865	10,50	14,21	9,85	13,30	10,35	16,58
GGL	2802	8,48	1,39	8,74	6,07	7,96	9,99
GGL 3	2813	10,35	6,84	9,69	11,51	9,28	25,17
GGL 8	2815	13,08	14,30	12,16	16,07	12,12	30,69
EL	2845	16,27	21,16	16,13	17,80	15,29	37,32
EL 3	2855	16,87	34,47	16,79	21,23	16,85	35,36

Ratios*	No	Not PIGS	PIGS	North	South	Cont. Europe CG	Anglo Saxon CG
EL 8	2858	16,85	31,61	16,57	21,13	16,55	36,81
TIER	1231	15,03	11,50	13,64	16,44	14,79	18,46
TIER 3	1323	15,25	11,63	13,81	16,77	15,07	16,02
TIER 8	1380	15,46	11,16	13,55	17,67	15,18	17,71
TCR	1745	17,97	15,78	17,83	18,09	17,70	24,85
TCR 3	1745	17,77	15,45	17,37	18,42	17,53	23,16
TCR 8	1747	17,93	15,20	17,27	19,22	17,59	23,56
ENL	2781	26,45	38,14	27,43	26,24	25,35	59,57
ENL 3	2833	29,36	45,01	17,51	25,09	27,74	74,02
ENL 8	2838	29,86	40,86	16,63	26,08	28,29	68,78
ROA	2867	0,22	-0,10	0,27	0,01	0,23	-0,23
ROA 3	2873	0,27	0,01	0,20	0,19	0,22	-0,14
ROA 8	2872	0,34	0,35	0,31	0,43	0,37	-0,02
REP[2]	2867	1,06	1,04	1,13	0,88	1,09	0,69
REP 3	2872	1,04	1,04	1,07	0,93	1,05	0,74
REP 8	2872	1,08	1,14	1,09	1,08	1,11	0,69

* NLTA = Net loans / Total Assets, ETA = Equity / Total Assets, GGL = Growth of Gross Loans, EL = Equity / Liabilities, TCR = Total Capital Ratio, ENL = Equity / Net Loans, ROA = Return on Assets, REP = Recurring Earnings Power. The number 3 indicates that it is the average of three years and the number 8 that it is the average of eight years.

3. Data, variables and empirical approach

The data used for the empirical analysis cover the period from 2004 to 2011, is focused on the twenty seven (27) European Union countries and only commercial and cooperative banks. The total number of banks, initially, collected from Bankscope were 4.573. After the analysis of outliers the sample was reduced to 4.536 banks (2.873 active and 1.663 inactive). In order to create a more homogenous and usable sample, the initial data were filtered and new ratios were calculated. The final data is comprised of 640 banks. The selection criteria were: a) size of assets (more than 2 billion Euros) and b) the ratio of Equity to Total Assets is higher than 10%.

The dependent variable (inactivity) is binary and (1 if the bank is inactive and 0 if the bank is active). A large number of independent variables have been used. More than four metrics of performance (e.g. ROA, ROE, Operating profits,

[2] Recurring Earning Power: is the ratio of Profit before Taxes plus Loan Loss Provision minus Income from Associates and minus Exceptional Income to Average Assets

dividends, etc.), size (assets, loans, growth, etc.), capital structure. Overall the number of independent variables as more than 80. It is useful to analyze the sample using the fundamental characteristics of the corporate environment.

Ownership and type of entity variable shows that the sample is not very different from the one that was described in the second section of the paper (see, Table 6). 187 inactive banks were found and the majority of them are Single location banks. The majority of inactivity is caused by M&As. A small number is caused from liquidation and bankruptcy (see, Table 7).

Table 6: Sample – Entity type

Entity type	GUO*	Single location	Branch locations	Independent companies	Controlled subsidiary	Unknown	**Total**
Active	58	18	16	10	351		453
Inactive	3	159		4	11	10	187
Total	61	177	16	14	362	10	640

Table 7: Sample – Status

Status	**Active, no longer with accounts on Bankscope**	**Dissolved, In liquidation**	**Dissolved (merger)**	**Bankruptcy**	**Total**
Active	450	3			**453**
Inactive		29	156	2	**187**
Total	**450**	**32**	**156**	**2**	**640**

A Good Practice Corporate Governance Index is calculated. The calculation of the index is based on the reported good practices of corporate governance (i.e. duality of roles, audit committee, etc.). The index is the sum of the number of the good practices that were reported. Table 8 shows that majority of the banks involved in a M&A applies none of the good practices. This is an indication that the corporate governance system is weak and perhaps is the underlining factor of the M&A.

Table 8: Sample – Good Corporate Governance Index by Status

Good Corporate Governance Index	Active	Dissolved, In liquidation	Dissolved (merger)	Bankruptcy	Total
0	157	27	142	1	**327**
1	91	4	5	0	**100**
2	128	1	8	1	**138**
3	36	0	0	0	**36**
4	19	0	0	0	**19**
5	15	0	1	0	**16**
6	3	0	0	0	**3**
7	1	0	0	0	**1**
Total	**450**	**32**	**156**	**2**	**640**

The best performance of the index is observed for the controlled subsidiaries (see, Table 9) and the GUO banks. Banks that are more universal or are less ownership concentrated tend to implement a larger number of good practices.

Table 9: Sample – Good Corporate Governance Index by Entity type

Good Corporate Governance Index	GUO	Single location	Branch locations	Independent companies	Controlled subsidiary	Un-known	Total
0	17	162	13	7	119	9	**327**
1	7	6	1	2	83	1	**100**
2	21	8	0	3	106	0	**138**
3	8	0	0	2	26	0	**36**
4	3	0	0	0	16	0	**19**
5	5	1	1	0	9	0	**16**
6	0	0	0	0	3	0	**3**
7	0	0	1	0	0	0	**1**
Total	**61**	**177**	**16**	**14**	**362**	**10**	**640**

The two corporate governance systems of Europe's banks show different ratio of inactivity. In the Continental Europe system the ratio is 30,6%, while in the Anglo-Saxon system the ratio is almost half (17,6%). This finding is consistent with the hypothesis that the banking sector in Europe has gone through a M&A wave.

Table 10: Sample – Inactivity by corporate governance system

	Continental Europe	Anglo-Saxon	Total
Active	397 (69,4%)	56 (82,4%)	**453**
Inactive	175 (30,6%)	12 (17,6%)	**187**
Total	**572**	**68**	**640**

4. Methodology

A probit model is used to achieve two things. The first is to identify the factors that affect inactivity and the second is to create a model that predicts inactivity.

There are a great number of factors that have to be taken into account (seven). The evaluation of the system is even more complex because there are policy, regulating factors or events that there is not precedence. Furthermore the system has to provide a way to be tested and test the hypothesis and provisions of the model.

Table 11 shows the possible outcomes of the system – model. The first and most comprehensible criteria are the Type I, Type II and T total errors. MType I is the ratio of missing signals (i.e. when no early warning signal was issued despite a crisis occurred or else False Positive (FP)) to the number of periods when a signal should have been issued, while Type II is the ratio of wrong signals (i.e. when a signal was issued while no crisis occurred or else True Negative (TN)) to the number of periods when no signal should have been issued. T total is the sum of Type I and Type II errors.

Table 11: Possible Outcomes

		Predicted Class	
		0	1
Actual Class	0	False Negative (0, 0)	True Negative (0, 1)
	1	False Positive (1, 0)	True Positive (1, 1)

The value of these regressions is their ability to create a table of predictability. All of these metrics are informative, but in different ways. For example, the overall percentage quickly summarizes the success of a predictive method in a global sense. However, when there is an extreme imbalance between the two kinds of events being classified, then it is easy to formulate a useless rule with a very high overall percentage – just predict that every event will be the more frequent type. Overall percentage mostly measures success in classifying the more frequent event

type. A method can have very poor predictive success with the low frequency event and still score very highly on overall percentage. Sensitivity addresses success in classifying the event type (crisis) that is probably of most interest to the decision-maker: What proportion of crises are correctly predicted? A tradeoff between success with crises and success with non-crises is necessary. Specificity measures success at predicting non-crises. Sensitivity and specificity are useful tools for the development of a prediction rule. In the development phase, one tests a potential rule on events whose true binary classification is known and assesses how many of each type are correctly classified. A good potential rule should have high success rate in each type. However, it is possible for a predictive rule to have both high sensitivity and high sensitivity and yet be poor at prediction. This seemingly paradoxical situation occurs when there is an extreme imbalance between the two types of events and the potential rule generates a large number of false positives (C). The sensitivity and specificity metrics are supplemented with TPR and TNR, which measure the proportion of predictions that are correct. Indeed, many policymakers may be interested only in the success rate of their predictions. If so, then TPR and TNR are of primary importance. Sensitivity and specificity are retrospective and developmental measures; TPR and TNR are potentially prospective and applicational.

The task to extract signals from indicators can be done by using probit – logit analysis transforms the variable into crisis probabilities (eg. Demirguc Kunt and Detragiache, 1998).

In a discrete choice model, a binary classification set-up first maps various explanatory variables into the probability of a systemic banking crisis, i.e. either a probit or a logit mapping function transforms the variables into a continuous indicator variable between 0 and 1. This indicates the crises or inactivity probability. If the probability exceeds a specified threshold, a signal is issued. A discrete choice model can include one or several indicator variables at a time. While in the case of the multivariate signalling approach a joint condition needs to be fulfilled for a crisis to be signaled (e.g. all indicator variables breaching a specific threshold), in a multivariate discrete choice model each variable included reflects the marginal contribution of that variable. All variables then jointly determine a continuous crisis probability which, when exceeding a specific (optimised) threshold, signals a crisis.

5. Empirical results

A number or regressions have been attempted in order to find a suitable early warning system of

inactivity. These regressions are seeking to find the indicators of inactivity. Three main inactivity causes are examined. The first one is generic and covers the total number of causes, the second examines the indicators for the dissolved or in liquidation banks and the third the main reason – cause, which is the M&As.

In all regressions an indicator of size, performance, ownership, capital structure and corporate governance. Each and every one of these indicators have been identified as compatible with the theories of crises, inactivity and bank failure.

The results of the regressions for all causes or phenomena of inactivity has an overall predictive rate of 88,1%. Alternatively, a different measure of performance has been used (Net Income - Cash Dividends/ Total Equity, Nicdte). This model even though it has high overall predictability, the independent variables (Nicdte) is not statistical important. An alternative for the performance indicator (ROA and ROE) is used to compensate for this problem. The model with ROA has the same predictability, but the performance variable is not statistical important as well. ROE seems to be a better performance indicator (see, Tables 12 and 13).

Table 12: Regression results

METHOD	Optimal Error Criterion	Overall%	Sensitivity = TPR =1-P(Type I error)	PPV = Precision Positive	Specificity = TNR = 1-P(Type II error)	NPV = Precision Negative
Probit regression	0,257	**88,1**	83,2	**76,2**	**90,0**	93,3

Optimal Error Criterion [w ·FP+(1-w) ·FN]/TP, with w=0.5.
Overall% is the overall success rate = 100 ·(TP+TN)/TP+FP+FN+TN).
Sensitivity = TPR = 1-P(Type I error) = 100 ·TP/(TP+FN)
Specificity = TNR = 1-P(Type II error) = 100 ·TN/(FP+TN)
PPV (positive predictive value) = 100 ·TP/(TP+FP) = precision positive
NPV (negative predictive value) = 100 ·TN/(TN+FN) = precision negative

Table 13: Regression Predictors

Predictor	**Probit**	**Logit**	**OLS**
GoodPractIndex	-0,5837***	-1,1769***	-0,1006***
Entity_type	-0,4937***	-0,8712***	-0,1340***
Et	-0,0368*	-0,0684***	-0.0073***

Predictor	Probit	Logit	OLS
Roe	0,0114***	0,0210**	0,0011**
Constant	1,6722***	2,9911***	0,9396***

* p<0.05; ** p<0.01; *** p<0.001

6. Discussion – Conclusions

Bankruptcy has been found to be a phenomenon that doesn't happen often. On the contrary, M&As and liquidation are the main inactivity phenomena. In all other events or causes (total causes, in liquidation, M&As), all groups of indicators (performance, size, ownership, corporate governance) except two (capital adequacy or capital structure and growth) are statistical important. This finding is very important because it shows that emphasis is given on more dynamic indicators (performance and size), corporate governance and ownership.

Capital adequacy and solvency didn't improve, despite the alarming events that took place during the last 10-12 years. Banks have become more restrained in their credit expansion (probably because they were obliged to do so, due to stricter regulation). There are no evidence of financial development or the possibility of reaching the previous levels of profitability and activity (see for example the GGL and ROA ratio).

Especially, the last two groups of indicators that are statistical important (ownership, corporate governance) can be seen as opportunity indicators sue to the fact that the predicted sign is negative. Hence, higher number of corporate governance good practices applied and as ownership concentration is higher or the bank is a subsidiary or independent, the probability of inactivity is smaller. On the contrary, as size and performance gets bigger and better, so does the probability to be a merge target.

Overall, the model has a good predictability ratio and can be used to predict inactivity. The signs of the independent variables are in line with the main stream theories. Hence, the negative signs of corporate governance index (Black et al., 2006; Brown, 2005; ISS, 2005; Standard & Poor's, 2002; Bebchuk et al., 2004; Becht, 1999, the size variable (Et) and ownership status) are consistent with the theory that these factors are factors that play a negative role in implementing strategies of M&As or in creating a more stable and solvent financial environment. The fact that the sign of ROE is positive is due to the fact that high ROE can be seen as an incentive for a M&E.

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