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Content

Machine Learning Algorithms Used for Adaptive Modelling

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Abstract

In the web-based system for assessment we use machine learning algorithms for modeling students' knowledge. We applied clustering of students in similarity groups, attribute (or the most relevant exercises) selection and classification (of students in ability groups) on three different domains. The results of modeling are used for implementation of e-assessment system that adapts to the students needs and knowledge. Decision trees, provide adaptive assessment useful in oral examination and examination of students with special needs. At the same time they provide teachers feedback about the students' learning behavior during the course. From the student's point of view, models provide quick self-examination. Based on the decision tree structure, student can get advice on how to improve his success rate.

The same methodology could be used to model tourist's holyday actiovities, based on his characteristics and preferrences.

 Keywords: Adaptive modelling, e-learning, clustering, decission trees

Introduction

Adaptive modelling has been a popular topic in various areas like hypermedia systems, e-commerce systems, e-learning environments and information retrieval. In order to provide adaptivity, these systems need to keep track of different types of information about their users,. In our case we trace students' knowledge about selected topis [5].

In the paper we present a possible use of machine learning algorithms for modeling students' knowledge

captured in three different domains:. The first domain consist of validated tests of elementary school mathematics [15], [19], second domain consists of tests from introductory course in programming and the third domain is related to common knowledge about European Union (EU). The paradigm of machine learning modeling of solved tests could be used at different levels of education. It can be integrated in web-based system for learning and assessment, based on principles of e-learning [20] and collaborative learning,[22].

After the presentation of the thematic unit by professor (in our case elementary mathematics "Expressions" or "Introduction into programming with programming language Pascal"), we carry out web testing of students with a wider set of exercises in the first phase. The results of wider testing are saved in a common data base. Testing is anonymous and it enables students multiple testing. In the next phase, we try to "discover" knowledge contained in the data base of solved students' tests by means of machine learning. We expect that the data base of students' tests hides the rules of problem solving skills of students and their learning behavior patterns. In the case of EU questionnaire we are modeling common knowledge about EU in the academic environment in Slovenia.

We use the open source software packet WEKA[11]. The following machine learning algorithms are applied:

- o   Clustering: we cluster students with "similar"

knowledge about the topics into ability groups. Results of clustering could be compared to the ability groups, formed by the professor, according to the curriculum for elementary schools in Slovenia.

o Algorithms for attribute selection are used to select effective subset of exercises, which distinguish among differently successful students. By selecting the most quality attributes we expect to select the most quality exercises.

o Classification algorithms are used for effective and unbiased student testing with previously selected exercise set. We compare classification accuracies of different algorithms on the level of input-output mapping.

o Decision trees present the structure of knowledge absorption by students who solved the tests and enable generating tests which adapt to the students knowledge.

The main contribution of the paper is the possibility of building adaptive tests based on the decision tree structure. They could be used as supportive tool by professors for performing oral examination and examination of students with special needs. Adaptive assessment could be used in the both scenarios of traditional assessment: summative (e.g. oral) and formative [25], [26]. Their essential property in the formative context is personalization and quick examination. The both properties are desired for students with short concentration. Adaptive tests also provide feedback information for student how to improve his/her learning success.

From the pedagohical point of view, models proposed in the paper could be used in domains of solved tests from different subjects in primary (elementary), secondary or high schools, especially in the schools with setting and streaming, in accordance with expectation of different knowledge absorption of each ability group. If the e-assessment is performed by many generations and web tests are solved by significant number of students discordance between the models and teacher expectations could reflect generation shift or teachers misunderstanding of importance of particular topics for understanding of the entire unit. If the modeled domain is big enough

(contains many records of significantly solved tests), we expect the models to reflect the structure of the knowledge, basic topics involved in the thematic unit, which distinguish among the ability groups. This could be important information to experts, who compose the curriculum. Gathering and extracting information about the behavior of students during the knowledge absorption is otherwise time-consuming work.

However instead of student knowlede or in adition to it we can gather diferent information about user, as: interests, goals and tasks, background, individual traits and context of adaptation [4]. In order to provide adaptivity on the level of personalization, personalization strategies that are composed of personalization parameters are needed [8]. Personalization parameters represent the users' prior knowledge (or basic interest), other interests, motivation, cognitive abilities, learning styles and so on.

E-learning paradigm

Web-based systems are usually used in distance education, in blended learning or in traditional classroom as a supplement. The system proposed in the paper (fig. 1) could be classified as web-based systems for e-learning or e-assessment. E-learning refers to the use of electronic media and information and communication technologies (ICT) in education. E-learning is including all forms of educational technology in learning and teaching [27]. Computer-aided assessment or e-assessment, ranging from automated multiple-choice tests to more sophisticated systems is becoming a frequently used administrative tool of e-learning systems. Our research is focused on properties of e-assessment used mainly as both contexr as formative and summative assessment. At the same time our system could be used as a part of learning management system (LMS) [20], [21]. The term LMS is here used to describe a wide range of applications that track student training [9].

Machine learning algorithms in e-assessment, state of the art

Many systems for e-learning [1]-[4], [13], [21]-[23] emphasize the importance of personalization of learning environment. Personalization is usually

related to the adaptation of learning materials to the needs and behavior of each student. Materials could be selected from the fixed set of saved documents or extended by web (learning objects). This systems enables distribution of selected learning objects among students with similarities. Collaboration support is also needed in e-learning systems [9]. Creation of learning centric environment is based on the specific characteristics of students and enables communication among students with similar learning behavior [1], [2], [22]. The Internet enables students to be brought together where they can cooperate in learning in groups without space and time limitations. It is, however, quite a challenge to form ideal groups in a short time and ensure satisfactory interaction for students in cyberspace. One of the research challenges in the educational data mining[1] is to help teachers to improve group-learning in e-learning by first establishing effective groups with rules based on data mining, and then facilitating student interaction using a system that monitors members' communication status [22].

The assessment of students is the e-learning issue most commonly tackled by means of data mining methods[2], which mainly means application of machine learning algorithms. Some of the mains e-learning subjects to which data mining techniques have been applied are dealing with the assessment of student's learning performance, provide course adaptation and learning recommendations based on the students' learning behavior, improvement of student's problem solving skills, dealing with the evaluation of learning material and educational web-based courses, providing feedback to both teachers and students of e-learning courses, and detection of atypical student's learning behavior [1], [7], [9], [10], [12], [13], [17], [20]-[26]. Some modern adaptive learning systems adapte the learning environment on the basis of leaning style characteristics of the students [2], [18].

From the e-learning point of view data mining

applications in e-learning could be divided into the following categories [7]:

1. Applications dealing with the assessment of students' learning performance.
2. Applications that provide course adaptation and learning recommendations based on the students' learning behavior.
3. Approaches dealing with the evaluation of learning material and educational Web-based courses.
4. Applications that involve feedback to both teachers and students of e-learning courses, based on the students' learning behavior.
5. Developments for the detection of atypical students' learning behavior.

We range our approach into categories 1 and 4.

Our approach: integrating machine learning models into the learning environment

Our system enables not only personalization of learning materials but also personalization student's assessment or testing which adapts to her/his current knowledge [15], [16]. By application of machine learning algorithms we are trying intrinsically to model the mechanisms of knowledge absorption trough the process of adoption of particular thematic unit in the defined learning environment.

Learning environment is not only classroom and it is strongly influenced by social, demographical, economical properties of the student's surrounding. In other words, purposes of the modeling are: investigation of behavior patterns of students in the process of knowledge absorption, selection of the subsets of exercises, which effectively rate the students, and giving feedback information to professors about their achieving of particular learning objectives. After all, by investigation of the classification structure we can gain information about the "difficulty" of the particular topics and by this indirectly estimate how successful they have been presented (if they had been presented in classroom), how important they have been for understanding of complete unit, how useful the learning materials have been for understanding the topic etc. It is difficult to distinguish between the factors that influence knowledge absorption.

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[1] Educational Data Mining (EDM) describes a research field concerned with the application of data mining, machine learning and statistics to information generated from educational settings (e.g., universities and intelligent tutoring systems) [27].

[2] In our research we rather use the term "machine learning" then "data mining" because the modeling is realized on relatively small datasets.

In the given paradigm of e-learning (FIG 1) we have "Presentation of the thematic unit (professor)", except in the case of EU union questionnaire, where the knowledge is mainly adopted from electronic information sources, traveling, as common and specific knowledge, and by individual's interest on this topic.
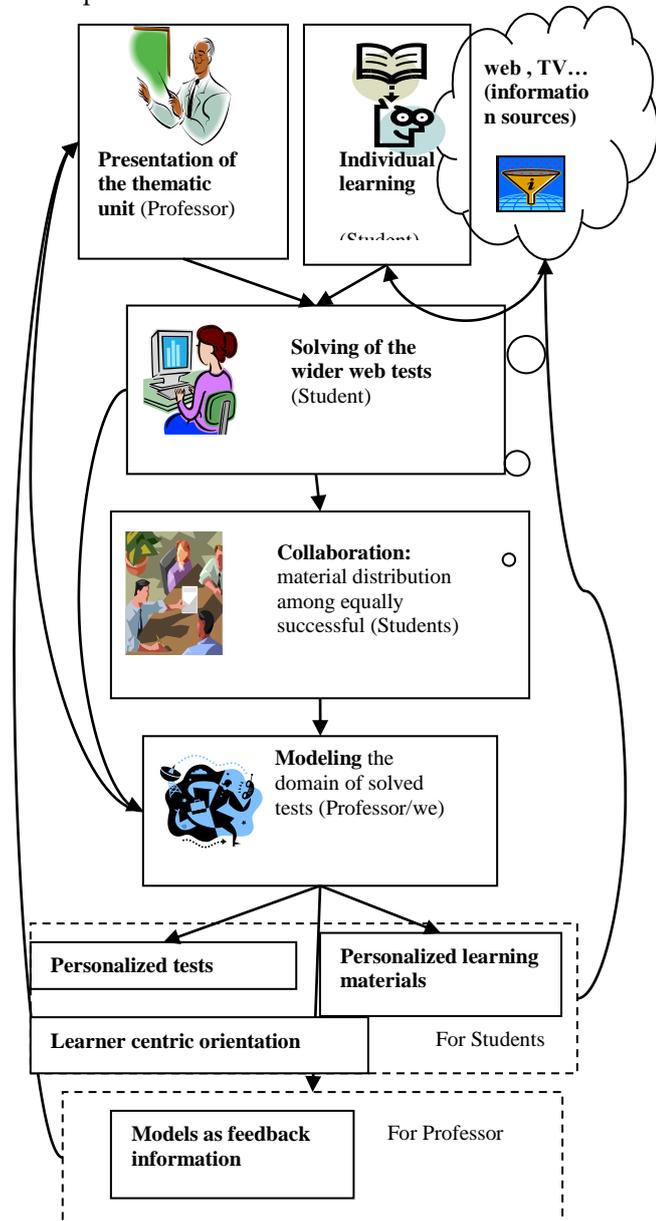
FIG 1 STRUCTURE OF THE WEB-BASED SYSTEM FOR E-ASSESSMENT.

Domains

We use machine learning methods on three different methods: domain of elementary school mathematics "Expressions", domain on "Introduction into programming" in higher education and knowledge about European Union domain [6], [15], [16], [30], [31]. Questions of type: "choose correct answer" or "fulfill the answer" are solved for each domain.

The values of the attributes are numerical (except the attribute class which is descriptive) and they present achieved points of an individual student for each individual question. The maximum number of points for the test was 100. Attribute Success is the rating of student into three classes as regards the points achieved on the test.

Domain of elementary school mathematics

The system for generation of adapted tests for the students was tested on domain of validated mathematical web tests for the thematic unit Expressions, which is a part of curricula of the 9th grade of elementary school inside the wider theme Arithmetic and Algebra. The testing was performed in two elementary schools in Slovenia. The tests were composed according to didactic standards and curriculum. Solved tests were anonymously stored into MySQL database.

Domain on introduction into programming

The wider test was made of 13 exercises and it was tested on domain of validated knowledge in the first programming language (Pascal). The testing was carried out at the Faculty of Education, University of Ljubljana, in the programming course for computer science students.

Our goal was to find out, how is the knowledge about different concepts in the first programming language connected and to build a representative adaptive testing. Solved tests were anonymously stored into MySQL data-base.

European Union knowledge domain

The domain of EU consists of web-inquire results. Questionnaires were sent to students and teaching staff on a program study of computer science at the Faculty of Education. Fulfilled questionnaires were anonymously stored in MySQL database.

In the database we have collected 120 solved web tests. The questionnaire/test contained 20 exercises each of them marked with 5 points.

Machine Learning Experiments

Clustering

We perform clustering to take insight how students are clustered into classes (clusters). We make clustering in two ways: with or without a priori given number of clusters. In the first experiment, we leave to the learning algorithm to choose relatively small group of classes (clusters), which contain similar instances [12], [14]. We compare the results of clustering with the results of classical marking and find that clusters' structure doesn't coincide with results of tests' evaluation.

For clustering students into successfulness groups we used two algorithms: k-nearest neighbors [12] and algorithm called expectation maximization (EM) that is based on probability density estimation [29].

We will explain the results of clustering on the domain of EU. We compare the results of clustering into 3 classes with the test results obtained with marking. K-nearest neighbors classifies many Sufficient students into the class Not Sufficient. Surprisingly, for some students algorithm suggested new class and there is no cluster Excellent.

EM algorithm is generalization of k-nearest neighbors and it is based on the estimation of the probability density of the clusters. EM classified students into 6 classes by breaking the class of Sufficiently marked students into smaller clusters. In the experiment with given number of clusters (3), EM algorithm didn't create cluster for Excellent students.

Selection of quality exercises

We use algorithms for attribute selection for selecting a small set of exercises, which influence the students' success. For estimation of the exercises' quality in [15] we used two algorithms: ReliefF [19] and algorithm used for calculating attribute weights in the Support Vector Machine (SVM) method [8]. By quality estimation we indirectly check the proposition if the questions which are not answered correctly by the majority (difficult questions) are important for rating.

We find that ReliefF as quality exercises selects exercises correctly solved by majority, but SVM select more difficult exercises or exercises, correctly solved by excellent students.

Classification as marking

On the level of input-output mapping we could test the classification accuracy of different classification algorithms. First we only try only the accuracy of the model and we do not analyze the structure of the model or include the expert knowledge (professors' experiences) into the model. We compare the accuracy of the following classification methods: decision trees, feed-forward neural networks multilayer perceptron (MP) and support vector machine (SVM).

Decision trees, because of the transparency of their structure, offer explanation of the classification (or rating) and at the same time they are good foundation for generation of personalized tests/tests which adjust to the students' level of knowledge. If we model the domain of solved tests after the presentation of particular thematic unit [15], [16], decision trees are good feedback information for teacher of how successfully they have presented the unit to their pupils. Unfortunately their classification accuracy is much worse then accuracy of SVM [8]. Therefore for performing of quick testing we propose exercise selection (with ReliefF) and classification with high accuracy algorithm, e.g. with SVM.

Conclusions

We modeled the students' knowledge captured in the tests on knowledge about the European Union, on primary school mathematics and on introductory course of programming for computer science students. We used algorithms for clustering, attribute selection and classification.

TABLE 1: CLASSIFICATION ACCURACY (IN %) OF ALGORITHMS ON EACH DOMAIN (10-FOLD CROSS VALIDATION/WHOLE TRAINING SET)

Domain/Method	Decision tree	ε-SVM	MP
Expressions (math.)	76/100	83/100	76/100
Programming	95/98	96/100	93/100
EU knowledge	88/96	93/100	90/95

We compared the results of clustering with the results of rating according to the sum of points achieved with traditional assessment. Clusters created with purposed algorithms could not be compared to rates of successfulness. We discussed the behavior of students,

who are "rated" by the algorithm EM into cluster with better rate. So they are rated differently then they should be by the criteria of achieved points. For these students we expose the need of personalized learning and training. For students rated by the sum of points worse then they would be classified by EM algorithm, we suppose, have bad motivation, nonattendance in teaching and/or superficiality. We tried to improve the deficiencies mentioned with the consolidation of important topics, which are problematical for particular student. At the same time we see opportunity to use the clustering paradigm for forming students' clusters with similar learning behavior (e.g. in schools with setting and streaming). These students could help each other to understand some concepts by collaboration, exchange literature, useful URL-s, advices…

By means of algorithms for attribute selection we can help professors to realize representative oral assessment or tests for quick and effective assessing for pupils with special needs. The SVM method achieved the best classification accuracy. Decision trees are interesting models not only because they are predictors but because of the transparency of their structure. As models, they are interesting for teachers as feedback information about the knowledge absorption in classroom or about the learning behavior of their students. At the same time, with absorption of knowledge also the nature of the knowledge is captured. Certain questions (parts of material) are more difficult then the others and need more attention and efforts to be understood. The social structure of students also influences the knowledge absorption (tree structure).

For students, they are interesting as paradigm for personalized test generation (Figure 2, Table 2). The system is asking the student in successive order, one exercise after another. In the background, the algorithm is following the structure of decision tree. The question/exercise in the root of the tree is given to all students. After they answer particular question, the algorithm chooses the next one regarding to the correctness of the current answer. The testing is finished after the leaf of the tree is reached. It means that the student's knowledge is rated.
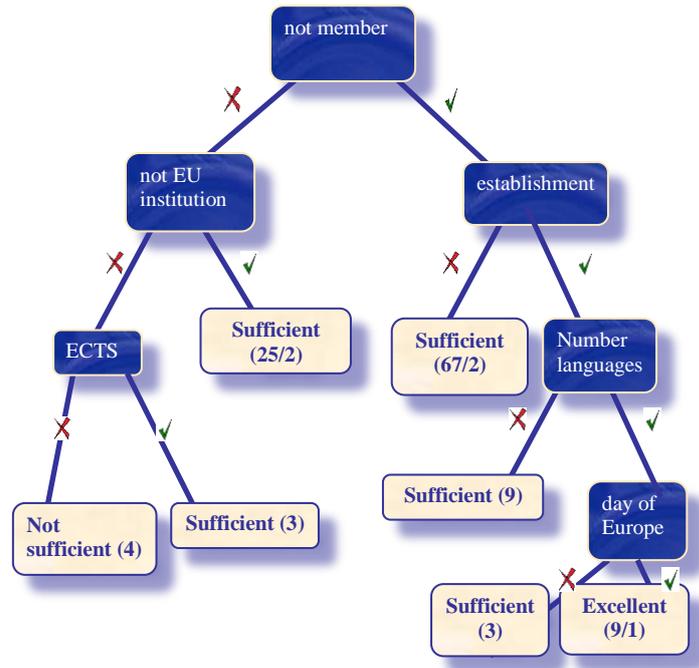
FIG 2 DECISION TREE ON THE DOMAIN OF EU.

TABLE 2: LEGEND OF DENOTATION.

mark of the leaf	number in the brackets	joint number of classified instances/incorrectly classified instances
excellent		9/1
sufficient	number of classified instances in separate leaf of the tree	103/4
not sufficient		4

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Income Inequality Measurement in Greece and Alternative Data Sources: 1957-2010

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Abstract

The main objective of this paper is the estimation of income inequality in Greece for the period 1957-2010. Alternative income sources are used for the estimation of aggregate and disaggregate measures. Empirical evidence from tabulated tax data indicates an increase on aggregate income inequality. This view is not supported by estimates derived from other data sources (i.e. Household Expenditure Survey). The level of aggregate inequality, also, differs from other empirical results. These findings imply that different data sources and/or methodological approaches could lead to different conclusions for the direction and/or level of aggregate income inequality. Nevertheless, top income shares yield similar trend (for certain periods) and level (to the possible extend) regardless the data sources. This view is consistent with [1] that top income shares may be a useful substitute for other measures of inequality.

Keywords: Income Inequality; Top Income Shares; Greece

Introduction

This paper provides empirical evidence for income inequality in Greece. Alternative data sources and methodologies are applied and inequality measures are provided. More specifically, empirical time-series evidence on economic inequality from grouped tax data will be presented. The time period of the analysis is from the year 1957 to the year 2010. In the next section micro data from EU SILC for the period 2002-2010 are utilized. In all cases corresponding evidence from other countries are presented. Empirical findings from other studies utilizing other sources [European Community Household Panel (ECHP) and Household Expenditure Survey (HES) micro data] are also discussed. Then a comparison for all results of aggregate income inequality is conducted. The summary of the empirical findings are presented in the last section.

AGGREGATE MEASURES OF INCOME INEQUALITY FROM GROUPED TAX DATA

Estimation of aggregate measures of income inequality from grouped tax data

Tax data provide detailed information on nominal family income and its sources, as reported annually in tax declaration forms. Family income is the sum of income received by the husband and/or wife. This definition also includes single persons. These data are compiled by the Tax Authorities and have been published annually by the National Statistical Service of Greece (NSGG, now ELSTAT) since 1958. From 2003 onwards the publication is conducted by General Secretariat of Informatics Systems of Ministry of Finance.

Total family income is the sum of one or more of the following components:

- Income from employment
- Income from buildings and lease of land
- Income from securities
- Income from commercial and industrial enterprises
- Income from agricultural enterprises
- Income from self-employment
- Income from abroad

The tax declarations are submitted in the following year of the year of reference. The term 'economic year t' refers to income that was acquired in the previous year. Thus, 'economic year 2011' refers to the calendar year 2010. Tax data are reported in tabulated form (grouped tax data). During the whole period the number of classes has changed, being more analytical in the latter years. For more details on Greek tax data see [2].

The following summary inequality measures have been estimated for the declared income of the physical persons (grouped tax data).

- Gini Coefficient (G)
- Relative Mean Deviation (M)
- Atkinson Index (ε=0,5)
- Atkinson Index (ε=1,5)
- General Entropy (GE(0)=Theil's L or Mean Log Deviation) (a=0)
- General Entropy (GE(1)= Theil's T) (a=1)
- General Entropy (GE(2)=type of Coefficient of Variation- CV) (a=2)

The choice of these indices is based on the underlying properties. Furthermore, these aggregate indices are widely used for the empirical measurement of inequality.

The distribution of the data within each class is not known. This issue is being tackled using interpolation methods [3]. Two interpolation methods were used: the split-histogram interpolation method and the linear interpolation method. The mean value of the computation of these two techniques provides the final estimation of the measure. The lower and upper bounds of the estimation have been also compiled. The compiled index of Relative Mean Deviation refers only to lower bound. Figure 1 presents the estimated time series of each individual index.

The evolution of these alternative inequality indices estimated for Greece for the period 1957-2010 (reference years) shows that:

Both Atkinson indices yield almost the same results, indicating an increase in income inequality. Atkinson (0,5) and (1,5) are 0,150620 and 0,313287 respectively for the year 1957 and 0,237057 and 0,912739 respectively for the year 2010. However A(0,5) shows a rather constant trend till early 1990 while A(1,5) not.

Mean Log Deviation (GE(0)) implies a continuous increase of income inequality for the whole period, with values of 0,282220 and 0,812106 for the years 1957 and 2010.

Theil's Index (GE(1)) suggests, a mixed pattern since it decreased till late `80s then increases till late `90s and then is almost stable. It starts at 0,392954 in 1957 and reach the level of 0,459359 in 2010.

The monotonic transformation of Coefficient of Variation (GE(2)) suggests also a mixed pattern: a decline of inequality till mid `80s, then a constant trend till early `90s and an increase afterwards. It, also presents cases of outliers, especially for years 1957, 1973 and 1974.

Gini coefficient implies an increase of inequality. It arises from 0,413949 in 1957 to 0,501893 in 2010. The upward trend seems to take place from the early 1990s, being relatively steady in the previous period.

Relative Mean Deviation suggests an increase as well, starting with a value of 0,591613 in 1957 and reaching the level of 0,719574 in 2010. The upward trend, as in the case of Gini, emerges from the early 1990s.

According to the empirical findings, six indices indicate an increase of income inequality while one (GE (2)) indicates the opposite (decrease).
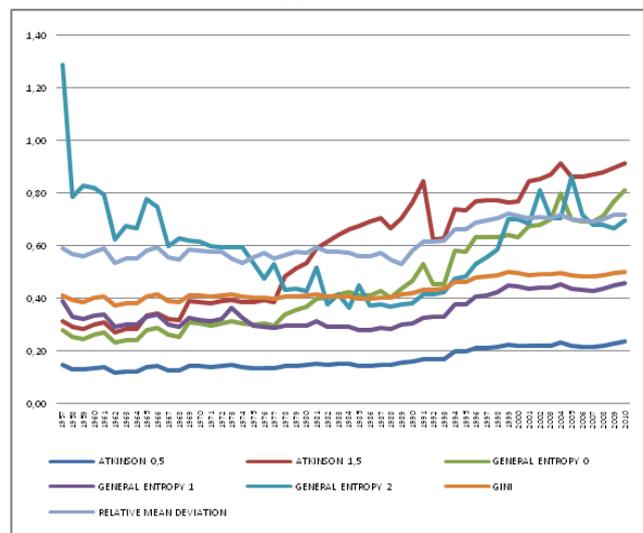

FIG. 1. AGGREGATE INEQUALITY MEASURES FOR GREECE, 1957-2010

International experience

There is an enormous amount of empirical research on income inequality. As a result several cross-national datasets have been compiled; for a review, see [4]. Some of the most influential projects are the

Luxemburg Income Study (LIS), the dataset compiled by [5], the World Income Inequality Database (WIID) created by [6] and its successor (WIID2), the Standardized Income Distribution Database (SIDD) (compiled by [7]) and the Standardized World Income Inequality Database (SWIID) compiled [8].

The comparison of Gini 's estimates (grouped tax data) for Greece is conducted with two country groups (SWIID ver. 3.1). The first group consists of South European countries such as Italy, Spain, Portugal and France (although France could be considered part of Central Europe). The second group includes countries from Central and North Europe (Germany, Switzerland, Netherlands and Sweden) as well as UK and USA.

The results of the comparison of Greece with the first group (Italy, France, Spain, Portugal) are presented in the Figure 2. Looking at the whole period, aggregate income inequality in Greece is lower than Portugal, higher than Spain (with the exception of late 60s and mid-70s), France (with the exception of first half of 90s and second half of the decade of 2010) while is lower than Italy until 1980 and higher from mid 90s and onwards. It is noticeable that Gini coefficient is in higher level in Greece from the mid 1990s with the exception of Portugal and partly France; in France is higher only in the second half of the last decade.
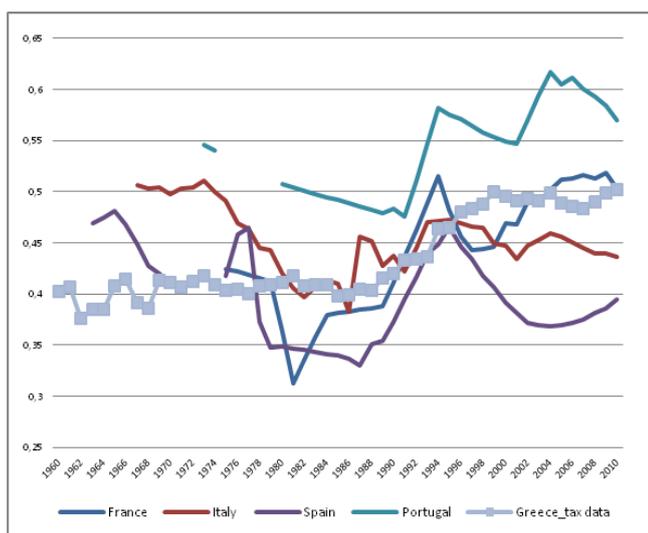
FIG. 2. INTERNATIONAL COMPARISON I – GINI COEFFICIENT

The outcome of the comparison of Greece with the second group (Germany, Switzerland, Netherlands, Sweden, UK and USA is presented in the next Figure 3. Until 1980, inequality in Greece is higher than in UK

and in the same levels with USA (though in USA is higher prior to 1970) and lower than other countries with the exception of certain years (almost equal for Germany in 1972 and 1977, Sweden in 1975 and Netherlands in 1973 and 1977) or periods (lower in Sweden in the late 60s). In the decade of 1980 inequality in Greece is higher only compared to Netherlands and partly Germany (only for the first half of the decade) and in the same level with Switzerland and partly USA and UK (both in the beginning of the decade). Greek Gini increases more intensely in the beginning of 90s. In the second half of 1990s aggregate income inequality in Greece is higher than every country. It is exceed only by Germany (late 90s) and Netherlands (early 00s). Finally in the second half of the last decade the level are similar to UK and slightly above USA, Sweden and Switzerland.
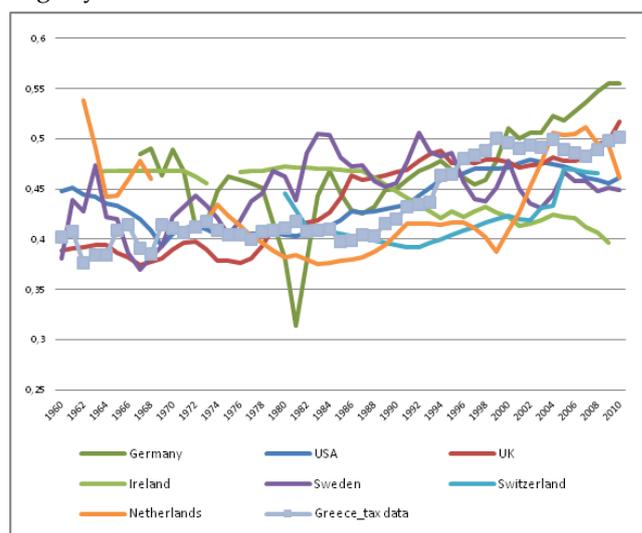
FIG. 3. INTERNATIONAL COMPARISON II – GINI COEFFICIENT

The broader conclusion could be that after the mid 1990s aggregate income inequality in Greece is in high levels compared with other countries, while it was a 'medium' case in the previous period.

AGGREGATE MEASURES OF INCOME INEQUALITY FROM EU SILC DATA

Estimation of aggregate measures of income inequality from EU SILC data

The European Union has set up a survey for collecting data on income, poverty, social exclusion and living conditions. The European Union Survey on Income and Living Conditions (EU SILC) includes micro data on income on household and personal level that can be used for the estimation of income distribution. This

survey replaced the European Community Household Panel (ECHP). The EU SILC project was launched in 2003 for Greece. The data are produced on annual basis and the reference population is all private households and their current members residing in the territory of the Member State at the time of data collection. The year of the survey contains data for the previous year; thus survey for 2011 illustrates information for the year 2010 (reference year).

These variables describe the concept of income on household level. The size of the household and the age of its members are important factors, therefore the use of an equivalence scale is appropriate. In this study the "OECD-modified scale" is utilized. This scale, first proposed by [9], assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child.

The time period of the analysis is from the year 2002 to the year 2010 (reference years).

The variable used for the estimation of income distribution is the 'Total net household income'. This variable includes net income on household level taking into account, also, components of personal net income; it is noted that we do not take into account the negative values in the variable net cash benefits or losses from self-employment (including royalties). It has been adjusted for the size of household and the age of the members of household with the OECD-modified scale.

The indices that indicate the gap between the income shares of certain portions of population are S80/S20 and S90/S10, which is simply the ratio between the income share of upper and lower income classes. There has been a small decrease in both indices; nevertheless the trend is not stable for the whole period. The decrease is more obvious in the year 2009 especially for S90/S10. Both ratios indicate increase for the year 2010. This implies that the recession, which is more apparent from 2009, seems to affect the distribution of income with ambiguous results.

The behavior of the aggregate inequality indices (GINI, Atkinson (0,5), Atkinson (1,5), General Entropy (0), General Entropy (1), General Entropy (2) and Coefficient of Variation) is rather stable with miniscule decline. In all cases the absolute values are slightly changing in both directions (increase or decrease); nevertheless, in all cases a small decrease is noted

from 2008 to 2009 and a small increase from 2009 to 2010. This element, also, implies a miniscule decline in inequality in the beginning of economic recession in Greece and a small increase onwards.

Figure 4 contains the indices of S90/S10 and S80/S20 and Figure 5 illustrates the trend of the seven aggregate inequality indices.
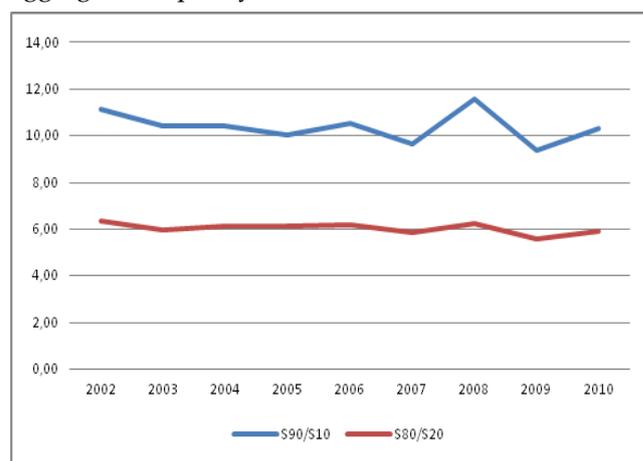
FIG. 4. S90/S10 AND S80/S20 FOR GREECE (EU-SILC DATA)
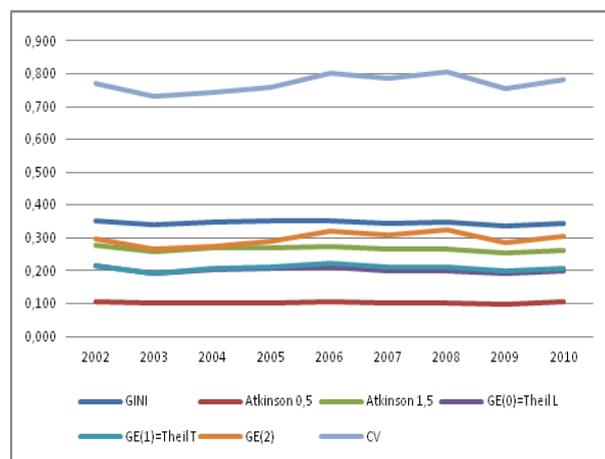
FIG. 5. AGGREGATE INEQUALITY INDICES FOR GREECE (EU-SILC DATA)

International experience

The main variable used in this paper for the estimation of income distribution is the 'Total net household income', which incorporates the net components of household income without taking into account negative values for net cash benefits or losses from self-employment (including royalties). This variable is slightly different in interpretation and in compilation procedure from the corresponding one (Total disposable household income (HY020)) used by ELSTAT.

Figures 6 and 7 illustrate the ratio S80/S20 and Gini coefficient for total disposable household income for Greece and European Union 27 and Euro Area 17. The reason for the sort period for comparison is due to the lack of data for European averages.
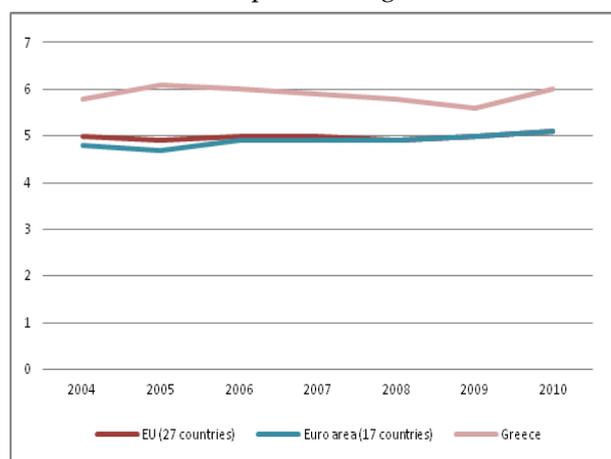
FIG. 6. S80/S20 – INTERNATIONAL COMPARISON I (EU-SILC DATA)
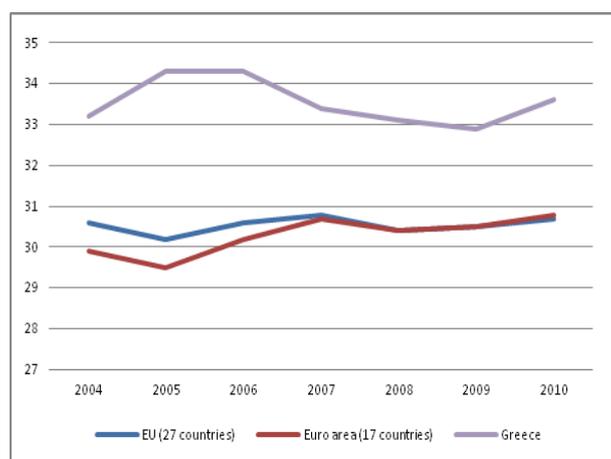
FIG. 7. GINI COEFFICIENT – INTERNATIONAL COMPARISON II (EU-SILC DATA)

The empirical findings indicate that aggregate income inequality in Greece is in higher level than the average of both European Union and Euro area.

RESULTS FROM OTHER DATA SOURCES

Household Expenditure Survey (HES)

Micro data from Household Expenditure Survey (HES) have been utilized for the estimation of income inequality. According to [10] available data exist for the HES of 1974, 1981/82, 1987/88, 1993/94, 1998/99, 2004/05 and 2008. The concept of income includes monetary incomes from all sources, such as wages,

self-employment earnings, pensions, rents, interest payments dividends, cash benefits (net of tax paid). Moreover, the definition of income includes the non-cash components, namely, imputed rents, other non-cash incomes (consumption of own farm and non-farm production, in-kind transfers from other households and fringe benefits). Adjustments were made for the size of the household; the equivalence scale used was 1,0 for head of household, 0,5 for other member above 13 years and 0,3 for under 13 years.

It should be noted that the authors compile, also, the distribution of consumption expenditures and they state that income information from HES is considered less reliable from ELSTAT. Nevertheless the results regarding inequality do not differ substantially using the two alternative definitions. Other researchers utilize only consumption data [11].

Tables 1-3 present aggregate and disaggregate inequality measures based on HES income micro data.

TABLE 1. INCOME SHARES FROM HES MICRO INCOME DATA

INCOME SHARES	1974	1982	1988	1994	1999	2004	2008
1	2,3	3,2	3,0	3,1	3,0	3,5	3,7
2	4,0	4,9	4,8	4,8	4,7	5,1	5,2
3	5,1	6,0	6,0	5,9	5,9	6,1	6,2
4	6,1	7,0	7,0	7,0	6,8	7,1	7,1
5	7,2	8,0	8,0	8,1	7,9	8,1	8,2
6	8,4	9,1	9,1	9,3	9,0	9,3	9,3
7	9,9	10,4	10,5	10,6	10,4	10,6	10,5
8	12,0	12,2	12,3	12,3	12,1	12,2	12,1
9	15,3	14,8	15,0	14,9	15,0	14,7	14,6
10	29,7	24,3	24,4	24,0	25,1	23,2	23,3
1 TIS	2,3	-	3,0	3,1	-	3,5	-

TABLE 2. AGGREGATE INEQUALITY MEASURES FROM HES MICRO INCOME DATA

	1974	1982	1988	1994	1999	2004	2008
GINI	0,382	0,309	0,314	0,310	0,322	0,292	0,288
VAR. OF LOG. (L)	0,497	0,314	0,339	0,322	0,346	NA	NA
THEIL (T) INDEX	0,274	0,170	0,176	0,170	0,187	NA	NA
MLD (N)	0,255	0,161	0,170	0,163	0,177	NA	NA
ATKINSON (0,5)	0,123	0,079	0,082	0,079	0,086	NA	NA
ATKINSON (2,0)	0,407	0,274	0,295	0,279	0,300	NA	NA

Furthermore, [10] estimate the Gini coefficient without imputed personal income from HES. As expected coefficient is larger.

TABLE 3. GINI FROM HES MICRO INCOME DATA WITHOUT IMPUTED COMPONENTS

	1994	1999	2004	2008
GINI	0,340	0,347	0,325	0,310

European Community Household Panel (ECHP)

The European Community Household Panel (ECHP) is a survey based on a standardized questionnaire covering a wide range of topics such as income, health, education etc. The survey was launched in 1994 and ended at 2002. According to Eurostat the characteristics of ECHP is the multi-dimensional coverage, the cross-national comparability and the longitudinal or panel design. The definition of income refers to total household income. Total household income is taken to be all the net monetary income received by the household and its members at the time of the interview (t) during the survey reference year (t-1).This includes income from work (employment and self-employment); private income (from investments, property and private transfers to the household), pensions and other social transfers directly received. No account has been taken of indirect social transfers (such as the reimbursement of medical expenses), receipts in kind and imputed rent for owner-occupied accommodation. In order to take into account differences in household size and composition in the comparison of income levels, the amounts given are per "equivalent adult". It should be noted that equivalised income is defined on the household level, so that each person (adult or child) in the same household has the same equivalised income. The year of the survey contains data for the previous year; thus survey for 2002 illustrates information for the year 2001.

The empirical findings for the Gini coefficient and for the S80/20 ratio are presented in Table 4.

TABLE 4. GINI COEFFICIENT AND RATIO S80/20 FROM ECHP MICRO DATA

	1994	1995	1996	1997	1998	1999	2000	2001	2002
GINI	0,37	0,35	0,34	0,35	0,35	0,34	0,33	0,33	0,35
S80/20	7,6	6,5	6,3	6,6	6,5	6,2	5,8	5,7	6,6

COMPARISONS

In the previous sections different data sources and methodological approaches have been applied for the estimation of income inequality in Greece. Moreover, results from other selected studies have been presented. The main differences can be categorized as follows:

• Data sources: Grouped tax data, Household Expenditure Survey (HES) micro data, European

Community Household Panel (ECHP) micro data and European Union Survey on Income and Living conditions (EU-SILC) micro have been used

• Methodology: There are certain variations in the methodology applied. The usage of grouped or micro data dictates the application of different statistical specification of the aggregate inequality indices (interpolation techniques have, also, been used in the case of grouped tax data). Moreover different compilation procedure was employed in the case of top income shares in tax data (interpolation techniques, control total for population and income).

• Unit of analysis: The unit of analysis is the household in all cases. The equivalence scale is only used when micro data are available.

• Income: The definition of income is not the same for every data source. For instance, studies using HES include also items of imputed person income.

Despite these differences it is interesting to compare the alternative empirical findings.
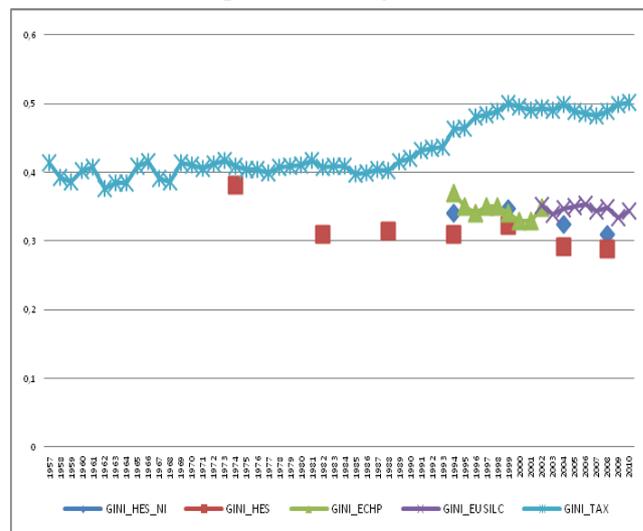
FIG. 8. GINI COEFFICIENT FOR GREECE FROM VARIOUS DATA SOURCES

Note 1: Gini_HES_NI: Gini from HES micro data with no imputed personal income items – [10]

Note 2: Gini_HES: Gini from HES micro data – [10], [12], [13]

Note 3: Gini_ECHP: Gini from ECHP micro data - ELSTAT various bulletins, Eurostat website

Note 4: Gini_EU SILC: Gini from EU-SILC micro data – authors' calculations

Note 5: Gini_TAX: Gini from grouped tax data – authors' calculations ([14] approach)

Figure 8 illustrates the results for the estimation of Gini coefficient from tabulated tax data and micro data

from HES, ECHP and EU-SILC.

Gini coefficient derived from tabulated tax data (GINI_tax) is in higher level compared with all other cases. As expected Gini from HES micro data (GINI_HES) yields the smaller values, since it includes non cash components. For the common period (1994-2008) small differences appear among alternative estimates (ECHP, HES and EU-SILC) of Gini (probably mainly due to different definitions). In detail, we notice that data from HES with no imputed personal income (GINI_HES_NI) result in higher values of the coefficient. The coefficient is both lower (1994) and higher (1999) compared with the corresponding one from ECHP data (GINI_ECHP). Furthermore, Gini is higher (compared to HES in 2004 and 2008) when is derived from EU-SILC micro data (GINI_EU SILC).

According to HES data, there is an impressive decrease from 1974 to 1982. For the period 1982-1999 the level of the income inequality does not alter significantly. On the contrary a decreasing trend exists for the period 1999-2008. The trend is similar for HES data when imputed personal income is not included for the period 1994-2008: a small increase is detected for 1994-1999 followed by a small decrease for the remaining period. Micro data from ECHP indicate a relative constant trend for the period 1994-2001. The coefficient derived from EU-SILC micro data yields a rather constant pattern until 2006 and presents a slight decrease until 2009 followed by a small increase for 2010. On the contrary, Gini coefficient from tabulated tax data implies an increased inequality. The upward trend seems to take place from the early 1990s, being relatively steady in the previous period.

Gini from tax and HES data show a similar trend for the period 1982-1988, while trend similarities exist for the period 2000-2010 for all cases (with small variations as described previously).

Figures 9-10 illustrate the results for the estimation of the upper shares of income distribution from tabulated tax data and micro data from HES and EU-SILC. The 10%, 1% , 0,5% and 0,1% top income shares (tis) are presented (only the first two cases are available for HES data).
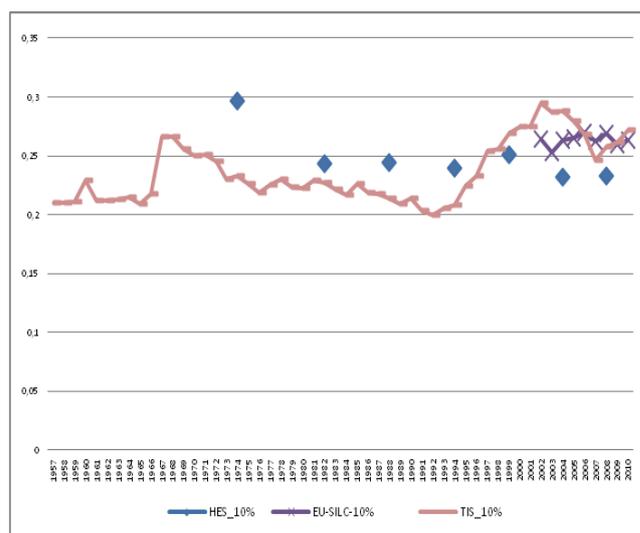
FIG. 9. 10% TOP INCOME SHARES FROM VARIOUS DATA SOURCES

Note 1: HES_10%: 10% TIS from HES micro data – [10]

Note 2: EU SILC_10%: 10% TIS from EU-SILC micro data – authors' calculations

Note 3: TIS_10%: 10% TIS from grouped tax data – authors' calculations ([14] approach)

The top 10% derived from micro HES data is around 30% in 1974, drops drastically in 1982 (24,3%) and then it remains relatively stable for the period 1982-1994 (between 24%-24,3%). A slight increase in 1999 (25,1%) and then a decrease from 2004 onwards (23,2 and 23,3) is detected for the period 1994-2008. In general the trend for the period 1982-2008 is rather constant. Micro data from EU-SILC indicate a relative constant trend (with minor fluctuations) for the period 2002-2010, where 10% top income share is approximately 26% with lower value in 2003 (25,3%) and higher value in 2006 (27%). The top 10% share derived from tabulated tax data [according to [14] approach – for more details see [2]] initiates from a value of 21% (year 1957) and ends up around 27,2% (year 2010). TIS_tax is relatively constant until the late sixties; after this period there is an increase for some years. From the mid 1970s the share declines and is in the level of 21%-22% until the end of 1980s. In the beginning of the next decade the income share of the 10% rises exceeding the initial levels. This trend seems to be interrupted in 2002-2003 and it continues rising after 2008.

We notice that 10% top income share derived from tabulated tax data and micro data from HES and EU-SILC do not yield such differences as in the case of

Gini coefficient. This justifies the generally adopted argument that tax data can be used for estimation of top income shares. The level of 10% top share from HES micro data is higher until 1994 and lower for the remaining period. The corresponding values derived from EU-SILC micro data are in lower level for 2002-2005, 2009-2010 and higher for 2006-2008. Moreover, EU-SILC values are above HES values both in 2004 and 2008 (years that HES data are available). This could be attributed mainly to the whole advanced methodological structure that EU-SILC adopts.
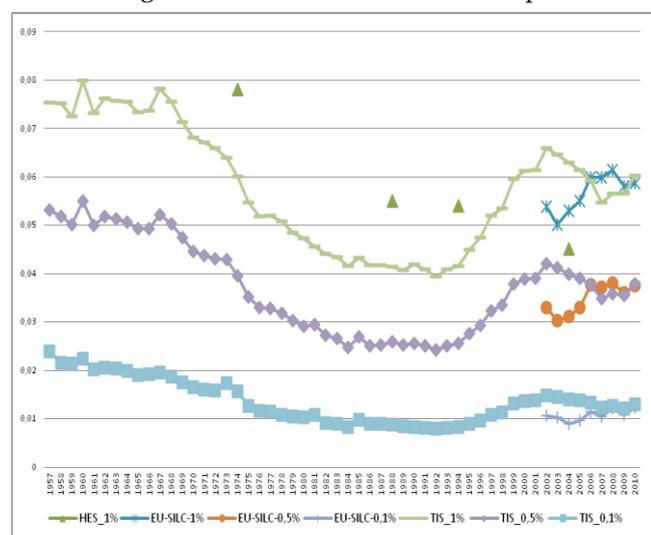

FIG. 10. 1%-0,5%-0,1% TOP INCOME SHARES FROM VARIOUS DATA SOURCES

Note 1: HES_1%: 1% TIS from HES micro data – [15]

Note 2: EU SILC_1%-0,5%-0,1%: 1% - 0,5% - 0,1% TIS from EU-SILC micro data – authors calculations

Note 3: TIS_1%-0,5%-0,1%: 1% - 0,5% - 0,1% TIS from grouped tax data – authors' calculations ([14] approach)

Figure 10 illustrates the empirical findings for the 1%, 0,5% and 0,1% of top income shares.

The 1% top share from HES data is 7,8% in 1974 and drops to 5,5% in 1982. It remains almost unchanged for 1984-1988 (5,4%) and it decrease for the period 1988-2004 (4,5%). EU-SILC data indicate a small decrease from 2002 to 2003 and then a gradual increasing trend which seems to be interrupted in 2008 and re-emerged in 2010. The top 1% share from tabulated tax data initiates from a value of 7,5% and ends up around 6%. The level is relatively constant until the late sixties; after this period a slow but steady decline emerges. This trend remains until the beginning of 1980s; during this decade the top 1% is

around 4%. In the beginning of the next decade the income share of the 1% rises without nevertheless reaching the initial levels. This trend seems to be interrupted in 2002-2003 and it re-emerges in 2008.

Three out of four HES give us estimates of top 1% at higher level than that of tax data. Data from EU-SILC yield a different pattern compared to the tax data for the period 2002-2010 despite the fact that respective values are quite similar for 2006, 2009 and 2010.

The 0,5 % and 0,1% top income shares are available for tax and EU-SILC data. Both for 0,5% and 0,1% top income shares the estimates for the period 2006-2010 are quite comparable. There are differences for previous common years. This diversity is rather attributed to the reasons mentioned at the beginning of this section.

CONCLUSIONS

This paper provides empirical evidence for income inequality in Greece. Various data sources and statistical techniques have been used for the compilation of aggregate and disaggregate measures of income inequality. Furthermore, empirical findings from other studies have been presented and compared.

Tabulated tax data for the period 1957-2010 have been utilized for the compilation of aggregate income inequality measures. Seven indices have been estimated. According to the empirical findings, six indices indicate an increase of income inequality while one (GE (2)) indicates the opposite (decrease). All summary inequality measures, except GE(2), indicate an upward trend for the period 1957-2010, whereas GE(2) indicate a decline followed by an increase (explaining thus the quadratic model of description). Nevertheless, the value of GE(2) never reached its initial level.

Our results were compared with data from Standardized World Income Inequality Database (SWIID) compiled by Solt (2009). The comparison of Gini 's estimates for Greece is conducted with two country groups. The broader conclusion could be that after the mid 1990s aggregate income inequality in Greece is in high levels compared with other countries, while it was a 'medium' case in the previous period.

Another data source is the European Union Survey on Income and Living Conditions (EU SILC). This survey includes micro data on income on household and

personal level that can be used for the estimation of income distribution. The time period of the analysis is from the year 2002 to the year 2010. The indices S80/S20 and S90/S10, which are the ratios between the income share of upper and lower income classes, suggest that there has been a small decrease; nevertheless the trend is not stable for the whole period. The decrease is more obvious in the year 2009 especially for S90/S10. Both ratios indicate increase for the year 2010. The behavior of the aggregate inequality indices is rather stable with miniscule decline. In all cases the absolute values are slightly changing in both directions (increase or decrease); nevertheless, in all cases a small decrease is noted from 2008 to 2009 and a small increase from 2009 to 2010. This element, also, implies a miniscule decline in inequality in the beginning of economic recession in Greece and a small increase onwards.

The ratio S80/S20 and Gini coefficient for total disposable household income for Greece and European Union 27 and Euro Area 17 are compared. The empirical findings indicate that aggregate income inequality in Greece is in higher level than the average of both European Union and Euro area.

Empirical findings from studies that utilize Household Expenditure Survey (HES) and European Community Household Panel (ECHP) micro data are, also, presented. In both cases income data are used.

Despite the differences (data sources, methodological differences such as estimation procedure, unit reference, definition of income) a comparison analysis was conducted for the empirical findings; specifically for the Gini coefficient and the top income shares.

The Gini coefficient derived from tabulated tax data is in higher level in all cases. As expected Gini from HES micro data yields the smaller values, since it includes non cash components. For the common period (1994-2008) small differences appear among alternative estimates (ECHP, HES and EU-SILC) of Gini (probably mainly due to different definitions).

We notice that the values of top income shares between tabulated tax data and micro data from HES and EU-SILC do not yield such differences as in the case of Gini coefficient. This justifies the generally adopted argument that tax data can be used for estimation of top income shares. The fact that top

income shares yield similar trend (for certain periods) and level (to the possible extend) regardless the data sources, is consistent with [1] that top income shares may be a useful substitute for other measures of inequality.

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Unregistered Production and Employment in Estonia: Measurements and Developments

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Abstract

This paper present data on unreported production and employment in Estonia, tracks developments over time and compares Estonia with other countries. According to official exhaustiveness calculations, unreported GDP amounted to around 4% of "true" or total GDP in 2012, having declined since 1995. Studies based on various indicator variables and surveys of the perceptions of business managers provide estimates for unreported GDP of 14-24% of true GDP in 2007-2012. Survey evidence suggests that informal employment has declined over time; in 2012 around 10-12% of the active people surveyed stated that they had undertaken unreported employment within the past year. This estimate is likely to be a lower bound and other studies provide somewhat different results. The extent of unreported activities in Estonia appears to be smaller than in many other EU countries from central and eastern Europe. Events such as the Russian crisis, the prolonged boom from 2000 to 2007 and the global financial crisis do not appear to have had a discernible impact on unregistered activities in Estonia.

Keywords

Shadow economy; Unreported production; Unreported employment; Transition; Global financial crisis

Introduction

The public and private sectors are closely intertwined in all market economies, and a well-functioning public sector is important for welfare and development in society. This in turn requires that the authorities have access to precise data on production, income, employment etc. Such data are important for the collection of taxes from individuals and businesses, for the provision of social benefits to individuals and for support measures targeting businesses. Reliable data are also vital for policy formulation and evaluation.

Unregistered economic activities go by many names and have prefixes such as informal, grey, black, unrecorded, underground, hidden and shadow. The abundance of labels reflects the many dimensions of unregistered activities as well as the complexities of defining and measuring such activities. Unregistered production or employment does not always entail evasion of taxes, as there may be cases where the activities are not subject to taxation, but there is nevertheless a close relationship. The main motive for individuals and companies to hide data on economic activities like production or employment from the authorities is typically to evade taxation.[3]

This paper provides an overview of developments in the extent and distribution of unregistered production and employment in Estonia since the mid-1990s. The paper brings together hitherto unpublished data from Statistics Estonia, official data from a range of data sources and results from a number of academic studies on unreported economic activities in Estonia.

The paper focuses on unreported production and

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[3]By not reporting production, a firm or a self-employed person can evade not only value-added and excise taxes, but also social security contributions, personal income tax and corporate income tax.

employment as these are among the most important manifestations of the shadow economy. The paper is largely descriptive and does not link the empirical findings to any particular theory or overarching conception. Changes in unreported production and employment are, however, linked to broader societal, administrative, economic and social developments, including the rapidly changing macroeconomic situation in Estonia since the mid-1990s. The paper updates and extends the survey [16] on unregistered activities in Estonia. Recent surveys discussing both theoretical and empirical aspects of unregistered activities and tax evasion include [2], [27] and [15].

Issues concerning unregistered activities and tax evasion are complex and it is, sui genesis, difficult to obtain a reliable and comprehensive picture of the extent and distribution of such activities. This also applies for Estonia. The complex nature of unregistered activities and tax evasion means that no single measure will provide a comprehensive representation of the extent and distribution of unreported activities, so it is expedient to consider different measures and to contrast them with each other. In any case, all measures of unreported activities are estimated with great uncertainty; a discussion of the uncertainty and its policy implications is provided in [34].

There are several reasons why individuals and companies may be choose not to report activities to the authorities [2], [27]. First, the activities may be illegal and therefore typically cannot possibly be reported, which applies to the production and sale of narcotics and to theft, robbery, smuggling, etc. Second, the activities may be subject to regulation or red tape that would increase costs or otherwise inhibit the activity if it were reported to the authorities. Such regulations could be labour laws, health and safety regulations, technical norms, etc. Third, the activities may be subject to taxation which may be evaded if the activity is not reported to the authorities. Fourth, underreporting of income or other activities may benefit individuals if they become entitled to social benefits in this way (social fraud). Taken together, individuals and companies have a host of reasons for leaving economic activities unreported, reasons that are associated with lower costs and higher income or a reduction in various inconveniences.

A main factor discouraging non-reporting is an effective administrative and legal system that makes detection and subsequent punishment a real possibility. This particularly applies to the requirements for reporting to the tax authorities, but it also applies to reporting to the statistics authorities, as statistics authorities typically use tax records for computing production and value added data. It also holds that "… the size of the shadow economy is a core input for estimating the extent of tax evasion…" [10] (p. 2). Another discouraging factor is a sense of moral obligation or the civic duty to obey laws and regulations. This may again depend on deeper societal norms, the general level of unlawful behaviour in society and the extent to which individuals and companies perceive that the government is working for their benefit [11], [19]. Overall, the balance of incentives and disincentives depends on the characteristics of the particular individual or business, but also on the surrounding administrative and societal structure.

The consequences for social welfare of taxpayers leaving economic activities unreported are not straightforward to ascertain. The taxpayer might seek to reduce a tax in several ways: a) Substitution, i.e. the taxpayer changes behaviour and substitutes away from the activities leading to the tax obligation. b) Tax evasion, i.e. the taxpayer evades taxes by not reporting the taxable activity to the relevant authorities. c) Tax avoidance: i.e. the taxpayer reclassifies or alters, within the law, income and deductions in order to reduce the tax payment.

It is not immediately clear which one of these alternatives that is preferable from the viewpoint of society. First, substitution brings about an excess burden, whereas tax evasion and tax avoidance only cause a resource loss insofar as tax rates or other taxes have to be increased to compensate for the loss of revenue (Slemrod 2007). Second, steps to reduce the extent of tax evasion will not necessarily lead to a corresponding increase in tax revenue, as individuals or firms may substitute away from the activity with the higher implicit tax burden. This also implies that more effective auditing may lead to an increased excess burden in some cases [27]. Third, taxes always affect distribution and it follows for that reason that evasion of tax also has distributional effects and hence important welfare consequences.

The rest of the paper is organised as follows: Section 2

provides brief background information on Estonia, the economy and the tax system. Section 3 gives an overview of the extent of unregistered production activities. Section 4 discusses the extent and distribution of unregistered employment and labour income Finally, Section 5 concludes the paper.

The Estonian Economy

Estonia is the northernmost of the Baltic States and lies to the south of Finland, across the Gulf of Finland. The country became independent in 1918, but was occupied by the Soviet Union during the Second World War and stayed under Soviet rule until August 1991, when it regained independence along with the other Baltic States. In January 2013 the population was 1.3 million, of whom 70% were ethnic Estonians, 25% ethnic Russians and the remainder mainly Belarussians, Ukrainians and Finns (Statistics Estonia 2013, code: PO0222).

Estonia has undergone rapid political and economic changes since the beginning of the 1990s [29]. The planned economy has been replaced by a market economy with free enterprise and private ownership. Early in the transition process Estonia set out on a radical and market-oriented reform strategy [13]. Estonia abolished all import duties in the mid-1990s, though it later reinstated some as part of the early trade agreements with the EU. It was the first country in Europe to introduce a flat personal income tax. In recognition of the country's limited administrative capabilities after it regained independence, regulations and standards were generally kept to a minimum. Estonia has obtained high rankings for economic freedom and for efforts to reduce bureaucratic interference in business.[4]

Fig. 1 shows the dynamics of GDP and the unemployment rate from 1993 until 2012. Like other post-communist countries, Estonia experienced a deep recession in the early 1990s, followed by rapid growth until the downturn in 1999 following the Russian crisis. The period 2000 to 2007 saw rapid economic growth. Negotiations on EU and NATO membership improved confidence and substantial capital inflows

financed booming consumption and investment [3]. Economic growth had already turned negative in 2007, but this development worsened after the bankruptcy of Lehman Brothers in autumn 2008. The economy contracted by 14.3% in 2009, but growth returned in 2010. Purchasing power adjusted GDP per capita amounted to 31.2% of the average in the EU15 in 1995 and 62.5% in 2012 [8] (code: nama_gdp_c). The convergence process has entailed large structural changes; agriculture and manufacturing have declined in relative terms since the early 1990s while services have gained importance.

Fig. 1 shows the survey-based unemployment rate among working-age individuals (15-64 years) from 1993 to 2012. The dynamics of unemployment have in large part mirrored those of GDP. The unemployment rate increased in the early 1990s due to the transition process, stabilised in 1995-1998 as growth resumed and increased temporarily after the Russian crisis. The rapid decline in unemployment from 2000 until 2008 is striking, but so is the peak it reached after the outbreak of the global financial crisis. The employment rate has generally been high; in 2012 the employment rate of the population of working age (15-64 years) was 67.1%, almost 2%-points above the EU15 average [8] (code: lfsi_emp_a).
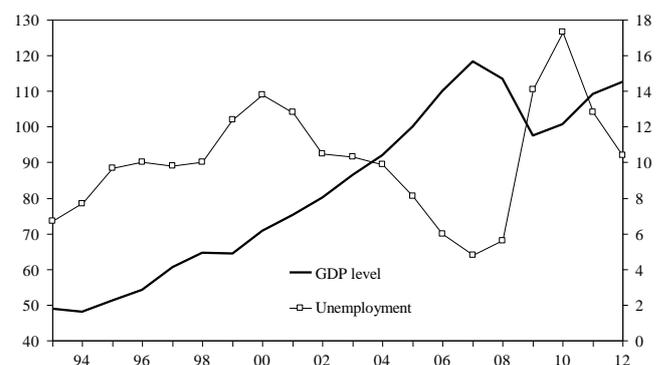
FIG. 1: GDP LEVEL, INDEX 2005 = 100. UNEMPLOYMENT RATE, 15-64 YEARS, % OF LABOUR FORCE

Sources: [8] (code: nama_gdp_k), [31] (code: ML35)

The transition has influenced the welfare of people in Estonia in numerous ways. Some marginalisation problems have affected the elderly and non-Estonian speakers in particular [17]. Absolute poverty is limited, while relative poverty is more pronounced. A frequently used measure of relative poverty is the risk

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[4]See for instance the surveys of economic freedom by the Heritage Foundation (http://www.heritage.org) and the rankings of business friendliness published by the International Bank for Reconstreuction and Development (http://www.doingbusiness.org/rankings).

of poverty measured as the share of the population with equivalised disposable income after social transfers below 60% of the national median. In 2011 in total 23.1% of the Estonian population was at risk of falling into poverty. This is comparable to the EU27 average of 24.2, but substantially above the levels found in the welfare states in neighbouring Nordic countries (Eurostat 2013, code: tsdsc100).

Survey-based studies of values and beliefs from the late 1990s bear out suggest that people in Estonia are generally individualistic but also "survival oriented", i.e. concerned about their own material well-being [32]. They share the individualistic beliefs with their Northern neighbours, but the orientation towards survival is akin to that found in other post-communist countries. The survival orientation is likely to reflect the difficult economic situation experienced by many Estonians during the early stages of the transition process, but may also reflect a breakdown of collective responsibility and civic norms during 50 years of Soviet rule or even deeper cultural traits stemming from centuries of suppression by foreign rulers.[5]

The government sector has undergone deep structural and institutional change since Estonia regained independence in August 1991. Estonia established independent political institutions and reformed administrative structures. In many cases, entirely new administrative systems were established, while others were thoroughly remodelled. It should be underscored, however, that government authority never collapsed in Estonia; the public administration, courts, police force and tax collection bodies retained authority.

The tax system in Estonia is simple. It has been a key objective to keep laws and regulations simple in order to reduce bureaucratic burdens and increase compliance [14]. The basic structures were put in place at an early stage, but a major reform in 1994 simplified the system, removed the progressive steps for personal income tax and increased reliance on indirect taxes [21], [20]. Appendix A describes the main taxes in Estonia.

The 1994 tax reform resulted in a substantial simplification of the taxation of income. Relatively few deductions are allowed and they are capped, which reduces the scope for overstatement of deductions, at least for taxpayers that are employed. The VAT system is similarly simple and comprehensive with essentially one rate levied on all products.

Estonia was one of the first countries in Europe to introduce a three pillar old-age pension system. The specific design chosen has very "high powered" incentives with pension payouts broadly proportional to the income registered during the lifetime of the individual. During the preparations for the pension reform, it was explicitly stated that the higher degree of self-financing of pensions was meant to increase the amount of registered income [25]. Other laws introduced since the turn of the century have reduced the incentives to hide personal income from the authorities, with a revised unemployment insurance system and a vastly improved parental-leave scheme where payouts are closely tied to earlier reported income in both cases.

Unregistered Production

Following guidelines from Eurostat and the, Statistics Estonia includes estimates of the production in the shadow or unregistered economy in the official GDP figures [21]. These exhaustiveness calculations provide estimates of otherwise unregistered legal and illegal production. However, since the exhaustiveness calculations only include production for which the statistics authorities have some direct verifiable information, the estimates of the shadow economy based on these calculations constitute lower estimates of the actual size.
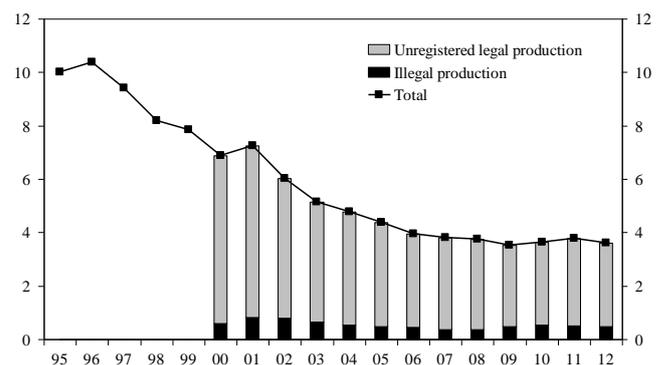
FIG. 2: OFFICIAL ESTIMATES OF INFORMAL PRODUCTION, % OF TRUE GDP IN MARKET PRICES

Source: Data provided by Statistics Estonia.

Fig. 2 shows the official exhaustiveness estimates of unregistered production as a share of the true GDP for the period 1995-2012, where the term true GDP denotes registered GDP plus estimated unregistered

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[5]The importance of tax ethics for tax compliance across different countries has been confirmed in empirical studies [1].

GDP. The GDP measures are in market prices, i.e. include value-added and excise taxes. The overall picture is that informal or unregistered production has exhibited a marked fall from around 10% of true GDP in 1995 to less than 4% in 2012. As discussed in Section 2, the Estonian economy grew rapidly in 2000-2007. The reduction in the share of unregistered GDP from 2000 to 2007 came about as the unregistered economy has grown less rapidly than the registered economy [30]. It is noticeable that no apparent change took place in 2008-2009, when Estonia was most affected by the global financial crisis. The conclusion is that the official estimates of the informal GDP in Estonia have been only little affected by broader macroeconomic developments.

It is possible to distinguish between unregistered legal production and illegal production from 2000. Illegal production comprises the value-added from prostitution, drugs production and delivery, and the illegal trade in alcohol, tobacco and petrol. The official estimate is quite stable at around 0.4-0.8% of GDP during the 12 years for which data are available. The sources for these estimates are police reports, sociological studies, newspaper articles, court rulings and the Estonian Tax and Customs Board. Estimates of drugs production and trade, and the illegal tobacco and alcohol trade are based on confiscation data. The prostitution market is estimated from police reports and sociological studies, while estimates of the illegal petrol trade use confiscation data and data from the Statistics Estonia energy balance.

The legal but unregistered production included in official GDP estimates has declined markedly since 1995 and amounted to around 3% of GDP in 2012. It is estimated from several data sources [30]. The largest part of unregistered production is computed from estimations of unregistered employment and unregistered wage income. Unregistered employment is obtained by comparing employees' self-reported employment in the labour force survey with employers' reporting of their number of employees. For sole proprietors the estimate is taken from their reports to the Tax and Customs Board. The number of full-time jobs underreported by employers is used to create a proxy for the unregistered economy. The unregistered production due to underreporting of employment amounted to 1.5% of true GDP in 2012. Unregistered wages for employed persons constitutes another part of unregistered production. The unregistered wages are estimated from the wages reported by firms. If the wages reported by a firm are considerably lower than those of other firms in the same activity and size stratum, an adjustment is made. The unregistered production due to underreporting of wage income amounted to 1.1% of true GDP in 2012.

The remainder of unregistered legal production is attributed to tipping and abuse of special tax treatments of fringe benefits and other sources of non-monetary income. The tipping estimates are drawn from expert assessments, while the abuse of special tax treatments is estimated by comparing declarations of non-monetary income to the Tax and Customs Board with data from the household budget survey. These components of unregistered activities amounted to around 0.5% of true GDP in 2012.[6]

The sectoral breakdown of the exhaustiveness estimates shows that unregistered production comprises a particularly large share of the production in fishing and agriculture, construction, retail and wholesale business, the repair of vehicles and other machines, and hotels and restaurants [30]. It is reasonable to assume that the nature of the business activities in these sectors makes it particularly easy to underreport production and income.

A cross-country study of unreported economic activities in the EU around the year 2000 is presented in [26]. The study concludes that the range of estimates of unreported activities in individual countries is typically very wide and the range is particularly wide for those countries that have the most unreported activities. Despite this, the study provides central estimates of the size of unregistered production in the 10 central and eastern European countries that joined the EU in 2004 or 2007. The estimate for Estonia is the estimate from the exhaustiveness calculations for 2001, which at the time was estimated to be a bit less than 10% of true GDP. The conclusion in [26] is that the prevalence of unregistered production in Estonia is the lowest among the 10 central and eastern European countries. The estimates for the extent of unregistered production in Estonia were also substantially below the estimates for most Southern European countries,

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[6] Some underreporting of income can also be detected through underreporting of value-added taxation. Estimates become available with long time lags and are therefore not included in Fig. 2. However, the informal produc-tion originating from these frauds is relatively small, 0.4% of GDP on average during 2000-2008 according to data provided by Statistics Estonia.

but above the levels of the neighbouring Nordic countries.

The official estimates of unregistered production based on the exhaustiveness methodology in all likelihood constitute a lower bound of the actual or true unregistered production. First, unreported employment cannot be ascertained if both employees and employers choose to leave employment unreported. Second, the extent of unregistered wage income of employed individuals is probably also underestimated as the estimate is based on simple comparisons across different firms. Third, it is particularly difficult to estimate the potentially very substantial underreporting of income from self-employment and other business activities.

The conclusion is that the results from the exhaustiveness calculations must be supplemented with results from methods that are more comprehensive and use data from other sources. While there are numerous empirical studies focusing on particular components of the shadow economy, relatively few studies seek to estimate the extent of the entirety of shadow production.

A latent estimator approach is used in [28]. Different causal and indicator variables like tax rates, state regulation, unemployment, corruption and income in individual countries are used to estimate the extent of informal production. The study provides data for Estonia for 2000-2007 and these data are in principle comparable with results for countries all over the world. The shadow production is estimated to to 30-32% of official production or, equivalently, to 23-24% of true production in [28]. There seems to be only a very modest downward movement from 2000 to 2007. The estimates for most of the 10 central and eastern European countries that joined the EU in 2004 and 2007 are also in the vicinity of 30% of official GDP, but the estimates for the Czech Republic, Slovakia and Hungary are lower.

The latent estimator approach is also used in [33] and [10] but these studies include other variables in the analysis and use regional instead of country-level data. The more elaborate approach leads to much lower estimates of the informal economy for Estonia. [33] report results for 2004 and find that the national average of the shadow economy in Estonia amounted to 16-17% of reported GDP or 14-15% of true GDP. This makes the Estonian shadow economy one of the smallest in central and eastern Europe and in the middle of the group of EU countries. Data for 2007 and

2008 are also provided in [10] and obtain results that are very close to those for 2004 in [33], which suggest that the shadow economy has not changed much in the period of rapid structural and institutional change from 2004 to 2008.

Another way to obtaining estimates of the informal economy is to ask managers in companies to provide estimates of the unreported or informal production in the sector(s) in which their companies operate. This methodology is used in [23] and [24] to obtain estimates of perceived unreported employment, wages and profits in the three Baltic States for 2009-2012. The data on the size of unreported wages and profit income in each sector are accumulated over all the private sectors in the economy. The resulting perceived underreporting of GDP refers to the private sector only and does not include production of illegal goods and services. Unreported private GDP in Estonia was perceived to be 19-20% of true private GDP in 2009-2012 [24]. The same magnitude was perceived for Lithuania, while the Latvian unreported private GDP was perceived to be very large in 2009-2011, but fell in 2012 to the level found in the other two Baltic States.

A breakdown of the data on perceived underreporting of private GDP is provided in [24]. Underreporting is perceived to be most prevalent in services, construction and retail and less prevalent in manufacturing. Small companies are perceived to leave more of their activities unreported than larger companies. Data from the 2009 and 2010 surveys documented in [23] are used in [19] and a number of factors that may explain perceived underreporting are analysed. It is found that a narrow individualistic profit motive is of importanced, but so are broader non-individualistic motives such as satisfaction with government performance and a perception of responsibility for societal developments. The interpretation of these results is hampered by the fact that the analysis cannot ascertain the direction of causality.

Private consumption amounts to around half of GDP and, although not directly comparable, the share of household spending that is not registered may therefore shed light on the overall development of the shadow economy. Each year, the Estonian Institute of Economic Research (EKI) conducts a telephone survey with the purpose of recording the prevalence of different types of unregistered activity in Estonia. The sample is relatively small with around 700 persons

included in each round (of which some decline to answer), but the survey provides results that are broadly comparable across years.

Respondents to the EKI survey are asked to estimate the share of their income spent on purchases that they assess not to have been reported to the authorities. The survey does not ask the respondents to assess the reasons for the lack of registration, and it is thus unclear whether the purchases are unregistered to avoid paying various taxes, to elude regulation or to hide illegal production or sales (e.g. moonshine alcohol). Fig. 3 shows the developments for all the years 1999-2012 except for 2009.)
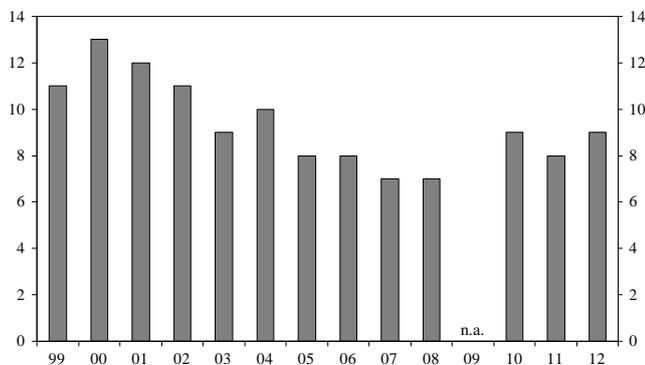
FIG. 3: SPENDING ON PURCHASES ASSESSED TO BE UNREGISTERED, % OF INCOME

Source: [4],[5]

The spending on unregistered purchases exhibits a downward trend from 2000-2002, but subsequently hovers around 8% of income. These developments are broadly in line with developments in the exhaustiveness estimates of unregistered GDP presented in Fig. 2 and arguably also with estimates of informal production in studies using the latent estimator approach and in surveys of the perceived size of the informal economy.[7] The survey also asks the respondents to ascertain the fractions of their purchases that are unregistered within different spending categories. Spending on unregistered purchases is especially prevalent on housing repairs, computer service, tobacco, audio and video media and car repairs.

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[7] A special Eurobarometer survey used a survey methodology comparable to the one used by EKI and found that in 2007 around 14% of the respondents in Estonia had bought goods or services embodying unreported work within the last 12 months (European Commission 2007).

Unregistered Employment and Labour Income

A very important part of the shadow economy is unregistered employment and labour income. The most direct way to measure such activities is to ask individuals if they have received unregistered labour income, known in Estonia as "envelope wages", within a given period. The drawback of this methodology is a possible downward bias of the results as some recipients may not answer truthfully; receipt of envelope wages normally means evasion of social security and income taxes and hence implies that national tax laws have been broken.

The survey by the Estonian Institute of Economic Research discussed in Section 3 also includes questions on unregistered labour income. Fig. 4 shows the share of respondents stating that they had received envelope wages during the last year. The share of respondents stating that they received envelope wages regularly or occasionally amounted to 19% in 1999 and to 12% in 2012. The reduction in the share of individuals receiving unregistered labour income broadly follows the trend in the share of unreported GDP found by the exhaustiveness calculations.
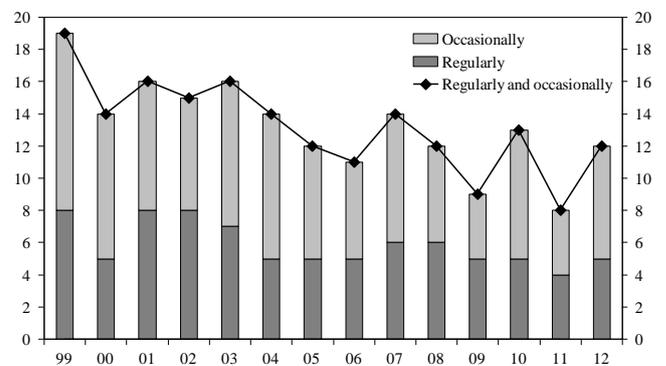
FIG. 4: SHARE OF RESPONDENTS RECEIVING ENVELOPE WAGES WITHIN LAST YEAR, %, 1999-2012

Note: % of all respondents for 1999-2001, % of respondents with labour income for 2002-2012, Source: [4],[5]

The share of respondents stating that they received envelope wages occasionally varies substantially after the outbreak of the global financial crisis; the share is small in 2009 and in 2011, but comparatively large in 2010 and 2012. The rapid changes in the share of respondents receiving envelope wages occasionally may reflect changes in the labour market or the

macroeconomic situation, but no clear picture is apparent.

Respondents who answered that they had received unregistered income were subsequently asked how large a share the unregistered labour income comprised of their total registered and unregistered labour income. The results shown in Fig. 5 indicate that around 40% of the income of these respondents comes from envelope wages. Although the share varies considerably from year to year, it is clear that for recipients of unregistered income, such income is of great importance.

A sectoral breakdown of the receipt of envelope wages produces results in line with the findings from the exhaustiveness calculations, i.e. envelope wages are particularly prevalent in the agricultural, construction and service sectors [4],[5]. Data from the survey on envelope wages for 2004 from the Estonian Institute of Economic Research and two other datasets are used in [12]. In all cases, it is found that unregistered employment is most prevalent among individuals that: i) are men; ii) work in the construction, service or agricultural sectors; iii) work in small firms; iv) do not work full time; v) have lower education; vi) are young or elderly; vii) report low income; and viii) are resident in the relatively rich northern region of Estonia.
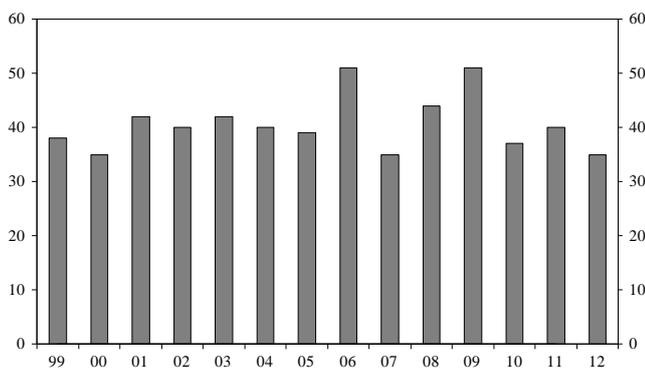
FIG. 5: UNREGISTERED LABOUR INCOME AMONG RECIPIENTS OF ENVELOPE WAGES, % OF TOTAL INCOME

Source: [4],[5]

Overall, [12] conclude that relatively marginalised people often work in the informal sector in Estonia. In this sense, informal employment can be seen to provide a safety net for individuals who might have problems finding well-paid formal employment. Evidence of the exclusion hypothesis has also been found in other transition countries where a relatively low income level and large structural changes have

exposed many individuals to hardship [12]. The finding may also help explain the apparent drop in unregistered work during the period 2000-2007 when the Estonian economy grew rapidly, but it cannot explain why informal employment did not increase in 2009-2010 when the Estonian economy was in recession and unemployment increased to very high levels.

A special Eurobarometer survey of unreported work undertaken in the middle of 2007 makes it possible to compare the extent of unreported work across the EU countries [7]. According to the survey 11% of the respondents in Estonia stated that they had carried out unreported work during the past 12 months. This result is not far from the 2007 result in the EKI survey, cf. Fig. 4, but is substantially above the EU27 average of 5%. It is noticeable, however, that the share of respondents who admit to having carried out unreported work varies a lot across the EU countries and often in unexpected ways; Denmark have largest share of unreported work, while Cyprus and Malta at the other extreme have essentially no unreported work.

The surveys of company managers presented in [24] includes questions regarding the perceived prevalence of unreported employment and envelope wages in the Baltic States. The interviewed managers conjecture that in the case of Estonia around 10% of the true number of employees are not reported in 2009-2011, while the share is somewhat lower in 2012. These results are broadly consistent with the EKI results. The managers also estimate that around 20% of the true wage income is not reported in 2009-2011, while the share is around 22% in 2012. These estimates appear rather high compared to the EKI results, cf. Figs. 4 and 5, but the EKI results might be downward biased. The possible bias in the estimates in [24] is more uncertain given that they are based on the perceptions of managers.

Another way to measure the extent of informal employment is by looking at whether or not an individual has worked with a valid employment contract. Data from the European Social Survey have been used to compute data on informal employment for a large number of European countries for 2008 or 2009 [9]. The result is that 9.8% of the respondents had worked without a formal employment contract within the last 12 months. It is noticeable that most of the respondents state that the informal work took the form of self-employment, i.e. they did not receive envelope wages from an employer but rather engaged in

business activities for which the income was not registered. Only 3.2% of the respondents stated that they had dependent employment, i.e. worked informally for an employer. This also means that the results are very different from the EKI results in Fig. 4. The results in [9] reveal very large differences in the extent of informal employment across European countries. Surprising, Estonia along with Hungary and the two other Baltic States are found to have some of the lowest shares of informal employment. This result might raise some doubts about the results of the survey methodology.

Results based on data from the Working Life Barometer, a survey undertaken in all three Baltic States in 1998 and 2002, are presented in [18]. Respondents were asked to state whether they had received envelope wages in the recent past. The results vary substantially across the three countries and across the sampling years. For Estonia a total of 19.5% had received envelope wages in 1998, but only 10.3% in 2002. The results are of the same magnitude as those in the EKI survey, but the decline is very substantial. The econometric analysis shows that the characteristics of the stated employer, including the sector, firm size and changes in the number of people employed, have substantial explanatory power, while the effects of the socio-demographic characteristics of the respondent are small and difficult to estimate precisely. An Oaxaca-Blinder decomposition reveals that only a small fraction of the changes in unreported employment between 1998 and 2002 can be explained by changes in the characteristics of the individual and the firm in which the individual works. The upshot is that it is difficult to explain changes in informal employment by easily observable developments in the economic and societal environment and, hence, that explanations must be sought elsewhere.

The share of wage income earned by employed individuals but not reported to the tax authorities in Estonia is estimated in [22]. Data on employment income reported by individuals to the tax authorities are compared with data reported to the European Social Survey in 2007. The innovation of the study is a decomposition of any discrepancy into measurement errors and underreporting to the tax authorities, i.e. genuine tax evasion. The decomposition is made possible by the assumption that public employees who have held the same job throughout the year and who have only held this one job do not engage in

underreporting, so any discrepancy must in this case be attributed to measurement error. The overall share of wage income not reported to the tax authorities is found to be approximately 20% of true employment income. It is noticeable that especially high-earning individuals are found to evade a large share of their wage income.

Underreporting of income by Estonian households with income from self-employment or other business activities is considered in [13]. The study uses data from the Estonian Household Budget Survey for the period 2002-2007. The share of unreported income is computed using the assumptions that households with and without business income have the same propensity to consume food, that all households provide correct data on their consumption expenditures, and that households without business income provide correct data on their income. The result is that households who have business income above 20% of their total reported income underreport around 60% of their true income. Households with business income between 0 and 20% of reported income also underreport their income but to a lesser degree. The extent of underreporting is fairly stable across the six sample years. There is evidently substantial uncertainty associated with the results, but they do illustrate that underreporting of business income is a common phenomenon in Estonia. This view is shared by the Estonian Tax and Customs Board, which has taken numerous measures to increase compliance among taxpayers with income from self-employment and other business activities [6].

Conclusions

It is challenging to provide a comprehensive picture of unregistered production and employment. This applies in general and evidently to the case of Estonia. The official exhaustiveness measure of unregistered production has declined gradually from around 10% of true GDP in 1995 to less than 4% of true GDP in 2012, where true GDP denotes registered GDP plus estimated unregistered GDP. According to the official estimates, unregistered production is particularly prevalent in fishing and agriculture, construction, and services. There are reasons to believe that the exhaustiveness calculations only capture a small part of the informal economy.

Studies using the latent indicator methodology suggest that the informal economy has been relatively

stable since the turn of the century. Recent studies provide estimates for the informal economy of 14-24% of true GDP in the middle of the 2000s, where estimates in the lower end of the interval originate from the more elaborate studies. Surveys of managers of Estonian companies conclude that the perceived unreported share of private GDP amounted to around 20% of private true GDP in the years 2009-2012.

Self-reported measures of informal employment have been fairly stable since 1999 when data were collected for the first time, although a weak downward trend appears to be present. Around 10% of individuals stated that they had engaged in such activities in 2010-2012. These results are likely to be downward biased as they rely on self-reported survey data. Other studies of informal employment provide quite ambiguous results, both across studies and often also within a particular study. A study using tax records and survey data suggests that 20% of true wage income was not reported to the tax authorities. Another study suggests that the extent of underreporting of income is much more prevalent among households with income from self-employment or other business activities than in other households.

The overall conclusion is that unreported production and employment does not appear to be of epidemic proportions in Estonia. The extent of unreported activities has been relatively stable since the early 2000s and is probably not larger than in many other EU countries in central and eastern Europe and in southern Europe. There is no discernible link between the broader structural and macroeconomic developments in Estonia and the prevalence of unregistered activities. Membership of the EU, the pronounced boom in 2000-2007 and the deep downturn in 2008-2009 do not appear to have had substantial effects on informal production and unregistered employment in Estonia.

The welfare consequences of informal production and unregistered employment in Estonia are difficult to ascertain. This in part is because the exact size of the unregistered economy cannot be determined with any degree of certainty, cf. the discussion above. Underreporting of production and income typically leads to lower tax revenues, which entail deadweight losses if tax rates are raised. The net effect on tax revenue will, however, generally not be proportional to the extent of unregistered production and employment. Many economic activities would not be economically feasible if they were in the formal economy and all taxes were paid. Moreover, even unregistered production or employment will eventually lead to transactions that are taxed and hence bring in additional revenue from VAT or other taxes [27]. The upshot is that the revenue loss stemming from unregistered economic activities will generally not be proportional to the extent of these activities.

Social welfare is also affected by the implied redistribution of unregistered activities and the picture is contradictionary in this regard. On the one hand, the results summarised in Section 4 suggest that unregistered employment is often undertaken by marginalised or disenfranchised individuals, cf. the exclusion hypothesis. In this way unreported employment acts as a safety net and may be of little concern from a social welfare view. On the other hand, results also suggest that the amount of taxation evaded by the better-off taxpayers is very substantial, potentially redistributing resources toward better-off segments of society.

ACKNOWLEDGMENTS

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[All links valid on 30 August 2013.]

Appendix A: The Estonian tax system

Direct taxes in Estonia comprise a social tax (social security contribution), a personal income tax and a corporate income tax. The social tax amounts to 33% of the wage bill with 20%-points going to the national pension fund and 13%-points to the health care fund. A funded pension system has been operating since 2002 with the effect that for participants, 4%-points of the social tax plus an additional 2% of income is transferred to a personal pension account [25].

The personal income tax has since 1994 been levied at a flat rate against all income in excess of a tax free minimum and possible deductions. The tax rate was initially 26%, but was gradually reduced and has been 21% since 2008. Since 2002, contribution to the unemployment insurance fund has been compulsory for both employers and the employed, effectively making the contribution a tax.

The tax rate levied on corporate income is the same as the rate levied on personal income. Thus, the gradual reduction in the personal income tax rate also applied to the corporate income tax rate. Since 2000, reinvested profit, i.e. profit not paid out to the owner, has been tax exempt.

Indirect state taxes in Estonia consist of a value added tax (VAT) and various excise duties. The VAT rate was 18% from 1994 until 2009 and has since been 20%, although a lower rate of 5% applies to a few selected items. The government levies excise duties on alcohol, tobacco, motor fuel, fuel oil and kerosene for heating, and packaging and motor vehicles for the transport of heavy goods.

Import duties are levied on imports from non-EU countries according to EU rules, with the revenue being transferred directly to the European Union budget. Estonia levies a land value tax, decided by the municipalities with the restriction that the rate must be within 0.1-2.5% of the assessed value (maximum 2% for agricultural land). Estonia does not levy taxes on property (except land), gifts, inheritances or wealth. Local government can impose local taxes within certain areas, but this is seldom done and overall local taxes yield very little tax revenue.

Quality Infrastructures Improve the Economies of Balkans and Eastern European Countries

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Abstract

The development of a common market for goods and services including a pan-European integrated industrial, technological and trade policy has represented the main challenge at the European Union level in the last years. In particular emphasis is given to Eastern European Countries (EEC) and Western Balkans which represent the Enhanced European Economic Area. European authorities have identified that in order to deepen the European integration process, and thus provide the full benefit of it to the European citizens, the integration of the goods and services sectors must be accompanied by an integration of the industrial sector by the development of certain Quality Infrastructures. Although certain infrastructures have developed in EU-28 countries, there is a challenge of the integration to EEC and W. Balkans systems and how this has influenced the economies and competitiveness of these economic areas. In this context and considering the fast growth and development of the industrial sectors from the new member states it appears reasonable to investigate which have been the main achievements in the integration process made by these sectors and also the futures challenges that may prevent the deepening of this process. Thus, the aim of our research is to analyse the progresses made so far in the integration process of the new member states industrial sectors from Quality infrastructures point of view while also underling the main challenges that prevent the deepening of this process.

Introduction

Eastern European Countries (EEC) and W. Balkans are of growing political relevance for the European Union (EU). Balkans are preparing themselves to become part of the EU, and since 2004, Southern Mediterranean countries, Eastern European countries and Caucasus have been "targeted" by the European Neighbourhood Policy (ENP). The Lisbon Treaty committed the EU to the "development of a special relationship with neighbouring countries aiming to establish an area of prosperity and good neighbourliness founded on the values of the European Union and characterised by close and peaceful relations based on cooperation". EU flagship programmes, Europe Aid and Twinning, have already been targeted at neighbourhood countries for many years. Quality Infrastructures are increasingly being included as action to enhance sustainable development, in line with the objectives of EU 2020 Horizon. In this context, this paper emphasizes the importance of smooth development of Quality Infrastructures in this EU Economic Areas in terms of connectivity to sustainable development, educational parameters, good practices and indicate how EU Aid funding programmes could support this transition in EU neighbouring countries (see Table 1). The result will shed some more light on how the EU and its

neighbouring countries can further cooperate at Quality Infrastructures.

TABLE 1: LIST OF THE EU COUNTRIES IN TOTAL (SOURCE: [8])

EU Neighbouring Countries Covered	
Balkan Countries	Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia (FYROM), Montenegro, Serbia, Kosovo, Bulgaria
Eastern European Countries	Belarus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Slovakia, Slovenia, The Russian Federation, Ukraine
Caucasus Countries	Armenia, Azerbaijan, Georgia
South – East Countries	Cyprus, Greece, Turkey
Rest EU countries (non examined in the study)	
EU Member States (rest)	Austria, Belgium, Demark, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom

Existing literature does not provide a clear picture of Quality Infrastructures (QIs) deployment in the target countries covered in this study neither a thorough correlation between QI and sustainable development is indicated. In many of these countries the whole Quality Infrastructures can be considered as being still under constant development.

Analysis

Two broad questions are raised through this research. First, "how does Quality Infrastructures (QIs) benefit the economy?" And second, "what can EEC and Balkan governments do to increase the economic benefits obtainable from standardization?"

A. Quality Infrastructures (QI)

By the term Quality Infrastructures (QIs) we indicate a balanced system of sub - modules which collaborate efficiently under a scheme of national support. The following structure is a typical QI system (Table 2).

TABLE 2. TYPICAL QUALITY INFRASTRUCTURE SYSTEM

Aspect	Sub Module of QI	Module of QI
Product related	Legal Metrology	Market Surveillance
	Testing Laboratories	
	Calibration Laboratories	
	Inspection Bodies	
	Conformity Assessment Bodies	
(more) Process related		Accreditation
		Standardization

As noted before, there are several other conceptions of QIs and their modules correlation which play an important role on the establishment of a QI. The following chart provides another view of QI usual incompatibilities (Figure 1).

FIGURE 1. QI USUAL INCOMPATIBILITIES (SOURCE: [7])

Notes:
1. The sampling and testing should be separated from the penalties attribution. Penalties could stay with the service responsible for the operation of the relevant regulation.
2. To be avoided because of different nature of activities. In any case different decision making system is necessary.
3. Different nature of activities.
4. Possible under the condition that there are separate decision – making systems and that equal possibilities would be given to private bodies to be active in the Conformity Assessment
5. Appropriate for calibration activities only, subject to accreditation.
6. Market surveillance should not be involved in accrediting bodies for the avoidance of a preferential treatment of products / services certified by bodies accredited by the system.

Moving from QIs structures to a wider view of Quality Management, we could point out other aspects which are correlated to economic indices and competitiveness, as is shown in the House of Quality (Figure 2).
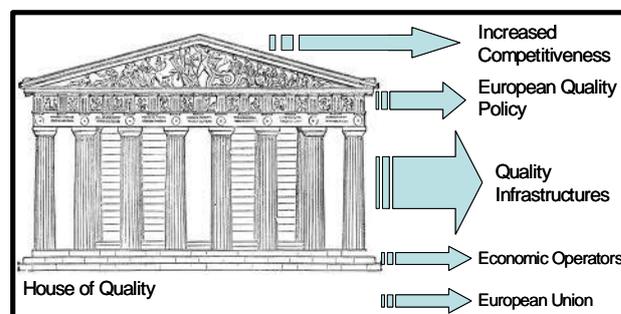
FIGURE 2. HOUSE OF QUALITY (SOURCE: [2])

The heart of QIs is standardization, which encompasses both product and process aspects and will be further analysed in the following paragraphs.

1) Standardization Literature Review

There is a large and complex literature on standardization, written by academics, practitioners and policy makers. Successful standardization does some or all of the following:

• Standardization defines some of the characteristics of processes and/or products which should be followed to make them suitable for use, likely to succeed in the market, understandable to the consumer, consistent with offering from other producers (e.g. David, 1987; DIN, 2000; Krechmer, 2000a; de Vries, 1999: [4])

• Standardization helps to build focus, cohesion and critical mass in the formative stages of a market (e.g. Krechmer 1996b; Swann and Watts, 2000: [4])

• Standardization reduces transactions costs between different producers and between producers and customers (e.g. David, 1987; DIN, 2000; Hudson and Jones, 1997, 2000b, 2000c; Krechmer, 2000a: [4])

• Standardization of measurements allows innovative producers to demonstrate to the satisfaction of the customer that products are as innovative as they claim to be (e.g. Tassey, 1982; Swann, 1999: [4])

• Standardization reduces risks as perceived by producers and by customers (e.g. David, 1987; DIN, 2000: [4])

• Standardization codifies and diffuses state of the art technology and best practice (e.g. Krechmer 2000a; Blind and Grupp, 2000: [4])

• Standardization captures trends in customer demand (e.g. DIN, 2000: [4])

• Open standards are desirable to enable a competitive process of innovation-led growth (e.g. Krechmer, 1998: [4])

• There is an important "public good" aspect to standards (e.g. Kindleberger, 1983; Berg, 1989a, 1989b: [4])

• Companies that use standards perform better (e.g. Adolphi and Kleinemeyer, 1994; DIN, 2000; Perez, 1994; Toth, 1984, 1990: [4])

• Standardization can increase trade (e.g. Swann et al, 1996; Blind, 2000a, 200b; Blind and Jungmittag, 2000: [4])

• Standardization contributes to economic growth (e.g. Blind *et al* 1999b; Jungmittag *et al*, 2000: [4])

In short, the existence and use of standards makes it easier to produce, sell and buy products and services. Standards enable a market. They are part of the infrastructure for innovation-led growth. However, their ability to do all these things depends on the process by which they were prepared. They will only if they are produced by a process in which concern for quality is taken seriously. Moreover, they cannot be expected to codify the state of the art unless those at the technological frontier participate in their definition.

2) Standardization in the global economy

Standardisation is a voluntary process for the development of technical specifications based on consensus amongst the interested parties themselves: industry in first place, but also a variety of users, interest groups and public authorities. Standardisation is a cooperation among private interests, which also has an important dimension of general interest. In Europe, standardisation has been entrusted for the last 40 years to industry with the participation of other stakeholders.

Formal standardisation includes the following organisations [1]. [2]:

• At national level, 1, 2 or 3 national standards bodies are the recognised members of the system, depending on whether or not there are specific bodies for the electro technical and/or telecommunications sectors

• At European level, there are three recognised European Standards Organisations (ESOs), CEN, CENELEC and ETSI. National standards bodies are members of CEN and CENELEC, which are based on the principle of national delegation in their governance and procedures: national members take decisions at European level. In contrast with this, ETSI functions on the basis of direct membership of companies, administrations and other organisations

• There are 3 recognised international standards organisations ISO, IEC and ITU. National standards bodies are also the members of ISO and IEC, whereas the members of ITU, which is part of the system of United Nations, are national governments.

Whilst there are no organic links between the European and the international level of standardisation (apart of –national- members

belonging to both levels), there are agreements for cooperation between ISO and CEN, between IEC and CENELEC, and between ITU and ETSI.

At the same time, industry engages in informal standardisation in hundreds of professional associations, usually called *fora* or *consortia*, with different characteristics in terms of longevity, sectoral coverage, and territorial scope, which is often global and thus may clash with the 3-level structure of formal standardisation. In some technological fields informal standards development organisations benefit from allocation of more expertise from the private sector and, therefore, have bigger impact than the formal organisations.

Actual use of standards depends on the perception by the different market players of the contribution of standards to their interests and their capacity to use them, in the context of their business strategy and regulation. Whilst usage of standards which have been developed in support of regulation is normally effective, other standards may fail to achieve relevance because of lack of visibility, the existence of competing standards or the absence of appropriate market incentives.

3) Standardization and Education

Standardisation is of strategic value both for the public and for the private interest. However, many business and governmental actors, including top management and researchers, do not feel they are concerned by standards issues, and standardisation activities are often consequently neglected. Education may play an important role in correcting this situation in the long term:

- Introducing standardisation issues to university curricula is a promising avenue for strengthening the contribution of standards to the competitiveness of Europe.

- Other trading partners such as China and Korea have already undertaken efforts to make future actors familiar with the benefits of standardisation and the issues which arise in the process

Recently, the standards community has increasingly been focusing on standardisation education (Hesser & Czaya 1999, de Vries & Egyedi, 2007; de Vries, 2011: [5], [6]). There are several reasons for this. Firstly, it is difficult to overrate the impact that standards and standardisation have on modern societies and social interaction. Standardisation, however, can fully unfold its beneficial potential only as long as the relevant actors (regulatory authorities, standards developing organisations, companies, consumers, users and other interest groups) are able to make appropriate decisions and to conduct their standards activities in a professional, effective fashion. Together with metrology, testing and quality management, standardisation and the organisations to support it are essential elements of a country's QI system and are essential for facilitating international trade (WTO, 2005: [2]).

Secondly, the demand/need for standards expertise can be expected to grow in the future for a number of reasons: socio-economic and technological integration will continue in the long term and crucially depend on the availability of adequate standards and the capability to develop such standards. Furthermore, adequate standards are a prerequisite for advanced technologies such as nanotechnology to enter markets on a large scale. However, the preparation of such advanced standards is becoming increasingly demanding and complex, which immediately calls for sufficient manpower and expertise to accomplish the necessary tasks.

As a result of these trends, job requirements have risen sharply for everyone who deals with standardisation issues – from the technical expert who prepares standards in a Working Group, to the business strategist who needs the development of new products/markets or to the policy-maker who relies on standardisation as a regulatory instrument. In this respect the "good old way" of standardisation education – i.e. learning by doing/learning on the job without any prior or, at best, only limited knowledge of standardisation – is no longer really viable and new educational concepts are needed. The old perception that the persons who know the (scientific or technical) content can alone develop the relevant standards is, since long time abandoned. As it is said 'those who know what should be written in a standard, should also know also how to write a standard". The need for education on standardisation has been addressed in several studies (Verman, 1973; Hesser & Czaya 1999; Korukawa 2005; de Vries, 2005; de Vries and Egyedi, 2007; Krechmer, 2007; Cooklev, 2010: [6]).

The need for standardisation education in industry is latent rather than manifest. Considering the case of industry participants in international standardisation, literature has revealed more than 100 factors that

contribute to successful participation in international standardisation committees (Brons, 2007: [2]). Most participants in international standardisation are <u>not</u> aware of these factors. They spend several days or weeks a year in standardisation activities and have the impression that they are doing a good job but are not aware that their efforts could be much more effective. The "volunteer-approach" they have makes the need for efficiency not so visible…

There is some demand for "standards engineers" (experts) but there are neither official descriptions nor formal training for such positions. Due to the lack of a formal curriculum, the selection of such professionals is mostly based on his/her previous practical experience in standards and related standardisation activities, and on his/her proficiency in specific soft skills. In addition to the technical standardisation experts (standards engineers), who are usually appointed as technical experts for the development of standards in standardisation committees, there are two other demand groups in companies. Firstly, the employees in the standardisation departments are main contacts and coordinators for all standardisation activities within the company. Secondly, the management as a decision/maker for strategic standardisation activities in the company has to be granted a principal role. Here, especially, the strategic aspects of standardisation are important. Most companies, in particular SMEs, have no standards expert or standardisation department at all Vries et al. (2009: [6]).

Standards and standardisation are core business for standardisation bodies, so one might expect them to be centres of standardisation expertise. DIN requires from its staff that they should have passed exams in some standardisation courses (Behrens, 2010). However, such recognition of the importance of real standardisation expertise for standardisation bodies is not widespread. Standards bodies are not only potential users of standardisation education, but many of them offer it as well, albeit only for further education. It is therefore important to distinguish between

- Professional training in the field of standardisation and
- Academic education in the field of standardisation

National governments play different roles related to standards and standardisation (De Vries, [5]), they can:

- Support standardisation, through a legal foundation, as a part of their general role in stimulating business performance and international trade
- Carry out standardisation activities themselves (in many countries, in particular in the former Soviet Union and in developing countries, the national standardisation organisation is a governmental agency)
- Supplement, simplify, or improve their legal system with standardisation by making references to standards in laws
- Use standardisation for specific public sector tasks (for instance, in the areas of public health, environmental protection, traffic infrastructure, army, and police. Then governmental interests are comparable to those of companies with a dominant market position or companies as main users)
- Use standardisation to improve their performance in areas that are not specifically governmental (for instance, procurement, IT systems, occupational health and safety of government workers)
- It is responsible for education. The government may include standardisation knowledge in its criteria for accreditation of educational programmes (Spivak and Kelly, 2003; Cooklev, 2010: [6]).

Many governments seem to be insufficiently aware of these different roles and lack a policy that addresses the different roles.

B. Innovation

Within the renewed Lisbon agenda, innovation is central to the preservation and improvement of the welfare of European citizens. Many different elements in the realms of education, science and markets have to come together in order to achieve successful innovation. As part of the EU strategy for innovation, the Commission and the Council of the European Union have identified standardisation as one of the key instruments to be improved [2]. Standards can be decisive for commercial success, in helping to aggregate demand for innovation activity. Ensuring interoperability is also important in order to avoid

fragmentation of the Single Market. Standards can determine the success or failure of new technologies.

1) Law and Innovation

There is a substantial challenge of matching "Law" and "Innovation" against time and technology constraints. From centrally to market economy there is a gap of law which should follow the technology developments. The faster technical regulations are shown up the less technology loss because of law is indicated. This is mapped in Figure 3 (E. Vardakas, 2008: [7]).
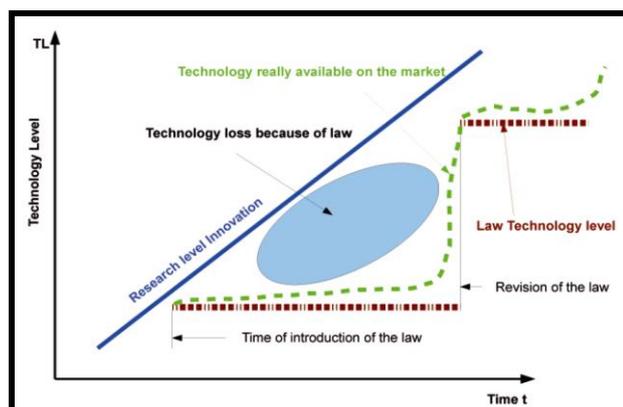
FIGURE 3. LAW AND INNOVATION CORRELATION

2) Standards and Innovation

Following the above presentation between "Law" and "Innovation", there is also another correlation of "Standards" and "Innovation", Figure 4 (E. Vardakas 2008: [7]). As technology increases over time and the faster standards created the less innovation loss is indicated.
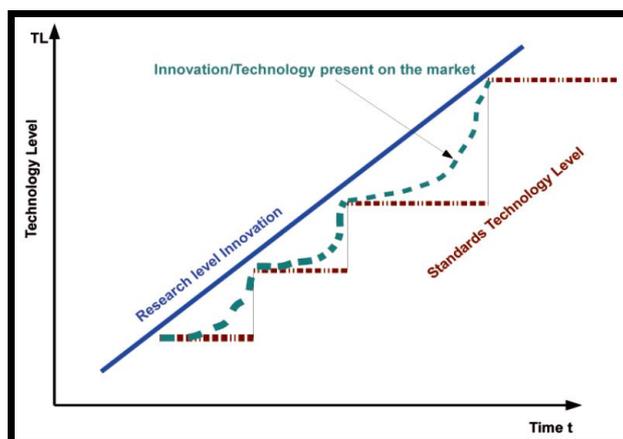
FIGURE 4. STANDARDS AND INNOVATION CORRELATION

Standardisation and innovation are often perceived as conflicting processes. Whereas innovation strives for excellence and exclusivity, standardisation strives for

predictability and a level playing field, and standards are in many aspects a public good. However, in an apparent paradox, standardisation can make an important contribution to innovation:

• Innovation needs either to combine some new piece of technology or novel organisational practice with existing elements of a product, service or process, or to recombine existing technologies or practices in a new way. In this way, it is clear that following established standards in a conventional way will hardly lead to innovation

• Nevertheless, innovation benefits from standards in many different ways:

o Standards for interoperability are essential for allowing innovations to complement existing products and services and integrate existing systems allowing open markets and competition. In other cases innovators need the development of new standards prior to the provision of new products or services. Standards for interoperability also allow innovators to reap the benefits of network effects in delivering their products/services.

o Measurement standards allow innovators to differentiate their product/service offer, or to improve their internal processes. An example here would be standards for the measurement of the aerodynamics of high speed trains

o Standards for safety, quality and environmental performance allow innovators either to follow market expectations (and in some cases legal requirements) or to exceed them. This allows market entrants to benefit from the trust which the usage of standards conveys, and without which more conservative solutions could be preferred by customers

o Management/Process standards may generate improvements in all aspects of a company: better quality, new schemes of internal organisation and of service delivery, and also facilitate the creation of new products and services.

Standards thus play a role in facilitating interoperability, safety and trust, whilst leaving ample room to innovators for capturing the market on the basis of novelties in other aspects of the product, service or process.

3) Knowledge Triangle and Innovation

There is also a cognitive dimension in standards which contributes to the diffusion of innovation. Many

standards (clearly those for interoperability, test methods and quality) also embody knowledge, and their development and dissemination contributes to knowledge transfer. For example, access to standards for *in-vitro* testing allow practitioners to capture essential elements of the state of the art of the technique, which in turn are valuable for improving the quality of diagnostics and on this basis offering new services. Standardisation is one among many existing instruments for knowledge transfer, such as scientific publications, patents, disclosure of proprietary interfaces, etc. In this respect, it is up to those owning intellectual property on research results to decide which is the most appropriate vehicle in order to reap the benefits of an investment, and standards allow the dissemination of knowledge while respecting intellectual property rights.

However, it should be underlined that the trend, especially in the last 30 years in Europe, of development of "performance standards" instead of "descriptive standards" has reduced the role of these standards as vehicles of technology transfer. Descriptive standards can be considered as a "design guide" to some producers. They give "solutions" for the important aspects of the products. On the contrary, performance standards are in reality abstract descriptions of the solutions sought by the designers of the products. It is obvious that every product standard has to find the appropriate equilibrium point between facilitation of innovation (i.e. more performance oriented standard) and facilitation of technology transfer (i.e more descriptive standard).

A rigorous approach on Innovation in EU is encouraged by the European Institute for Innovation and Technology (EIT) which link the knowledge triangle components of education, research and businesses across Europe into an innovation system (Figure 5, source: [3]). For example, a skilled workforce is the basis for undertaking research and development activities, as well as for bringing new products and processes to the market. In return, knowledge and new market developments should have a feedback loop to educational programmes. Similarly, new knowledge is the source of innovation and in return, new market prospects for innovation can point towards new avenues for research. This process is captured by the concept of the knowledge triangle. This could be better formalised through

eliminating the Standardisation gaps between the three components of it.
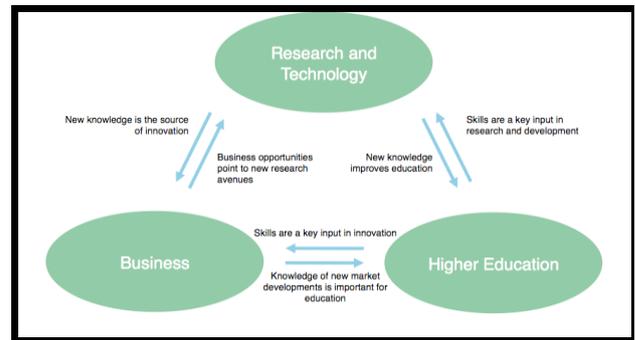
FIGURE 5: THE KNOWLEDGE TRIANGLE (SOURCE EIT, 2012: [3])

C. EEC & W. Balkans

1) EEC & W. Balkans Socio - Economic background

The EEC & W. Balkans countries region is characterised by the existence of a highly diverse mosaic of countries varying in size and dynamics. The following paragraphs briefly present an overview of the socio-economic contexts considering indications provided by the World Bank.

In 2011, the total population of the 27 EU EEC & W. Balkans countries was 429,258 m inhabitants, compared to the 388,041 m inhabitants of the rest 14 EU Member States (table 1). As would be expected, there are considerable differences between countries both in terms of demographics and national revenue. A majority of the total population is concentrated to the Russian Federation together with Ukraine which accounts 44%; the EEC countries accounts 20% of the total population; and the rest South East Countries accounts 20% of the total population; the Balkan countries accounts 16% of the total population.

Demographic trends are an important factor to keep in mind when explaining the current and future changes in Quality Infrastructures (QIs). Unsurprisingly, EU neighbouring countries lag behind Western countries in terms of Gross Domestic Product (GDP) per capita. The levels of national wealth and income are also a key determinant in the development of education in standardization.

A Socio-Economic visualization is given by The World Bank's Knowledge Assessment Methodology (KAM: www.worldbank.org/kam) which is an online interactive tool that produces the Knowledge Economy Index (KEI) [8] an aggregate index representing a country's or region's overall

preparedness to compete in the Knowledge Economy (KE). The KEI is based on a simple average of four sub-indexes, which represent the four pillars of the knowledge economy: Economic Incentive and Institutional Regime (EIR), Innovation and Technological Adoption, Education and Training, Information and Communications Technologies (ICT) Infrastructure .

2) EEC & W. Balkans Quality Infrastructures status

By aggregating data provided by the World Bank (source 2012, Infrastructures rankings), we could indentify the distribution of infrastructures operating in EU neighborhood countries, emphasizing data relative to "quality certifications", "technology licenses", "customs, trade, government regulations" and "business licensing", as follows in Table 3 (World Bank, 2012 dataset: [8]):

TABLE 3: INFRASTRUCTURES VIEW (WORLD BANK, 2012 DATASET: [8])

Economy	Year	A	B	C	D	E	F	G
All		16,0	15,2	72,6	5,7	9,5	15,4	17,9
Eastern Europe & Central Asia		17,9	20,8	72,2	7,5	10,4	15,8	14,4
High-income OECD		37,2	18,3	85,0	7,5	10,2	13,0	7,3
Albania	2007	24,6	38,6	73,1	16,3	18,7	10,6	22,2
Armenia	2009	26,9	40,3	66,3	19,4	10,3	5,6	26,5
Azerbaijan	2009	18,2	23,8	70,5	4,8	3,0	8,5	7,1
Bulgaria	2009	19,9	12,5	80,9	4,5	10,6	8,9	4,1
Bosnia and Herzegovina	2009	30,1	25,3	75,3	5,5	11,2	19,4	12,5
Belarus	2008	13,9	18,2	74,8	7,7	13,6	40,8	30,1
Czech Republic	2009	43,5	11,6	90,0	10,5	10,4	13,7	10,7
Estonia	2009	21,2	25,5	78,0	3,4	5,5	3,4	3,3
Georgia	2008	16,0	16,8	49,7	11,4	2,1	10,7	12,0
Greece	2005	11,7	...	88,2	...	1,8	7,7	5,5
Croatia	2007	16,5	22,5	75,5	7,2	10,9	9,9	8,9
Hungary	2009	39,4	13,1	78,8	3,2	13,5	15,6	3,6
Kosovo	2009	7,9	20,3	63,9	2,6	9,8	7,5	11,2
Lithuania	2009	15,6	24,9	77,7	13,3	9,3	23,4	4,7
Latvia	2009	18,2	28,0	72,8	2,7	9,7	14,4	11,4
Moldova	2009	9,1	14,9	60,0	1,8	7,0	20,0	27,4
Macedonia, FYR	2009	21,5	41,2	74,7	9,3	14,5	14,7	14,6
Montenegro	2009	13,0	17,2	76,5	6,1	6,8	2,7	5,4
Poland	2009	17,3	6,4	82,4	9,2	12,8	21,5	10,3
Romania	2009	26,1	15,9	81,3	22,0	9,2	29,9	16,1
Russian Federation	2012	12,6	7,7	71,7	8,9	14,7	15,6	16,0
Serbia	2009	21,8	14,7	69,3	8,2	12,2	12,7	17,7
Slovak Republic	2009	28,6	30,1	86,2	8,8	6,7	9,6	7,6
Slovenia	2009	28,0	15,3	84,8	10,4	7,3	4,6	4,7
Turkey	2008	30,0	15,6	65,1	9,7	27,1	24,0	12,3
Ukraine	2008	13,0	26,6	77,0	3,8	11,3	32,7	24,5

Where,
A: Percent of firms with an internationally-recognized quality certification
B: Percent of firms using technology licensed from foreign companies
C: Capacity utilization (%)
D: Real annual sales growth (%)
E: Senior management time spent dealing with the requirements of government regulation (%)
F: Percent of firms identifying business licensing and permits as a major constraint
G: Percent of firms identifying customs and trade regulations as a major constraint
…:   No Data Provided

3) EuropeAid Development and Cooperation

EuropeAid Development and Cooperation is responsible for designing European development policy and delivering aid throughout the world. EuropeAid delivers aid through a set of financial instruments with a focus on ensuring the quality of EU aid and its effectiveness.

The EU's evolving relationship with its partners in the Neighbourhood and the transition in the Southern Mediterranean called for a new policy response, set out following a Strategic review of the European Neighbourhood Policy (ENP).

Two flagships programs are the main drives of this EU wide initiative: a) EuropeAid and b) Twinning. Both are focused on the external aid to EU neighborhood countries and are the catalyzing vehicles to support the development of Quality Infrastructures in the EEC & W. Balkan Countries.

Conclusions

EU neighbouring countries present a dynamic landscape with regard to the organisation of Quality Infrastructures. Most of these countries are currently reforming their systems with the intention of better matching EU country organisation and they display high levels of commitment and motivation towards this end. However, there are still challenges to be overcome for the future development of Quality Infrastructures in these countries. Challenges appear at the following paragraphs. These challenges are anticipated that will feedback both pools of society: a) European Union society as far as the formulation of better EuropeAid and Twinning Programmes in the field of Quality Infrastructures driven by their impact in business performance and b) the EU Neighbourhood countries on developing "strategic" Quality Infrastructure Systems which take into account indicative by this study challenges.

A. Quality Infrastructures Challenges

1) Orientation

The transition from centrally planned to market driven economy puts the Quality Infrastructures (QIs) in previously centrally planned economies in a new perspective, as shown in Table 5 [7]. The following may be taken into account:

- Centrally planned economy QIs institutions cannot unchanged support trade agreements like

ACAA[1]s or WTO participation. This is mainly due to the legacy of perception of "standards" as typical regulations with obligatory character.

- Spreading of relevant knowledge and support for the creation of citizens movements for consumers and businesses are crucial.
- Scrupulous check of potential conflict of interests in the relevant systems is a must

TABLE 5. CENTRALLY PLANED TO MARKET DRIVEN QIS

Centrally Planed QIs	Market Driven QIs
Unconceivable as non-obligatory	Conceived for voluntary application
The qualitative part of the central plan	Supporting mainly private contracts
The country's macro-design tool	Tool for technology transfer
Descriptive by their very aim	Performance – oriented content
Single structures covering all aspects	Independently acting bodies
Non-development of private sector	Important private sector involvement
Management bodies only nominated (non transparency)	Representative management bodies (built in transparency)
Built-in conflicts of interest	Absence of conflicts of interest

2) National Policy

Considering the socio-economic indicators provided by the World Bank dataset, along to current literature there is a clear connection of the impact of Quality Infrastructures to nations' sustainable development. Therefore a strategic national policy on Quality Infrastructures may encourage better contribution to standards, faster anticipation of technologies, faster law formulations including intellectual & industry property issues. In addition, it is anticipated that there will be a balanced public and private funding for the operation of certain QIs. Like the "hard" infrastructure there is a strong public good element to the standardization infrastructure. There is a role for government and/or government agencies to keep this standards infrastructure in good shape, and in trying to ensure that there is balanced participation in the creation of standards.

In a typical market, when the rate of change is rapid, producers need standards quickly, but customers need the confidence offered by high quality standardization. There is a mismatch between the rate of innovation,

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[1] Agreements on Conformity Assessment and Acceptance of Industrial Products (European Commission Doc. SEC(2004)1071, 25 Aug. 2001)

the requirements for rapid standardization on the part of suppliers and the need for quality standardization on the part of empowered customers. Speeding up the standardization process is not necessarily the right answer to this mismatch.

The "ideal model" for the involvement of national standards bodies and government in the standardization process has two components. The first is to correct the typical imbalance in participation. Government can help to balance participation by subsidizing some marginal or ill organised and financed participants, and by acting in extreme cases very carefully as the representative of excluded interests.

A sound National QI fosters innovation, competitiveness, consumer protection, promotes market transparency and the elimination of technical barriers to trade (TBT) which, in turn, promote access to new markets, job creation, encourage investment and a more careful use of natural resources.

3) Education in Standardization

As identified in this study, there should be additional resources planning in technical education in Standardization considering current trends and focusing either in professional or academic courses. This may work as well as a knowledge transfer tool and feedback the society with better understanding of standards, technologies as such end to national competitiveness.

In some ex-centrally planed economy countries (e.g. Ukraine) educational institutions (self standing or working as part of broader institutions) already exist. However, sometimes the orientation and the content of the relevant curricula need dramatic re-orientation to cater for the (new) needs as eg. Voluntary standards, WTO obligations etc.

4) Knowledge Triangle Governance model

Another challenge is the adoption of the Knowledge Triangle governance model in new innovative firms and the role of QIs – standardization in its success. Issues such as IP rights, R&D patents, papers, research, and business performance are included in this.

A few proposals for facilitating the use of standards in support of innovation are:

- In order to provide SMEs with the benefits of standards without the full burden of technical

complexity, a comprehensive programme by standards makers to publish abstracts of European Standards and simple usage guidelines without access restriction needs to be set up

- The standards organisations need to address the barrier that the cost of access implies for the dissemination of standards

- The European Commission needs to consider together with the standards bodies how to improve the usage of available funding for translations

- The standards organisations, together with IPR owners, need to pursue an active IPR policy which allows not only the transfer of valuable knowledge to standards, but also their wide adoption and implementation

- The standards organisations, together with business/SME associations and other interested parties, need to consider how to increase their role in facilitating the implementation and usage of standards, and in achieving interoperability.

Standardization is a key part of the microeconomic infrastructure: it can enable innovation and act as a barrier to undesirable outcomes. One important aim of standardization is to help create a strong, open, and well-organised technological infrastructure that will serve as a foundation for innovation-led growth. It is often asked whether, on balance, standardization acts more to constrain innovation or to enable innovation. These two activities are inextricably linked. Standardization does constrain activities but in doing so creates an infrastructure for subsequent innovation. Well-designed standards should be able to reduce undesirable outcomes. Moreover, standardization is not just about producing norms for given technologies in given markets. Standardization helps to credibility, focus and critical mass in markets for new technologies.

5) SMEs impact

Companies that make the most of standardization opportunities enjoy a head-start over their rivals. They can reduce costs and increase quality. They can reduce the risks they face - both technological risks and market risks. Standards can help to develop the market for products and services based on the newest technologies. Moreover, there are benefits from participating in the standardization process as well as in using the end results.

Standardization increases competition and that does not necessarily increase profitability of all companies. However it is in the interests of the economy as a whole. By opening up markets and enabling competition, standards do not necessarily increase the profitability of all companies. On the contrary, open standards may actually reduce profitability. But there is a strong presumption that the customer benefits from this increased competition. Standardization increases the volume of trade, increasing imports as well as exports, and makes an important contribution to macroeconomic growth.

B. EU Aid Programs Challenges

The development of new EuropeAid and Twinning programs regarding Quality Infrastructures (QIs) have to consider that they have to correlate social, business, economic and performance issues and provide the need for a strategic QI system incorporating associated challenges as presented in this paper.

The proposed National Quality Infrastructures (QIs) shall include most of the challenges addressed as far as both the common technical and regulatory approaches and elements of performance management. Benefit countries which build or expand their QI shall include in their call for tenders specifications assuring the minimum of common to EU approaches and new elements discussed in this study.

Summarizing the conclusions, we discussed:

1. Identification of Quality Infrastructures Challenges for the countries discussed:

   - Orientation (Centrally planned against Market driven);

   - National Policies to support smooth QI development;

   - Education in Standardization initiatives;

   - Adoption of the Knowledge Triangle governance model in innovative firms and the role of QI;

   - SMEs impact by competitive QI National Systems (role of standards and intellectual property)

2. EU Aid funded programs challenges:

- Better design and development of the following EuropeAid and Twinning EU Calls of Interests in the field of QI by incorporating challenges discussed above

Further Research Work

A few recommendations for further research work are:

- A field study to measure the performance of QI systems over business performance in EU Neighbourhood countries;

- A literature study to evaluate initiatives in "Education in Standardization" in EU Neighbourhood countries;

- Further research on contribution of Standardization into the Knowledge Triangle initiatives along to requirements of "standardize" the Knowledge Triangle.

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Credit Management Spur Higher Profitability? Evidence from Nigerian Banking Sector

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Abstract

The rising non-performing credit portfolios have significantly contributed to financial distress in the banking sector. Banks collect deposits and lends to customers but when customers fail to meet their obligations problems such as non-performing loans arise. This study evaluates the impact of credit risk management on bank profitability of some selected commercial banks in Nigeria using econometric analysis method on annual time series data of ten banks over the period of 2006 to 2012. The results from Levin, Lin & Chu unit root test shows that all the variables were non-stationary at level. The results from Panel Least Square (PLS) estimate found that that credit risk management has a significant impact on the profitability of Nigeria banks. Therefore, management need to be cautious in setting up a credit policy that might not negatively affects profitability and also they need to know how credit policy affects the operation of their banks to ensure judicious utilization of deposits. This conclusion has important policy implications for emerging countries like Nigeria as it suggests that capitalisation and total assets of the bank should be periodically evaluated. The regulatory authorities will therefore need to put in place appropriate machinery that will address issues of bank liquidity and shore assets quality in the industry.

Introduction

Financial institutions are exposed to a variety of risks among them; interest rate risk, foreign exchange risk, political risk, market risk, liquidity risk, operational risk and credit risk [17] . In some instances, commercial banks and other financial institutions have approved decisions that are not vetted, there has been cases of loan defaults and nonperforming loans, massive extension of credit and directed lending. Policies to minimize on the negative effects have focused on mergers in banks and NBFIs, better banking practices but stringent lending, review of laws to be in line with the global standards, well capitalized banks which are expected to be profitable, liquid banks that are able to meet the demands of their depositors, and maintenance of required cash levels with the central bank which means less cash is available for lending [15]. This has led to reduced interest income for the commercial banks and other financial institutions and by extension reduction in profits ([20]; [22]; [39]).

Credit risk is the possibility that the actual return on an investment or loan extended will deviate from that, which was expected ([16];[18]) defines credit risk as losses from the refusal or inability of credit customers to pay what is owed in full and on time. The main sources of credit risk include, limited institutional capacity, inappropriate credit policies, volatile interest rates, poor management, inappropriate laws, low capital and liquidity levels, directed lending, massive licensing of banks, poor loan underwriting, reckless lending, poor credit assessment., no non-executive directors, poor loan underwriting, laxity in credit assessment, poor lending practices, government interference and inadequate supervision by the central bank. To minimize these risks, it is necessary for the financial system to have; well-capitalized banks,

service to a wide range of customers, sharing of information about borrowers, stabilization of interest rates, reduction in non-performing loans, increased bank deposits and increased credit extended to borrowers. Loan defaults and nonperforming loans need to be reduced ([29]; [37]).

Definition of Terms

The ability of the banking industry in granting credit facilities has played a predominant role in the Nigerian economic environment. The probability of incurring losses resulting from non-payment of loans or other forms of credit by debtors known as credit risks are mostly encountered in the financial sector particularly by institutions such as banks. The biggest credit risk facing banking and financial intermediaries is the risk of customers or counter party default. During the 1990s, as the number of players in banking sector increased substantially in the Nigerian economy and banks witnessed rising non-performing credit portfolios. This significantly contributed to financial distress in the banking sector. Also identified was the existence of predatory debtor in the banking system whose modus operandi involve the abandonment of their debt obligations in some banks only to contract new debts in other banks. Credit creation is the main income generating activity for the banks. But this activity involves huge risks to both the lender and the borrower. The risk of a trading partner not fulfilling his or her obligation as per the contract on due date or anytime thereafter can greatly jeopardize the smooth functioning of bank's business. On the other hand, a bank with high credit risk has high bankruptcy risk that puts the depositors in jeopardy. In a bid to survive and maintain adequate profit level in this highly competitive environment, banks have tended to take excessive risks. But then the increasing tendency for greater risk taking has resulted in insolvency and failure of a large number of the banks.

Banking problems majorly are caused of serious by low credit standards for borrowers and counterparties, poor portfolio management, and lack of attention to changes in economic or other circumstances that can lead to deterioration in the credit standing of bank's counter parties. And it is clear that banks use high leverage to generate an acceptable level of profit. Credit risk management comes to maximize a bank's risk adjusted rate of return by maintaining credit risk exposure within acceptable limit in order to provide a framework of the understanding the impact of credit risk management on banks profitability.

The excessively high level of non-performing loans in the banks can also be attributed to poor corporate governance practices, lax credit administration processes and the absence or non- adherence to credit risk management practices. The question is; how low should credit risks in banking be? Or put in different words; is there a level of credit risks at which the relationship between credit risks and bank specific factors (such as non-performing loans ratio; loan & advances; and operating efficiency) becomes positive? The hypothesis is that; at some low level of credit risks, the relationship between the two variables is non-existent, or perhaps even positive, but at higher rates it becomes negative. Are these the same for Nigerian banks? The last twenty years have been marked by substantial financial deregulation which is accompanied by methodologies and technologies for managing credit risks. The art of managing credit risk is more challenging than ever. Hence, the question is what is the impact of credit risk management on the profitability of Nigerian banks? How does Loan and advances affect banks profitability? What is the relationship between non-performing loans and profitability in Nigerian banks?

This study therefore seeks to examine the impact of credit risk management on Nigerian banking profitability and identifies the relationships between the non-performing loans; loan and advances and banks profitability. To achieve the study's objectives it is hypothesized that there is no significance between non-performing loan, loan and advances and banks profitability.

Review of relevant literature

Credit risk is the current and prospective risk to earnings or capital arising from an obligor's failure to meet the terms of any contract with the bank or otherwise to perform as agreed. Credit risk is found in all activities in which success depends on counterparty, issuers, or borrower performance. It arises any time bank funds are extended, committed, invested, or otherwise exposed through actual or implied contractual agreements, whether reflected on or off the balance sheet. Thus risk is determined by factor extraneous to the bank such as general unemployment

levels, changing socio-economic conditions, debtors' attitudes and political issues.

Credit risk according to Basel Committee of Banking Supervision [7] and [24] is the possibility of losing the outstanding loan partially or totally, due to credit events (default risk). Credit events usually include events such as bankruptcy, failure to pay a due obligation, repudiation/moratorium or credit rating change and restructure. Basel Committee on Banking Supervision- ([29] & [37]) defined credit risk as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms. [29] observe that credit risk as the risk that an asset or a loan becomes irrecoverable in the case of outright default, or the risk of delay in the servicing of the loan. In either case, the present value of the asset declines, thereby undermining the solvency of a bank. Credit risk is critical since the default of a small number of important customers can generate large losses, which can lead to insolvency [10].

[6] & [9] observed that banks are increasingly facing credit risk (or counterparty risk) in various financial instruments other than loans, including acceptances, interbank transactions, trade financing foreign exchange transactions, financial futures, swaps, bonds, equities, options, and in the extension of commitments and guarantees, and the settlement of transaction. [2] asserts that credit risk arises from non-performance by a borrower. It may arise from either an inability or an unwillingness to perform in the pre-committed contracted manner. [14] claimed that the single biggest contributor to the bad loans of many of the failed local banks was insider lending. He further observed that the second major factor contributing to bank failure were the high interest rates charged to borrowers operating in the high-risk. The most profound impact of high non-performing loans in banks portfolio is reduction in the bank profitability especially when it comes to disposals.

[5] stated that lending involves a number of risks. In addition to risk related to the creditworthiness of the borrower, there are others including funding risk, interest rate risk, clearing risk and foreign exchange risk. International lending also involves country risk. [8] observed that historical experience shows that concentration of credit risk in asset portfolios has been one of the major causes of bank distress. This is true both for individual institutions as well as banking systems at large.

[36] state that the most obvious characteristics of failed banks is not poor operating efficiency, however, but an increased volume of non-performing loans. Non-performing loans in failed banks have typically been associated with regional macroeconomic problems. [21] observed that the US Office of the Comptroller of the Currency found the difference between the failed banks and those that remained healthy or recovered from problems was the caliber of management. Superior mangers not only run their banks in a cost efficient fashion, and thus generate large profits relative to their peers, but also impose better loan underwriting and monitoring standards than their peers which result to better credit quality.

[28], [27] and [3], suggest that bank risk taking has pervasive effects on bank profits and safety. [11] asserts that the profitability of a bank depends on its ability to foresee, avoid and monitor risks, possible to cover losses brought about by risk arisen. This has the net effect of increasing the ratio of substandard credits in the bank's credit portfolio and decreasing the bank's profitability [30]. The banks supervisors are well aware of this problem, it is however very difficult to persuade bank mangers to follow more prudent credit policies during an economic upturn, especially in a highly competitive environment. They claim that even conservative mangers might find market pressure for higher profits very difficult to overcome.

The deregulation of the financial system in Nigeria embarked upon from 1986 allowed the influx of banks into the banking industry. As a result of alternative interest rate on deposits and loans, credits were given out indiscrimately without proper credit appraisal [35]. The resultant effects were that many of these loans turn out to be bad. It is therefore not surprising to find banks to have non-performing loans that exceed 50 per cent of the bank's loan portfolio. The increased number of banks over-stretched their existing human resources capacity which resulted into many problems such as poor credit appraisal system, financial crimes, accumulation of poor asset quality among others [38]. The consequence was increased in the number of distressed banks. However, bank management, adverse ownership influences and other forms of insider abuses coupled with political considerations and prolonged court process especially as regards

debts recovery created difficulties to reducing distress in the financial system [38]. Since the banking crisis started, the Central Bank of Nigeria (CBN) has had to revoke the licenses of many distressed bank particularly in the 1990's and recently some banks has to be bailout. This calls for efficient management of risk involving loan and other advances to prevent reoccurrences.

[34] highlighted that available statistics from the liquidated banks clearly showed that inability to collect loans and advances extended to customers and directors or companies related to directors/managers was a major contributor to the distress of the liquidated banks. At the height of the distress in 1995, when 60 out of the 115 operating banks were distressed, the ratio of the distressed banks' non-performing loans and leases to their total loans and leases was 67%. The ratio deteriorated to 79% in 1996; to 82% in 1997; and by December 2002, the licences of 35 of the distressed banks had been revoked. In 2003, only one bank (Peak Merchant Bank) was closed. No bank was closed in the year 2004. Therefore, the number of banking licences revoked by the CBN since 1994 remained at 36 until January 2006, when licences of 14 more banks were revoked, following their failure to meet the minimum re-capitalization directive of the CBN. At the time, the banking licences were revoked, some of the banks had ratios of performing credits that were less than 10% of loan portfolios. In 2000 for instance, the ratio of non-performing loans to total loans of the industry had improved to 21.5% and as at the end of 2001, the ratio stood at 16.9%. In 2002, it deteriorated to 21.27%, 21.59% in 2003, and in 2004, the ratio was 23.08% ([32] & [33]).

The role of bank remains central in financing economic activity and its effectiveness could exert positive impact on overall economy as a sound and profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system [3]. Therefore, the determinants of bank performance have attracted the interest of academic research as well as of bank management. Studies dealing with internal determinants employ variables such as size, capital, credit risk management and expenses management. The need for risk management in the banking sector is inherent in the nature of the banking business. Poor asset quality and low levels of liquidity are the two major causes of bank failures and represented as the key risk sources in terms of credit and liquidity risk and attracted great attention from researchers to examine the their impact on bank profitability.

Credit risk is by far the most significant risk faced by banks and the success of their business depends on accurate measurement and efficient management of this risk to a greater extent than any other risk [5]. Increases in credit risk will raise the marginal cost of debt and equity, which in turn increases the cost of funds for the bank [9]. To measure credit risk, there are a number of ratios employed by researchers. The ratio of Loan Loss Reserves to Gross Loans (LOSRES) is a measure of bank's asset quality that indicates how much of the total portfolio has been provided for but not charged off. Indicator shows that the higher the ratio the poorer the quality and therefore the higher the risk of the loan portfolio will be. In addition, Loan loss provisioning as a share of net interest income (LOSRENI) is another measure of credit quality, which indicates high credit quality by showing low figures. In the studies of cross countries analysis, it also could reflect the difference in provisioning regulations [19].

Assessing the impact of loan activities on bank risk, [13] uses the ratio of bank loans to assets (LOTA). The reason to do so is because bank loans are relatively illiquid and subject to higher default risk than other bank assets, implying a positive relationship between LTA and the risk measures. In contrast, relative improvements in credit risk management strategies might suggest that LTA is negatively related to bank risk measures [1]. [12] reports the effect of credit risk on profitability appears clearly negative This result may be explained by taking into account the fact that the more financial institutions are exposed to high risk loans, the higher is the accumulation of unpaid loans, implying that these loan losses have produced lower returns to many commercial banks [31]. The findings of Felix and [23] also shows that return on equity ROE and return on asset ROA all indicating profitability were negatively related to the ratio of non-performing loan to total loan NPL/TL of financial institutions therefore decreases profitability.

[6] & [9] asserts that loans are the largest and most obvious source of credit risk, while others are found on the various activities that the bank involved itself with. Therefore, it is a requirement for every bank worldwide to be aware of the need to identify measure, monitor and control credit risk while also determining

how credit risks could be lowered. This means that a bank should hold adequate capital against these risks and that they are adequately compensated for risks incurred. This is stipulated in Basel II, which regulates banks about how much capital they need to put aside to guide against these types of financial and operational risks they face. In response to this, commercial banks have almost universally embarked upon an upgrading of their risk management and control systems. Also, it is in the realization of the consequence of deteriorating loan quality on profitability of the banking sector and the economy at larger that this research work is motivated.

Methodology

The study is both historical and descriptive as it seeks to describe the pattern of credit risk of Nigerian banks in the past. The sampling technique that will be use is panel data technique. For example, total of five deposits money banks in Nigeria from 2006-2012 as used in this study. These include:

- o First Bank of Nigeria Plc
- o Access Bank
- o Zenith Bank Plc
- o Guaranty Trust Bank Plc
- o United Bank of Nigeria

Model Specification

This study examines the relationship between credit risk management and bank profitability of some selected commercial banks in Nigeria using econometric analysis method for the period 2006- 2012. Data for the study are obtained from secondary sources such as various editions of annual reports and account of the selected commercial banks listed in Nigeria Stock Exchange, as well as review of existing literatures. The problem of stationarity has been solved through the use of Levin, Lin & Chu unit root test unit root test. The pooled data was analysed using multiple regression models which adopt Panel Least Square (PLS), method in estimating the parameter of the model, which is specified thus:

Model:
Profitability = f(Credit Risk) (i)
Prof=f(Total Credit2Total Asset; NPL2Total Loan) (ii)
$ROA_{it}=\alpha_0+\beta_1 LA2TA_{it}+\beta_2 NP2TL_{it}+\mu$ (iii)

Where:

α_0 = Autonomous incomes
β_1, and β_2 are parameters
ROA = Return on Assets - Ratio of Profit after tax to total assets. (Proxy for Profitability)
LA2TA = Loan & advances to Total Asset
NP2TL = Non Performing Loan to Total Loan
μ = Error Term

Regression was employed in the study to forecast relationship between variables and estimate the influence of each explanatory variable to the dependent variable.

Results and Discussion

Levin, Lin & Chu Unit Root Test

The study employs E-view package to carry out unit root tests (Levin, Lin & Chu) in order to determine the stationarity of the variables used. All the variables were stationary at level.

TABLE 1 LEVIN, LIN & CHU UNIT ROOT TEST RESULT

Variables	LLC	Order of Integration	Probability
ROA	4.0633	I(0)	0.0008
LA2TA	-13.3896	I(0)	0.0000
NP2TL	2669.64	I(0)	0.0000

Note: The null Hypothesis is the presence of Unit root above in ROA, LA2TA and NP2TL. Levin, Lin & Chu test includes a constant; Akaike Information Criterion was used to select lags automatically.

The unit root test is conducted on the variables used in this study in other to avoid a spurious regression. From the above results, it shows that the data are all stationary at level. Moreover, considering the low probability value and critical values that are significant at 1%, 5% and 10% when compare to the Levin, Lin & Chu test statistics. The above result show that ROA, LA2TA and NP2TL are stationary series at level form but became an I(0) series. This implies that the above Levin, Lin & Chu test suggest that, ROA, LA2TA and NP2TL are of the same order of integration.

Descriptive Statistics

Table 2 shows the descriptive statistics of all variables used in the research.

TABLE 2 SUMMARY STATISTICS OF VARIABLES USED IN THE MODEL

	ROA	NP2TL	LA2TA
Mean	0.021220	0.335017	0.42857
Std. Dev	0.011639	0.134755	13.36496
Skewness	-0.071953	-2.099630	0.951022
Kurtosis	4.067129	10.32870	4.278915
Probability	0.429364	0.000000	0.021697
No of Obs	35	35	35

As can be observed from Table 2 the lowest mean value is Return on Asset (ROA) as 0.021220 and the highest mean value of Loan and Advances to Total Asset is 0.42857. Whereas the mean value of Non Performing Loan to Total Loan is 0.0335017. The mean of the data are ROA (0.021220), NP2TL (0.335017) and LA2TA (0.42857) while the standard deviations of the data are ROA (0.011639), NP2TL (0.134755) and LA2TA (13.36496). It is also observed that ROA and NP2TL are negatively skewed while LA2TA is positively skewed.

Model Estimation Issues and Discussion of Results

TABLE 3 PANEL LEAST SQUARE

INDEPENDENT\ DEPENDENT	ROA	
	Coefficient	Probability
NP2TL	-0.52620	0.0128
LA2TA	-0.83607	0.0076
R²	0.731209	
ADJUSTED R²	0.556742	
F-STATISTIC	1.898401	0.024286
DURBIN WATSON	1.899315	

Regression Results and Discussion

The regression result of the study's model as indicated above suggests that all the independent variables have negative impact on profitability. Therefore, this research shows that all the variables used to capture capitalization that is (bank liquidity, bank deposit, bank loan, operating expenses and bank size followed the theoretical a'priori expectation in relation to the profitability captured by return on asset.

The studies of credit risk management and bank profitability enables us provide answer to the soundness, safety, profitability, quality of loan

portfolio, asset, and deposit in the Nigerian banking industry. The selection of credit risk management has not been taken seriously and the performance is a function of the inputs.

The result show that the ratio Non-performing loan to Total Loan negatively relate to profitability though not significant The parameters shows that increase in non-performing loans decreases profitability (ROA) by 53%, however, increase in the level of loan & advances to total assets significantly decrease profitability of the banks by 84%, this expose them to higher risk level. The study shows that there is a direct but negative relationship between profitability (ROA) and the ratio of non-performing loan to total loan and the ratio of loan & advances to total asset.This is consistent with the findings of [13], [12], [31], [1] and [23].

In terms of the fitness of the study model, the coefficient of multiple determinations R² indicates that about 73% (adjusted R 56%) of the variations in ROA are explained by the combined influence of credit risk indicators (NP2TL and LA2TA) in the model. The Durbin Watson statistic measures the serial correlation of the variables. The result of the Durbin Watson test shows 1.899315. Since the value is approximately 2, it is accepted that there is no autocorrelation among the successive values of the variables in the model.

The test of overall significance of regression implies testing the null hypotheses. The overall significance of the regression is tested using Fisher's statistics. In this study the calculated F* value of 1.898401 is significant at 5%. It is therefore, concluded that linear relationship exist between the dependent and the independent variables of the model. Base on this findings, the postulations which respectively state that there is no significant relationship between non-performing loan and banks profitability while loan and advances does not have a significant influence on banks profitability were rejected. The evidence established that the independent explanatory variables (credit risk indicators) have individual and combine impact on the return of asset of banks in Nigeria.

This study shows that there is a significant relationship between bank performance (in terms of profitability) and credit risk management (in terms of loan performance). Loans and advances and non performing loans are major variables in determining asset quality of a bank. These risk items are important in determining the profitability of banks in Nigeria. Where a bank does not effectively manage its risk, its

profit will be unstable. This means that the profit after tax has been responsive to the credit policy of Nigerian banks. The deposit structure also affects profit performance. Many highly profitability banks hold a large volume of core deposits. The growth of loan has been relatively fast for the past few years and which is not fully covered by the deposit base. Banks become more concerned because loans are usually among the riskiest of all assets and therefore may threatened their liquidity position and lead to distress. Better credit risk management results in better bank performance. Thus, it is of crucial importance for banks to practice prudent credit risk management to safeguard their assets and protect the investors' interests.

Conclusion and Recommendations

The study investigated the impact of credit risk on the profitability of Nigerian banks. From the findings it is concluded that banks profitability is inversely influenced by the levels of loans and advances, and non-performing loans thereby exposing them to great risk of illiquidity and distress. Therefore, management need to be cautious in setting up a credit policy that will not negatively affects profitability and also they need to know how credit policy affects the operation of their banks to ensure judicious utilization of deposits and maximization of profit. Improper credit risk management reduce the bank profitability, affects the quality of its assets and increase loan losses and non-performing loan which may eventually lead to financial distress. CBN for policy purposes should regularly assess the lending attitudes of financial institutions. One direct way is to assess the degree of credit crunch by isolating the impact of supply side of loan from the demand side taking into account the opinion of the firms about banks' lending attitude. Finally, strengthening the securities market will have a positive impact on the overall development of the banking sector by increasing competitiveness in the financial sector. When the range of portfolio selection is wide people can compare the return and security of their investment among the banks and the securities market operators. As a result banks remain under some pressure to improve their financial soundness.

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How can Big Data transform knowledge management?

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Abstract

This document examines the new technological hype, the big data by analyzing the road that led to big data. After discovering trends in storage costs and integrated circuit number of parts, is a description of the core theory regarding to big data, the 4V. Findings suggest that big data is usable at knowledge management, it is possible and useful to monitor collect data from our users to improve the knowledge management system use.

Keywords

Big Data; Knowledge Management, Social Intranet, ELGG

INTRODUCTION

On an usually day we are browsing, sharing, searching, communicating, buying on the Internet. These activities have a trace, creates large and complex data. These data is saved because the availability of cheap, fast computers and storage, as well as open source tools.

The road to big data

Two factors assisted reaching the road to big data. First, the processing power is very fast nowadays. Intel co-founder Gordon E. Moore described a trend that the number of transistors on integrated circuits doubles approximately every two years.

The cost of storage is almost null. Matthew Komorowski [9] decided to look for some historic pricing information to see exactly how fast the cost of storage space has gone down over the last 30 years. He used a web page called Historical Notes about the Cost of Hard Drive Storage Space [8]. For data from 2004-present he was retrieved using the archive.org

Wayback Machine. Matthew did this research in 2009, so, in this research we enhance it. In this respect, we added 2010-2013 and we introduce a second chart to visualize the storage cost per terrabyte.
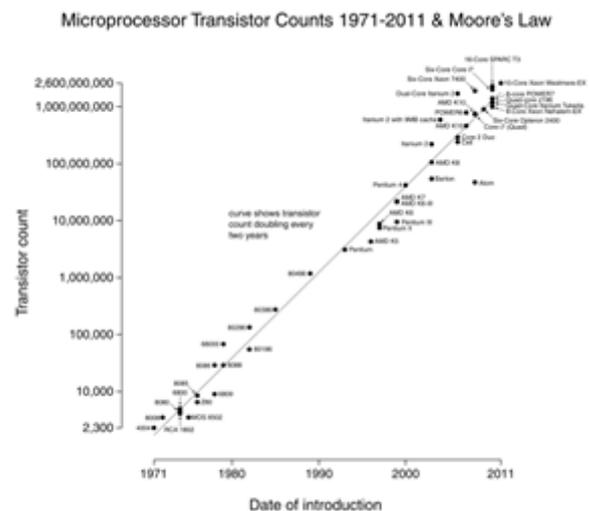
FIG. 1 MOORE'S LAW

In 2011 there was a flood in Thailand which created a shortage, so the prices increased for a year. Hard drive prices touch pre-flood levels in 2012 November [10].

So all these led to big data, now is available to use cheap hardware to store and process the information in innovative forms. The origins of the big data term come from a 2001 paper by Doug Laney of Meta Group [11]. In the paper, Laney defines big data as data sets where the three Vs—volume, velocity and variety—present specific challenges in managing these data sets. According to Ohlhorst [2] big data has 4V:

FIG. 2 HARD DRIVE COSTS PER GIGABYTE

FIG. 3 HARD DRIVE COSTS PER TERRABYTE

1. Volume. Big Data comes in one size: large. Enterprises are awash with data, easily amassing terabytes and even petabytes of information.

2. Variety. Big Data extends beyond structured data to include unstructured data of all varieties: text, audio, video, click streams, log files, and more.

3. Veracity. The massive amounts of data collected for Big Data purposes can lead to statistical errors and misinterpretation of the collected information. Purity of the information is critical for value.

4. Velocity. Often time sensitive, Big Data must be used as it is streaming into the enterprise in order to maximize its value to the business, but it must also still be available from the archival sources as well.

Big data and data mining can be used to predict disease outbreaks, understand traffic patterns, and improve education. To show this we collected a list with real life examples of successful Big Data projects (see Table 1).

TABLE 1. BIG DATA EXAMPLES

Company	Big Data Source	Findings	Url
Ford	Fusion generates up to 25 GB data per hour	To understand driving behaviors	http://www.datanami.com/datanami/2013-03-16/how_ford_is_putting_hadoop_pedal_to_the_metal.html
Caesars casino		found that increasing pay within certain limits had no impact on turnover	Phil Simon: Too Big to Ignore [7]
Union Pacific Railroad	Ultrasound scanners sending every passing train and send the data to the railroads data center	identify equipment at risk of failure	http://en.wikipedia.org/wiki/Industrial_Internet
Walmart	Using big data from websites to feed shopper and transaction data into an analytical system	Shoppycat product	http://gigaom.com/2012/03/23/walmart-labs-is-building-big-data-tools-and-will-then-open-source-them/
Google	Search terms used	Flu map	http://www.google.org/flutrends/
Tesco		Cut cooling costs	http://www.computerweekly.com/news/2240184482/Tesco-uses-big-data-to-cut-cooling-costs-by-up-to-20m
Xerox		Xerox found that experience was overrated for call-center positions. What's more, overly inquisitive employees tended to leave soon after receiving training.	Phil Simon: Too Big to Ignore [7]
EMC Corporation	Insurance data	Better car insurance	Phil Simon: Too Big to Ignore
Thomas M. Menino (Boston's mayor)	Mobile phone gps data	Finding potholes and general road hazards	http://streetbump.org/
Amazon	Mining customer data	Recommender system	http://www.bigdata-startups.com/BigData-startup/amazon-leveraging-big-data/

Knowledge Management 2.0

The research topic is knowledge management 2.0, which is based on the foundations of social web. Tumblr, Twitter, Facebook, Instagram changed our life, we posting our thoughts, we share the photo immediately online right after we shot it. First it was a tool to communicate, and then an agent of change, we should think about the Egypt's Facebook revolution. It's not just a place to discuss about politics, it transforms people life, creates new industries. Flash mobbing show how efficiently is possible to organize an event. Web 2.0 provides new systems for knowledge management. People are now the generator of knowledge, they social participation grows, they can communication in a many-to-many model, the culture is changed so they are now more proactive, thanks to the possibility of self-organizing. Social network is also a tool to improve the transfer of implicit knowledge. According to Stowe Boys implicit knowledge is an interpersonal knowledge, which is communicated implicitly in the conversations and connections of people. Knowledge management 2.0 is focusing on socialization the most important mode of knowledge creation [1].

Széchenyi István University's Regional Development Doctoral School (RGDI)

RGDI has around 170 members, who can inform about new publication possibilities, call for papers, and conferences in a newsletter. This communication method makes hard to enhance the conversation on topics. So there was a need for a change. We chosed ELGG. "Elgg is an award-winning open source social networking engine that provides a robust framework on which to build all kinds of social environments, from a campus wide social network for your university, school or college or an internal collaborative platform for your organization through to a brand-building communications tool for your company and its clients." [3] Elgg is aimed primarily at education, according to the developer Dave: "Elgg focuses on the learner and interactions whereas VLE's focus on the course and content delivery. It's about providing an informal space that lets learners exercise their own thoughts, reflections, make their own connections and be able to compile a body of evidence that would normally slip through the cracks with the more highly structured approach that a VLE offers. The creation of ad-hoc communities around similar interests is what happens when you learn and discuss in real life, and Elgg allows people to do this in the online space, whereas Virtual Learning Environments do not." [4]

Sofar, we learned from the big data concept, that every log, database contains valuable data, so we examined how is it possible to make research about the ELGG data. In this line, we checked the data schema (see Table 2).

TABLE 2. ELGG DATA SCHEMA

Table name	Function
elgg_access_collection_membership	connection between access collection and user tables
elgg_access_collections	contains the user access
elgg_annotations	empty table
elgg_api_users	empty table
elgg_config	System parameter can be found here
elgg_datalists	path and cache information are stored here
elgg_entities	entity table
elgg_entity_relationships	shows the relation between entities
elgg_entity_subtypes	description of entities
elgg_geocode_cache	empty table
elgg_groups_entity	user groups access level
elgg_hmac_cache	empty table
elgg_metadata	entity and metadata connection table
elgg_metastrings	metadata description
elgg_objects_entity	objects description
elgg_private_settings	settings
elgg_river	river table
elgg_sites_entity	it contains the site name and url
elgg_system_log	log table
elgg_users_apisessions	empty table
elgg_users_entity	user list
elgg_users_sessions	empty table

Table 2 is important due to fact that the system log is stored. The default system log is stored in the prefix_system_log database table. It contains the following fields:

- id A unique numeric row ID

- object_id The GUID of the entity being acted upon

- object_class The class of the entity being acted upon (eg ElggObject)

- object_type The type of the entity being acted upon (eg object)

- object_subtype The subtype of the entity being acted upon (eg blog)

- event The event being logged (eg create or update)

- performed_by_guid The GUID of the acting entity (the user performing the action)

- owner_guid The GUID of the user which owns the entity being acted upon

- access_id The access restriction associated with this log entry

- time_created The UNIX epoch timestamp of the time the event took place

Analysis
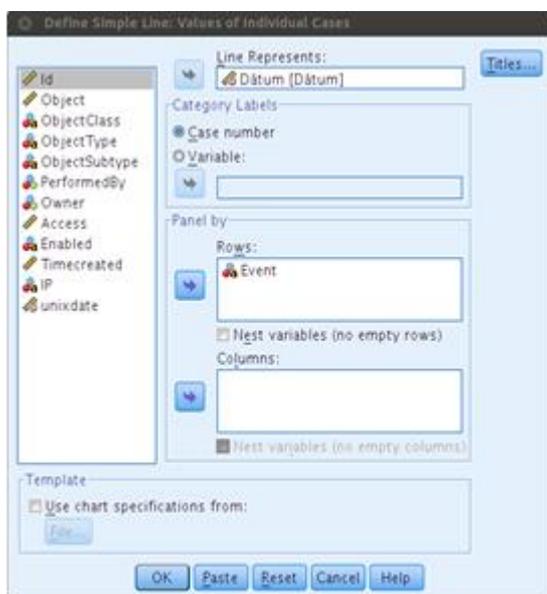
FIG. 4 ELGG DATA IN SPSS

The following analysis is very easy after importing the log tables data into SPSS (see Fig. 4):

1. transactions and event types

2. users and event types

3. users and transactions

4. time and transactions

Conclusion

It is hard to decide wheather Big Data is a hype or not, but the technology allows us to collect, crawl almost every data. This gives us more research opportunity, like how the knowledge transfers in a social intranet. My next paper will be a case study about the RGDI Social Intranet project. Maybe it won't transforms the knowledge management, but the data can be used to fine tune the knowledge management system.

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Employee share ownership plan, Managerial Entrenchment and Social Performance: Some Empirical Evidence in the French Context

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Abstract

The purpose of this study is to examine whether employee stock ownership plans (ESOPs) and CEO entrenchment affect social performance. Our central question: does employees' participation in the system of corporate governance (shareholding and presence in the boards of directors and supervisory boards) influence social performance in the context of manager's active behavior? The findings contribute to explain the social performance and they have implications for firms that decide to engage in ESOP plans in French context

Keywords

Employee stock ownership plans; Board of directors; CEO entrenchment; Social performance; France.

Introduction

Employee shareholding is a phenomenon which has developed in most industrialized and emerging countries. The development of employee shareholding has led to a significant interest in this phenomenon among academia as well as among practitioners. In fact, employee shareholding is at the heart of reflections on corporate governance, as it constitutes one of the ways of accompanying its changes which are underway [14], [64], [71], [56], [5], [33], [69], [46], [77] and [60].

Even though on a theoretical level, in the context of a partnership governance, the positioning of employee shareholding is fully justified and on an empirical level, it is in a phase of progressive development, nonetheless this topic is the subject of a set of empirical studies that seems insufficiently expanded in France except for, as far as we are concerned, the research of [82], [29], [83], [28], [69], [46], and [39]. These French studies, generally aiming at emphasizing the benefits of employee shareholding, have often sought to demonstrate their positive impact on value creation. Falling within this perspective, our research aims at showing the impacts of employee shareholding on investment in human capital, which are rarely taken into account in the existing research.

In France, according to, [8], [28], [5] and [32]employee participation in firms governance is not limited to taking the participation of the latter in the capital of their firm, but it also results from their active presence in the boards of directors and supervisory boards. Indeed, the development of employee shareholding in France has gradually made a number of firms to take interest in the role of employee directors within their boards of directors. While, according to facts, obviously, employees' participation in the system of corporate governance is growing, while being strongly encouraged and defended in France, no empirical study has, to our best knowledge, and in the French context, linked the degree of employee participation in the capital and the Board of Directors to social performance.

[45], [63] and [38] have postulated that employee shareholding can allow managers to entrench themselves and to better master governance mechanisms. In fact, employee shareholding creates a dependency of employee shareholders vis-à-vis the

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manager. The latter is at the same time their employer and their representative on behalf of the funds they have invested in their firm [41]. According to [38], employee shareholders find difficulties to break free from their dependence vis-à-vis their managers and to avoid their influence. In the French context, [42] observed that the more employee shareholding is important (more than 5%), the more managers are able to entrench themselves. Thus, it seems necessary to include the impact of the manager's entrenchment policy and managerial discreti[1] on social performance.

Based on these findings, our research focuses on a central question: to what extent does employees' participation in the system of corporate governance (shareholding and presence in the boards of directors and supervisory boards) influence social performance in the context of manager's active behavior?

In an attempt to answer this research question, the current article is divided into four parts. The first two parts restore key elements of a literature analysis which allows us to study the social performance through the theories of corporate governance. In the second part, we have specially focused on research hypotheses. The third part discusses details the features of the empirical study that we conducted the used sample as well as the methodological choices. The last part introduces the obtained results as well as their interpretation and the respective discussion.

CONCEPTUAL FRAMEWORK

The role of employee shareholding is studied in two opposing research trends. The agency theory substantiates the idea of an employee shareholder who controls the managerial discretion. The entrenchment theory substantiates the thesis that employee shareholding is a lever for the manager's entrenchment and a source for the increase of his managerial discretion.

Employee Participation in Governance Bodies

Based on the works of [22] and [47], the theory of partnership agency showed that the relationship between shareholders (providers of financial capital) and employees (providers of human capital) may be conflictual insofar as the two parties do not always

have the same objectives in terms of resource allocation. The value of the specific assets of the employee, his "know-how", depend on the company's situation and especially on the risk related to its demise. This situation may cost him expenses from the moment that the company undertakes specific investments. The fact of favoring the interests of shareholders can lead the control coalition to take decisions contrary to the interests of other organization partners in particular employee decisions. According to several studies[2], company downsizing, accompanied by a market rise, aims to satisfy shareholders [40]. Similarly, according to the agency theory, employees may endorse harmful conduct to shareholders interests, in particular through increasing the level of their absenteeism and reducing their work intensity, which can lead to a profitability reduction and value destruction.

According to [36], the employee is in the situation of an individual who has accumulated experience and qualifications and who leases an asset (a specific job) to the firm. The value of this asset can diminish, or even be cancelled, if the employee loses benefits related to his job, if he is dismissed due to a sub-optimal behavior of the company or if the latter fails. As a result, the fear of being dismissed may encourage employees to propose investments in order to preserve their jobs [11], [13] and [54]. The existence of a situation of conflicting interests requires the establishment of mechanisms to preserve employees' interests. According to [59], it is currently interesting to notice a common desire to reconcile the interests of shareholders and employees. This is reflected in firms by the constant efforts meant to favor all shareholders (including employees) and to moderate the benefit granted at the sole creation of shareholder value. [28] and [77] have thus pointed out that employee representation in the board of directors would allow a better information sharing and a more effective cooperation between the various types of shareholders. [90] stated that it is the risk assumed by the employees which gives them legitimacy to control the decisions which affect their career as well as their heritage. The nature of employee participation in the governance of their firm may oppose, in a certain way, the force of the pressure exerted by financial stakeholders. The

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[1] According to Castanias and Helfat (1992), managers' entrenchment strategies can create annuities.

[2] The reader can refer particularly to the article of Hubler and Schmidt (1996).

compensations may be significant and are in particular reflected by a strengthening of the security level of jobs that the firm may grant to its employees [6]. According to [72], the more employees have high human capital, the more they can control access to key resources of the firm, not only develop them but also appropriate them to increase their human capital. According to the last two authors, the partnership approach of governance has led to a different view of shareholding structure and of the composition of the board of firms. It has allowed the various firms partners, including employees, to have property rights and to participate in the Board of Directors. [99] argues that human capital has become as fluid as financial capital. Workers' human capital requires a special follow-up within firms and gives certain legitimacy to employees to participate in corporate governance like the other shareholders [65].

Entrenchment and Manager's Active Behavior

The theory of corporate governance grants an active role for firms' managers, which is particularly useful in the context of the analysis of their strategies of defense and of governance mechanisms neutralization. However, the theory of corporate governance, which includes the entrenchment theory, highlights the fact that the leader can counter this disciplinary means [51]. In fact, the leader is able to follow an active strategy, enabling him to expand his discretionary space through neutralizing certain constraints bearing on his management. In this context, many studies have pointed to the existence of deviation strategies adopted by managers in order to eschew control mechanisms or to overcome them [47], [62], [7], and [81] explained that the manager who seeks to entrench himself uses the firm's resources in order to invest in specific investment projects, which make its replacement costly for shareholders. Other authors including [62], [27] and [2] postulated that diversification investments can be analyzed as means for increasing power, managers' entrenchment and reducing other business partners. Some studies [63], and [28] note that employee shareholding is likely to encourage management's entrenchment. [63] state that this entrenchment is easy as the degree of independence of employee shareholders with respect to the leader is weak.

RESEARCH HYPOTHESES

In this part, we will tackle the consequences of employees' participation in the share capital and in the Board of Directors of companies that employ them, as well as the impact of entrenchment strategies of their Employee shareholding contributes to creating a positive employment relationship which on the one hand, leads to the development of perceptions relating to the existence of common interests and shared purposes and on the other hand, develops the willingness to cooperate [52]. According to [32] employees are encouraged to cooperate rather than to come into conflict in order to participate in the creation and allocation of rents processes.

Thus, financial contribution creates an important modality at the disposition of employees to enable them to become more involved in the mechanisms of businesses decision-making, [50]. This path aims at offsetting the weight of capitalist shareholders, because as underlined by [1] "employee shareholders are deemed to have a logic that is less short-term than institutional shareholders." In this context, employees become full shareholders, they participate in votes during ordinary and extraordinary general meetings and they can exercise their power in firm management. It is clear from most studies that employee shareholding promotes higher motivation and employee involvement [58], a reduced absenteeism and turnover, an improved production quality and increased productivity [77], [54], and [60]. However, according to [57] the beneficial results expected from employee shareholding, in terms of human resources (motivation, effort...) are only achieved through a significant control exercised by the latter.

Employees remuneration through granting shares may also provide a mechanism which can encourage investment in human capital [12], [74] and [60]. In the same vein, [55] and [30] highlighted the existence of a positive relationship between employee incentive modalities and their level of satisfaction in general, as well as the increase of their sense of job security. According to [73] with employee shareholding, employees are less likely to be dismissed especially during mass unemployment where none is really secure from losing his job. A recent study carried out by the European Foundation for the Improvement of Living and Working Conditions (Eurofound), and

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whose purpose is to study the financial participation of employees in some 2500 European companies having more than 200 employees during the period 1999-2000, is instructive. Researchers have thus found that the use of this formula contributes to protecting the value of investment in human capital as well as in training and qualification of personal. [65] showed in their study that an increasing in the participation of employees in the capital has a positive impact on the decisions which enhance employees' training and skills. Finally, [75] have empirically shown that employees shareholding in Great Britain encourages commitment, loyalty and safeguard investments of the human capital of workers. Hence our first hypothesis:

H1: *The Employee share ownership plan (ESOPs) is positively related to social performance.*

According to [14] the new powers relating to employees shareholding are thus indirect powers which will be exercised by their representatives. The development of shareholding can lead employees to serve on the board of directors or supervisory board. According to [18] the German model of governance grants a great importance to employees, in such a way that the latter can be found in the supervisory board. This right known as co-determination allows employees to participate in determining their rights relating to work hours, dismissals and training. It is in this context that [28] mentioned that "by allowing them to protect their investment in human capital specific to the firm, the representation of employees in the board leads to an amelioration of employee's satisfaction, involvement and productivity, and promotes the speeding up of process of innovation and a higher quality ...".

In the same vein, the report established by the French Institute of Corporate Governance [49] appointed administrators employees as an asset to the company and all governance actors including employees. According to this report, it is logical to observe a correlation between the intensity of human capital deployed in the business project and the presence of administrators employees.

According to [44] employees' participation in the board of directors has many advantages. First, it ensures a certain level of democracy in the firm through imposing the participation of employees in strategic decisions. Second, it allows to protect the

investment in human capital, through ensuring job security to employees, improving business productivity and creating a good social climate. Finally, co-management allows them to exchange credible information and control managers more effectively. In the same vein, according to [79] this system enables to reduce the asymmetry of information supported by shareholders, as well as limit managers' opportunistic behavior and discretionary latitude.

Co-management can also improve employees' satisfaction [35]. It is manifested by the development of new ways to allocate staff, by changes in work hours and investment decisions in training and qualification. However, according to [73] representative participation, aligned with the existing trade union structures, seems more effective as representatives certainly act very seriously, the trade unions are anxious to protect the value of the investment of employees, and eager to support management commitments to do so. Thus, we deduce our second hypothesis:

H2: *The presence of the administrators "employee shareholders "in the board of directors or supervisory boards of firms is positively related to social performance.*

The Impact of Managerial Entrenchment Strategy

According to [47], [62] and [85] the fact that managers observe some specific commitments (implicit and explicit) vis-à-vis a stakeholder can help establish a trust relationship as well as a relaxation of the control carried out by all stakeholders. In our case, employees, as company partners, contribute to the development of a significant entrenchment ground, insofar as they can support him in the event of a conflict with certain shareholders or members from the board of directors. Thus, the manager who wishes to expand his discretionary space and to delimit employees' control power has all the interest in promoting investment in human capital. Managers can promise employees an amelioration of job security, faster promotions, more interesting remunerations [24] and [51]. According to [86] the manager tends to invest in businesses with high growth potential in order to maintain his implicit contracts with employees (various investments in human capital). According to the same author, the

respect of these contracts strengthens his entrenchment in the firm because employees affected by these agreements tend to remain faithful to him. All these conditions lead employees to grant greater confidence to managers. Moreover, it leads them to relax their control exercise and contribute to the expansion of the manager's discretionary space. Similarly, according to [62] in their anti-takeover battles, managers most often seek to defend their own position. In these situations, they often get employees' support, the main argument being generally defending jobs. In the same vein, [70] and [38] showed that managers may be tempted to establish employee share mechanisms in a defensive purpose in order to protect themselves against takeovers and thus promote their entrenchment.

Privileged relationships, likely to exist with the influential agents in the economy or the State, can also constitute a valuable source of entrenchment. In fact, investments in human capital and especially job creation and putting downsizing policies on standby are very advantageous for managers because these measures allow them to amplify their distinctive relationships with their agents intervening at State level [81]. This good image especially established with politicians can enhance the manager's human capital, increase his value in the labor market and guarantee his external entrenchment strategy. Our third hypothesis is the outcome of these analyses:

H3: *The managerial entrenchment is positively related to social performance*.

CHARACTERISTICS OF THE STUDY

This section is denoted to present our sample as well as the operationalization of the applied variables, information sources and estimation techniques.

Sample

Determining the sample size is conditioned upon achieving a compromise between the need to have a large enough sample that could serve to obtain statistically significant results, and secondly, the need to obtain detailed information relevant to social performance which involves working on a relatively small sample. Faced such these constraints, we have decided to study business firms pertinent to the SBF 250 index. The selected companies are listed ones over

the period 2007-2011. The choice of companies belonging to the SBF 250 index is justified by the fact that with respect to the Federation of Employee Shareholders and Former Employees (FAS), such firms undertake a highly developed employee ownership and shareholding strategy. Hence, this initial sample is likely to ensure a good representation in terms employee involvement and commitment level in the corporate governance system. Noteworthy, however, such firms as banks, insurance and investment companies, brokerage firms, portfolio management and development companies making part of the SBF 250 index have been excluded from the sample awing to the fact that these firms have an accounting structure that greatly differs from that of the of industrial and commercial companies, which does not allow for a homogeneous statistical processing. Moreover, companies whose annual reports and some information have not been available or complete have also been eliminated.

TABLE 1. CONSTITUTION OF THE FINAL SAMPLE

Constitution of the final sample	
Initial sample before reprocessing (SBF 250 on December 31, 2011)	250
Companies belonging to the banking / insurance / investment / Real Estate sector	36
Companies whose annual reports and some information have been unavailable, incorrect or incomplete	106
Final sample	108

Indeed, some data incompleteness has not been observed with regard to the applied information sources. Following, the entirety of the necessary treatments undertaken, the final sample turns out to consist of 108 companies. Table 1 depicts data figures relevant to the constitution of the sample.

The 108 companies constituting the sample are predominantly listed in the first market (82), as well as the second (23) and the new market (3). Once can also notice that more than half of the companies belong to the industrial sector and that 20% among them are part Employee Shareholding Index (IAS). The 108 companies belong to different economic sectors, as determined on the basis of the NAF codes indicated in

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the database, relevant, to the company's main activity of the company. Actually, we have grouped the companies into ten sectors, as shown in Table 2.

TABLE 2. SAMPLE COMPANIES REPARTITION

Activity sectors	Firms' percentage
Processing Industry	11,11
Food Industry	3,7
Buildings and Public Works	2,77
Trading and Distribution	11,11
Services	28,70
Basic and Heavy Industry	11,11
High Tech	20,37
Communication	4,6
Chemistry	2,77
Energy	6,48
Total	100

TABLE 3. SAMPLE DISTRIBUTION ACCORDING TO EMPLOYEE NUMBER

Number of employees	Number of Firms	Percentage of Firms
More than 10000 employees	52	48,1
5000-10000 employees	18	16,66
1000-5000 employees	29	26,85
Less than 1000 employees	9	8,33
Total	108	100

Business companies' structure in terms of size shows an overrepresentation of large firms employing more than 10000 employees (Table 3).

Operationalization of Retained Variables

The operationalization of variables, in particular that of the dependent variable, has sought to use indices initiated.

The explanatory variable: Social performance

It is evidently clear that financial performance measures tend to be relatively more explicit than social-performance related ones.

Noteworthy, however, data relevant to understanding social performance are most often obtained through surveys, characterized with the major drawback that the respondent's subjective interpretation can present. Hence, this entails restoring to the French companies published annual accounts including social statement which would help define comparable social variables relying on somewhat generally questionable bases. However, we encountered several difficulties in collecting information published by companies on social performance. One of these difficulties has to do with the nature of information, simultaneously quantitative and qualitative, static (measured at a given time) and dynamic (including changes), such as staffing, training, health and safety, employee mobility, their compensation, satisfaction, social interaction, backgrounds diversity and working time. A second problem has been related to the wide array of information on human capital spread in several documents. In fact, in addition to the reference documents, such as annual accounts and management ones, most companies often publish a special report to sustainable development, with a section devoted to Human Resources. The amount of information available in these reports has made it necessary to undertake certain choices with respect to variables that can be applied to measure social performance. Actually, the retained variables have been selected on the basis of the following criteria: simple and little questionable data, data that best reflect the elements highlighted in previous empirical research (staffing, compensation, training...) as well as the most frequently available data. Based on these criteria, it has been discovered that only three variables, or indicators, z, social and payroll charges. This indicator is measured as follows: Part of the added value allocated to employees = wages + social charges + payroll charges + other incentives / added value. As part of a study dealing with human-resource management practices in the French family and non-family businesses, [80] attached a great importance to firms' willingness to retain or train staff as well as to remuneration policy and non-wage compensation. As for the second it indicator takes into account the training costs. Indeed, investment in training aimed at qualifying employees is likely to lead to increased human capital through knowledge constitution by means of learning [17], [20] and [61]. In conformity

with the study elaborated by [17] the ratio "training budget / payroll weight" has been used to assess the social performance intensity. Sustainable growth of social performance can only be achieved either by substituting personnel members by more qualified individuals, or by the continuous training of the labor force. The third applied indicator pertains to the companies adopted employment policy in, particularly, the evolution of the average number of employees (taking into account recruitment and job cuts). Indeed, the more growing the workforce evolution is, the firm saveguards the employees human capital (good employment relations'). This indicator is measured as follows: evolution in the number of employees = number of employees (N) - number of employees (N-1) / number of employees (N-1). To note, this ratio has been used in a study undertaken by [23] focusing on the relationship between innovation, employment and performance within French companies. Yet, this indicator has the disadvantage of being highly dependent on economic conditions. The latter, playing as the origin of job and recruitment cuts, it such conditions are differently interpreted from one company to another. So for the purpose of achieving dynamic indicators of social performance, we have reckoned it useful to examine these three indicators' evolution and trend over the entire study period, instead of merely applying their averages. In other words, we separately assign to each indicator a value (1) one an increase has been recorded, (0) otherwise. Hence, an increase would be recorded only, if the average variations in indicators over the next five periods (2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011) should be strictly greater than zero (the threshold is zero). A decline or stability is recorded in case the mean variations' changes in indicators over the next five periods (2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011) is inferior than or equal to zero. Thus, our variables to explain turn out to be dichotomous variables. Table 4 depicts the correlation coefficients Kendall Tau-B among the three explanatory variables.

As a matter of fact, correlation proves to be positive and significant among the three binary variables measuring social performance. In fact, reckon to reach relatively similar results by using, as dependent variable, the evolution in employees' number, the value added share denoted to employees or the training budget based on the payroll.

TABLE 4. CORRELATIONS BETWEEN VARIABLE TO EXPLAIN (SOCIAL PERFORMANCE)

Correlation coefficients	Variables	Evolution in the number of employees	Share of value added allocated to employees	Training budget / payroll weight
Kendall Tau-B [3]	Evolution in the number of employees	1	0,812**	0.629**
	Share of value added allocated to employees		1	0.479***
	Training budget / payroll			1

** Significant at 1% (bilateral), * significant at 5%

The explanatory variables

The explanatory variables, as applied in this work, are twofold, namely: interest variables along with control ones. The interest variables studied in this research are three in number.

➤ The employee's shareholding

The employee's shareholding variable to be measured in two ways. The first measurement procedure is a continuous variable pertinent to the capital percentage held by employees (ESOPS). The second procedure consists in retaining this variable as a dichotomous one. It takes the value (1), if the company has a significant employee ownership (at a 3 % threshold), and (0), if the company has no employee-shareholders or should they be very low represented. In fact, since 1999, the Federation of Employee Shareholders and

Former Employees (FAS) has determined a significant employee-shareholding practice should the company have an employee stock holding of more than 3% of the capital.

➤ The administrator employee variable

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[3] A nonparametric association measure for ordinal variables

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The first measure pertains to the percentage of employee directors in the board of directors or supervisory board (EMPDIR). As mentioned earlier, the second approach lies in retaining this variable as a dichotomous variable which takes the value (1) if the employee shareholders are represented on the board of directors or supervisory board and the value (0), if the company has no employee directors.

> The CEO entrenchment variable

Most often, the operationalization of directors' entrenchment is performed using the following criteria: the share of capital held by directors', the duration in officer of a director [7] , the CEO age [66], the number of terms registered by the directors [81], anti-takeover defense strategy [62] and the directors turnover [15]. In the present research work, three entrenchment indicators have been applied "ENTRCH": the registered number of terms undertaken by the CEO, the mean number of terms registered by directors in their entirely, and the CEO age. For testing purpose regarding the directors' entrenchment' variable, we exclusively use the second (TERMS) and the third measurement (AGE), as they have yielded more satisfactory results throughout the parameter estimation phase.

With respect to the control variables, three among them have been on the basis of influence they can have on social performance. The first variable represents the financial performance level. Actually, this variable has been included in our study for the sake of recognizing whether social performance does depend on the performance of the financial undertaking or whether it rests on the interest considerations related to employees and other stakeholders, within a value creating or destroying perspective. Our choice coincides with Tobin's Q as a business performance measurement. With regard to our study, equity an approximation of Tobin's Q is retained, calculated as follows [21]: Tobin's Q = (equity market value + debt accounting value) / book assets.

TABLE 5. SAMPLE DESCRIPTIVE STATISTICS

Variables	Mean	Standard deviation	Minimum	Maximum
Evolution in the number of employees	3,321%	8,582%	-27,158%	24,369%
Share of value added allocated to employees	61,981%	15,128%	10,397%	106,746%
Training budget / payroll weight	4,323%	1,621%	2,144%	6,321%
% of Employed Directors	0,492%	2,147%	0	14,93%
% of Employed Shareholders	1,623	0,817	0	7,236
Average tenure of directors' terms	8,314	4,247	1	26
CEO age	52,634	7,342	42	69
Tobin's Q	1,284	0,196	0,874	1,542
SIZE	6,324	1,721	8,639	0,724
DEBT	0,239	0,154	0,127	0,591

TABLE 6. SUMMARY OF DETERMINANTS TO TEST AND ESTIMATED RELATIONSHIPS

Endogenous variable	Indicators	Labels
Social performance	Evolution of the number of hired employees = employee number (N) - Employee Number (N-1) / employee number (N-1).	EMP
	Share of added value allocated to employees = wages + social charges + payroll taxes + other incentive / added value	ADDEMP
	Training budget / payroll weight	TRAIEMP
Control variables	Indicators	Labels
Size	Total assets log	SIZE
Financial Performance	Tobin's Q proxy = (equity market value + debt book value) / book assets	PERF
Debt	Total Financial Debt / total assets	DEBT

Exogenous variables	Indicators	Name
Employee shareholding	- A continuous variable:% of detained capital employee (continuous variable) - A binary variable: 1 if significant presence in the capital does exist (3% threshold), 0 otherwise.	ESOPS ESOPSBIN
Employee directors	-A continuous variable: % of employees in the Board of Directors - Binary variable: 1 in the case of presence in the board, 0 otherwise.	EMPDIR EMPDIRBIN
Weight of employees	-A binary variable Which takes the value (1) if there is a simultaneous presence of employees in the capital, whatever the company capital detention threshold might be, and the board of directors or supervisory board and (0) value otherwise.	WT
Management entrenchment ENTR	-Continuous variable: the average number of all directors' cumulative terms. - CEO age	TERMS AGE

As for the second control variable, it consists in the firm size, measured by the logarithm of the firm's total assets' booking value[4]. The third control variable retained is debt. It constitutes a fundamental variable in regard of corporate finance relevant researches, particularly concerning value creation decision. As part of our analysis, a purely accounting measure is undertaken through the debt ratio (DEBT), calculated via the ratio: total financial debt / total assets [34]. For the sake of characterizing our sample, some descriptive statistics elements are proposed, as depicted in Table 5.

For synthesis purposes, Table 6 depicts each model's variable measurement, their denomination along with their expected influence on the investment intensity pertinent to human capital and employment.

Information Sources

The used data pertain to four different sources, namely, the company annual report and the Internet, along with the Diane Dafsalien and Worldscope databases.

- The annual report and the Internet

Prior setting up the database, all the companies' annual reports, subject of the final sample, have been downloaded, as they constitute our primary source of information. The annual report includes a section frequently addressing the human resource management function as well as the social balance. Data has been extracted from a pre-established database: SBF 250 and from the following sites: www.cob.fr;www.rapportannuel.com;www.edubourse.com; www.societe.com. At an ultimate stage, we used the Who's Who (Jacques Lafitte Editions), which contains biographical information and notices relevant a number of personalities in France. We have applied the Internet available version (www.whoswho.fr) for access to some leaders' biography pertaining to our sample. The information collected relates to director's birth date (CEO age) regarding the case in which it has not been available in the annual report.

Diane database: The Diane data base has offered us access to the following information: salaries, social charges, payroll taxes as well as to other forms of incentive and added value.

Worldscope database: Data concerning the number of employees have been gathered from the Worldscope database.

Dafasalien database: Data relevant to the percentage of capital held by employees, the percentage of state held capital, the percentage of employed directors and leaders' entrenchment have been collected from the DAFSALIEN database.

The Estimation Method

In this respect, the objective lies in showing the ways how the hypotheses H1, H2 and H3 have been tested. More specifically, it consists in explaining social performance bases on corporate governance variables. Three control variables (performance, size and debt) are also taken into account. The undertaken method rests on a multiple regression analysis, more specifically, on logistic regressions. Indeed, since the dependent variable explanatory is a dichotomous one, a logistic regression proves to be particularly fit to our approach in that it does not proceed in an additive, way, but, rather, in an interactive manner, unlike a discriminant analysis [31]. According to the

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[4] To overcome the results' variability due to the presence of companies whose sizes differ, greatly, i.e., to reduce the size variable weight pertinent to large companies, and to reduce heteroscedasticity and extension likely to result from certain extreme points, this variable effect will be smoothed using its pertinent decimal logarithm.

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explanatory variables' approach, three regressions or equations are estimated, namely:

Model 1 holds ESOPS (the share of employee-held capital) and EMPDIR (the percentage of employed directors) as continuous variables;

Model 2 retains both the ESOPSBI and EMPDIRBIN variables as binary ones;

Model 3 accounts for a variable that helps perceive the employees' weight within in governance bodies (WT). It is, actually, a binary variable that takes the value (1) should there be a simultaneous presence of employees both in the capital (whatever the firms' capital detention threshold might be firm) and in the directors' board or supervisory board, the value (0) otherwise. In a next stage, models 1, 2 and 3 are, then, reproduced by substituting the variable AGE by the TERMS one for the sake of checking the results' sensitivity to the director- entrenchment measures. Overall, a sum of 18 equations will be assessed. The models to estimate are presented as follows:

$$(\text{EMP }i, \text{ ADDEMP }i, \text{ TRAIEMP }i,) = \beta0 + \beta1 \text{ ESOPS }i + \beta2 \text{ EMPDIR }i + \beta3 \text{ ENTRA }i + \beta4 \text{ Q de Tobin }i + \beta5 \text{ Log (actif }i) + \beta6 \text{ DEBT }i + \varepsilon i \quad (\text{MODELE 1})$$

$$(\text{EMP }i, \text{ ADDEMP }i, \text{ TRAIEMP }i,) = \beta0 + \beta1\text{ESIOPSBIN }i + \beta2 \text{ EMPDIRBIN }i + \beta3 \text{ ENTRA }i + \beta4 \text{ Q de Tobin }i + \beta5 \text{ Log (actif }i) + \beta6 \text{ DEBT }i + \varepsilon i \quad (\text{MODELE2})$$

$$(\text{EMP }i, \text{ ADDEMP }i, \text{ TRAIEMP }i,) = \beta0 + \beta1 \text{ WTi} + \beta2 \text{ ENTRAi} + \beta3 \text{ Q de Tobin }i + \beta4 \text{ Log (actif }i) + \beta5 \text{ DEBT }i + \varepsilon i \quad (\text{MODELE3})$$

DISCUSSION AND IMPLICATION

The regression results are synthetically depicted in Tables 7, 8, and 9. The models have been selected after several exhaustive iterations and following the removal some unnecessary irrelevant observations in a bid to present the best results of the model's general validity tests of be it for their prediction ability, their data adjustment quality, their explanatory power along with their overall significance (allowing to reject the null hypothesis stipulating that the coefficients are, in their entirely, equal to zero).

It is worth noting, however, that on examining Tables 7 and 8, one might well drain a noticeable be conclusion.

TABLE 7. REGRESSION RESULTS OF MODEL 1 (WITH BOTH CONTINUOUS VARIABLES ESOPs AND EMPDIR)

Variables	Sign	ADDEMP			
		Equation 1		Equation 2	
	Sign	(β)	sign	(β)	sign
Constant		-,508		,202	
ESOPS	+	,409	,017**	,342	,077*
EMPDIR	+	-,009	,547	-,001	,960
AGE	+	,139	,016**	------	--------
TERMS	+	--------	--------	,283	,000***
PERF	+/-	-2,670	,039**	-3,297	,022**
SIZE	+/-	-,178	,475	-,552	,051*
DEBT	+/-	,036	,125	,020	,450
Cox and Snell R2		,314		,410	
X2 for adjustment		40,765 P =0,000***		57,023 P=0,000***	
-2 Log likelihood		106,576		90,318	

Variables	TRAIEMP			
	Equation 3		Equation 4	
	(β)	Sign	(β)	sign
Constant	-,445		-,850	
ESOPS	,366	,029**	,345	,046**
EMPDIR	,011	,919	,028	,788
AGE	,077	,125	--------	--------
TERMS	--------	------	,120	,033**
PERF	-2,308	,078*	-2,326	,079*
SIZE	,071	,769	,209	,399
DEBT	,012	,987	,011	,618
Cox and Snell R2	,285		,298	
X2 for adjustment	36,211 P=0,000***		38,177 P=0,000***	
-2 Log likelihood	112,581		110,615	

Variables	EMP			
	Equation 5		Equation 6	
	(β)	sign	(β)	Sign
Constant	-,093		-,968	
ESOPS	,188	,228	,141	,366
EMPDIR	-,165	,204	-,129	,308
AGE	,093	,063*	--------	-------
TERMS	--------	------	,176	,003***
PERF	-3,293	,013**	-3,492	,012**
SIZE	-,162	,505	-,377	,143
DEBT	,006	,778	,011	,635
Cox and Snell R2	,302		,337	
X2 for adjustment	38,837 P=0,000***		44,374 P=0,000***	
-2 Log likelihood	110,289		104,753	

EMP, Evolution of the number of hired employees = employee number (N) - Employee Number (N-1) / employee number (N-1). ADDEMP, Share of added value allocated to employees = wages + social charges + payroll taxes + other incentive / added value. TRAIEMP Training budget / payroll weight. ESOPS, A continuous variable:% of detained capital employee (continuous variable). EMPDIR, A continuous variable: % of employees in the Board of Directors. TERMS, Continuous variable: the average number of all directors' cumulative terms. AGE, CEO age. SIZE, Total assets log.

PERF, Tobin's Q proxy = (equity market value + debt book value) / book assets. DEBT, Total Financial Debt / total assets

*, **, ***, Respective significance at 10%, 5% and 1%

With the exception of equations (5 and 6), one can notice an overall persistence of a positive and significant influence of employee ownership (as a continuous and binary variable) on the probability of increasing social performance indicators. This finding puts in question view point of [67] stating that shareholding democracy is a wandering stray. Indeed, this author has postulated that the employee / shareholder is, thus, placed in a "delicate" situation as an employee, who wants driven by the desire to gain wage increases and permanent employment, but as a shareholder, he seeks maximum performance or turn over for his savings, usually implying to look for a reduction in labor costs incurred by the company. Still, this reached result perfectly corroborates our hypothesis H1 as well as the ideas advanced by [65], [75], [55] and [30].

The involvement of employee shareholders (co-management) in the board of directors or supervisory board does not appear to have any statistically-significant effect on the probability of maintaining an effective social performance. This finding contradicts our assumption and the observation appearing in a report published by the French Institute of Corporate Governance [49] stating that: "It is logical to observe a correlation between the intensity in human capital investment and the presence of employee directors". This result is noticeable with respect to the entire set of indicators. Hence, it might be envisaged that the holding of a few seats by employees, in the board of directors or supervisory board does not constitute, by any means, a sufficient factor leading to a good social performance. In other words, the employee shareholder representatives on the board of directors or supervisory board do not enjoy enough power to protect employment and human capital of French firms' employees.

This can also be explained by the low level of participation level of employed directors in French firms subject of our sample (with average of 0.492%). Consequently, hypothesis (H2) turns out to be rejected.

TABLE 8. REGRESSION RESULTS OF MODEL 2 (WITH BINARY VARIABLES ACTSAL AND ADMSAL)

| Explanatory Variables | ADDEMP | | | |
	Equation 7		Equation 8	
	sign	(β)	sign	(β)	sign
Constant		-,474		-,984	
ESOPSBI	+	1,485	,017**	1,520	,032**
EMPDIBI	+	-1,613	,010	-,012	,119
AGE	+	,142	,025**	-------	---------
TERM	+	---------	-------	,265	,000***
PERF	+/-	-4,728	,000***	-,910	,001***
SIZE	+/-	-,171	,505	-,522	,076*
DEBT	+/-	,060	,029**	-,039	,182
Cox and Snell R2	,358		,427	
X2 for adjustment	47,881 P =,000***		60,107 P =,000***	
-2 Log likelihood	99,460		87,233	

| Explanatory Variables | TRAIEMP | | | |
	Equation 9		Equation 10	
	(β)	Sign	(β)	Sign
Constant	-,177		-,796	
ESOPSBI	,952	,081*	,923	,099*
EMPDIBI	-,149	,777	,165	,767
AGE	,074	,104	-------	--------
TERM	-------	------	,129	,020**
PERF	-,330	,005***	-,200	,008***
SIZE	-,044	,854	-,194	,427
DEBT	,002	,933	,012	,600
Cox and Snell R2	,268		,285	
X2 for adjustment	33,643 P =,000***		36,223 P =,000***	
-2 Log likelihood	115,150		112,570	

| Explanatory Variables | EMP | | | |
	Equation 11		Equation 12	
	(β)	sign	(β)	sign
Constant	-,749		-,792	
ESOPSBI	1,098	,050*	1,076	,069*
EMPDIBI	-,811	,146	-,367	,525
AGE	,107	,040**	-------	--------
TERM	-------	------	,180	,002***
PERF	-,811	,003***	-,689	,004***
SIZE	+,182	,456	,399	,125
DEBT	,021	,382	-,002	,947
Cox and Snell R2	,314		,344	
X2 for adjustment	40,694 P =,000***		45,577 P =,000***	
-2 Log likelihood	108,433		103,550	

EMP, Evolution of the number of hired employees = employee number (N) - Employee Number (N-1) / employee number (N-1). ADDEMP, Share of added value allocated to employees = wages + social charges + payroll taxes + other incentive / added value. TRAIEMP Training budget / payroll weight. ESOPSBIN, A binary

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variable: 1 if significant presence in the capital does exist (3% threshold), 0 otherwise. EMPDIRBIN, Binary variable: 1 in the case of presence in the board, 0 otherwise.. TERMS, Continuous variable: the average number of all directors' cumulative terms. AGE, CEO age. SIZE, Total assets log. PERF, Tobin's Q proxy = (equity market value + debt book value) / book assets. DEBT, Total Financial Debt / total assets

*, **, ***, Respectively significant at 10%, 5% and 1%

According to Table 9, the WEIGHT variable proves to be significant. As result, the employees' simultaneous participation both in the capital and the directors or supervisory boards seems to highlight that the more the employees are present and involved in the decision-making and control bodies, the more important social performance turns out to be. Noteworthy, also, entrenched leaders tend to increase social performance. Indeed, the coefficients of the variables (AGE and MAND) are positive and significant in terms of evolution in employed staff number and the value added share allocated to them. Yet, it is positive but insignificant with regard to the association training budget / payroll (equations 3 and 9). This result appears to be consistent with the director's organizational entrenchment theory as developed by [43].

According to the latter, leaders engage in wage salary policies favorable to employees, with the aim of wining their alliance and favor in fighting shareholder in case of conflict. Indeed, to ensure the continuous perennity of their employment and strengthen further consolidate their roots and background, directors committed to safeguarding human capital and employment of salaried employees. This behavior may lead employees to support their directors in case of revocation decision taken by the directors' board. This highlights a partial confirmation of our hypothesis H3.The financial performance level negatively affects social performance. This influence is significant with respect to all equations. This finding may have its justifications in two different explanations. Firstly, successfully performing firms have greater concerns exceeding social objectives. Secondly, as stated by [9] salaried employees may be considered as the major, and often the inevitable, victims of financial performance. With regard to the French context, this finding is discovered inconsistent with elaborated by the study of The Swiss Confederation, conducted on a sample of 2143 private swiss companies. Indeed, The

Swiss Confederation has reported that the more significant turnover decrease was during the years 1995-1997, the more staffing requirements (recruitment) declined, and, conversely, the higher the rise in turnover registered in this three years was, the more increased the needs for employee staff would.

TABLE 9: REGRESSION RESULTS OF MODEL 3

| | | ADDEMP | | | |
| | | Equation 13 | | Equation 14 | |
Variables predicted	sign	(β)	sign	(β)	sign
Constant		-1,865		-,774	
WT	+	1,852	,001***	1,807	,002***
AGE	+	,149	,006***	---------	-------
TERM	+	---------	-------	,303	,000***
PERF	+/-	-4,773	,000***	-5,072	,001***
SIZE	+/-	,032	,901	-,380	,213
DEBT	+/-	,033	,154	,015	,541
Cox and Snell R2		,356		,443	
X2 for adjustment		47,470 P = ,000***		63,271 P=,000***	
-2 Log likelihood		99,871		84,069	

| | TRAIEMP | | | |
| | Equation 15 | | Equation 16 | |
Variables predicted	(β)	Sign	(β)	sign
Constant	-1,675		-,529	
WT	1,142	,018**	,996	,042**
AGE	,088	,039**	---------	-------
TERM	--------	-------	,128	,013**
PERF	-3,820	,001***	-3,834	,001***
SIZE	,070	,774	-,081	,747
DEBT	-,007	,745	,021	,311
Cox and Snell R2	,284		,294	
X2 for adjustment	36,154 P=,000***		37,618 P=,000***	
-2 Log likelihood	112,639		111,174	

| | EMP | | | |
| | Equation 17 | | Equation 18 | |
Variables predicted	(β)	Sign	(β)	sign
Constant	-1,306		-,195	
WT	1,787	,001***	1,630	,002***
AGE	,126	,008***	---------	-------
TERM	---------	-------	,199	,001***
PERF	-4,233	,001***	-4,270	,001***
SIZE	-,025	,921	-,280	,308
DEBT	,008	,712	,011	,625
Cox and Snell R2	,354		,381	
X2 for adjustment	47,146 P=,000***		51,760 P=,000***	
-2 Log likelihood	101,981		97,366	

EMP, Evolution of the number of hired employees = employee number (N) - Employee Number (N-1) / employee number (N-1). ADDEMP, Share of added value allocated to employees = wages + social charges + payroll taxes + other incentive / added value. TRAIEMP Training budget / payroll weight. WT, Which takes the value (1) if there is a simultaneous presence of employees in the capital, whatever the company capital detention threshold might be, and the board of directors or supervisory board and (0) value otherwise. TERMS, Continuous variable: the average number of all directors' cumulative terms. AGE, CEO age. SIZE, Total assets log. PERF, Tobin's Q proxy = (equity market value + debt book value) / book assets. DEBT, Total Financial Debt / total assets

*, **, ***, Respectively significant at 10%, 5% and 1%

In so far as, the size and debt are frequently cited variables with respect to most research works dealing with investment issues; it turns out to be worth noting that these variables proves to have mixed effects in respect of the equation to estimate.

On the basis these reached results, one might well state/confirm that employee ownership a shareholding and directors' entrenchment contribute, well among other factors, in explaining social performance.

Conclusion

Like any other research work, this paper has some limitations. The capital percentage held by employees does not match the percentage of voting rights. This information is available for U.S. firms. However, it is not available for French firms.

Another limitation is of technical type and does not allow us to give an absolute guarantee in terms of the produced results. In fact, certain means exist and are related to data collection, especially those related to employee participation in governance bodies and managers entrenchment and which were obtained "manually" from primary data. Under these conditions, the choice of the used regression model (logistic regression) can affect the quality and the signs of the found results.

However, these limitations should not reduce the scope of the original results which were obtained. One important result of the multi-varied analyses (logistic regression) is that on the whole employees, if they exert an influence on the determination of social performance in the context of non-financial French firms, are relatively powerless, on their own to explain this phenomenon.

Shares' holding by employees has a significant positive impact on social performance. The presence of French employees shareholders within the boards of directors or supervisory board has, in contrast, no statistically significant impact on job retention. However, the combined impact of employee participation in the capital and within the Board of Directors (the weight of employees) shows that the more employees are present in decision-making and control bodies, the more their human capital is protected. Our results confirm the idea that the work of employees and investment in human capital are a significant support for managers' entrenchment.

Although employee shareholding has often been used in previous studies to assess in particular the effectiveness of this control mechanism in the creation of value, the originality of our work is to have extended its impact on social performance while taking into consideration the active behavior of the manager. Our main position which bears on three domains which have not been studied simultaneously so far in the literature, namely employee shareholding, social performance and managers' entrenchment, testify that that these three areas can be closely connected.

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