**Analysis of Human Capital Investments, Profitability Ratios and Company’s Features in EU**

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**Abstract**

The main aim of this paper is to explore the relations between human capital investments and company’s profitability measured through return on equity and profit margin ratios during the period of five years using panel data analysis. Research hypothesis assumes that companies which are more profitable will have higher cost of employee (human capital investment) and *vice versa*. This specially refers to companies in human capital intensive industry, such as information technology industry, where employees’ knowledge characterizes companies’ the most valuable asset. Thus, it is assumed that those entities will have great proportion of intellectual capital that will be capitalized through trademarks. Furthermore, this paper analyses whether the level of human capital investments significantly differ with regard to company size and listing status. Verification of empirical evidence is provided through the sample of app. 5,000 European Union companies within information technology industry for the 2011-2015 period, i.e. app. 25,000 company-year observations using adequate panel data analysis technique.

**Keywords:** *panel analysis, human capital investments, return on equity, listing status, EU*

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1. **Introduction**

Every company performing its own business depends on all types of resources, such as: physical, financial, information and finally human resources (HR). The latter one represent the most important company’s resource due to its unique characteristics and ability to create, manage and innovate all organizational process, i.e. becoming company’s crucial capital. Human capital (HC) assumes a very important role in the process of economic growth. Taking into consideration the influence of HC on company’s performance and economic growth, many experts, especially in the last decades have done researches investigating the specified relations. Many of those were investigating the relationship between human capital investments (mostly measured through employee expenditures or educational and training characteristics of employees) and companies’ performances (usually financial ones).

Similarly, the main aim of this paper is to explore the relations between HC investments (measure through individual annual salary) and company’s profitability (measured through return on equity and profit margin ratios) in European Union (EU) during the period of five years (2011-2015). The data for this research were obtained from Bureau Van Dijk Amadeus database of comparable financial information for public and private companies across Europe. The research is based on information technology industry, where employees’ knowledge characterizes companies’ the most valuable asset, with more than 25,000 company-year observations. Thus, it is assumed that those entities will have great proportion of intellectual capital that will be capitalized through trademarks. Furthermore, this paper analyses whether the level of HC investments significantly differ with regard to company size and listing status. The authors use panel data analysis in order to test stated hypothesis.

1. **Theoretical Background**
   1. **Definition of human capital**

Human resources represent the most important company’s resources, knowing the fact that those are valuable, exceptional and very difficult to imitate, according to their specificities such as knowledge, special experience, skills, abilities or emotional intelligence [5]. Furthermore, its importance is evidenced through managing and directing all other groups of resources and finally creating company’s competitive advantage, innovating and modernizing organizational process, reinforcing overall organizational success or just becoming company’s the most important capital, human capital.

According to different authors HC includes employees with a set of individual and collective knowledge, skills, abilities, attitudes, possibilities, behavior and emotions. Also, it includes the know-how, capabilities and expertise of the individuals of an organization [10], [11], [16]. HC can be observed from the social, but also from the economical aspect for each company. The overall definition of HC can be summarized as it is the result of investments and accumulation of education, skills, abilities, motivation, energy or cultural development which create group of people used in the sphere of public reproduction, promoting economic growth and influencing the size of income of their owner [19].

* 1. **Previous research review**

Some of the previous researches have been conducted investigating the importance of HC between high technology oriented companies and those traditional ones. One of them confirmed that high technology companies had significantly higher level of all components of intellectual capital (customer, structural and human capital) than traditional companies [16]. Similarly, [10] demonstrated that HC appears as the most influential component within high technology companies. The authors perceived HC as a sum of employees’ experience, creativity and teamwork. Observing this research, items related to HC showed higher means than others elements of intellectual capital, which was explained by the fact that companies operating in the chosen industry were highly focused on having strong HC.

Furthermore, many researchers were oriented towards investigating relationship between HC investments and companies’ performances, usually profitability. Different authors usually calculated HC investments through HR expenditures, such as salaries or training and developmental costs, but also some use other HC aspects. An interested research was conducted in Norway where authors provided regression analysis in order to test whether or not companies’ specific variables affect individual wages [12]. The dependent variable represented hourly wage rate, estimated from monthly wages divided by working hours. On the other hand, there was used set of different independent variables (including different social variables besides unemployment rate). A key issue of this paper was to test whether or not company size and profitability affect wages. The final results implied positive effects of companies’ specific profitability and company size.

Some other aspects of HC measurement have been noticed within following researches. The American research examined relationship between HC and companies’ profitability and growth of small (women and men owned) companies in the retail and service sector [9]. They created few models where return on sales and growth rate (in sales) where chosen as the dependent variables, while independent variables represented companies’ or owner characteristics that could be expected to contribute to HC. Those included: measure of education, age, experience, the presence of partners and family history that includes experience with business ownership. Multivariate (logistic regression) analysis was provided examining the simultaneous impact of multiple independent variables on a dependent variable, increasing the likelihood that relevant variables will be included. Results indicated that HC variables, including education and experience, had positive impact of the profitability of women owned companies. The other research [13] demonstrated relations between HC losses (measured through voluntary turnover rates) and organizational financial performances (sales per employee). Their research has revealed that HC losses have an attenuated negative relationship with organizational performance when HR investments are high. When those are low, however, HC losses and organizational performances are not significantly related.

The latest researches were very intrigued in revealing the relationship between HC and profitability. One was conducted within Nigerian banks where researchers used profitability values (net profit margin, capital employed and earnings per share) as dependent variables and expenditure of staff cost as independent variable [1]. Based on regression results, the study revealed that staff cost significantly affects earnings per share and there is positive relationship, also as net profit margin and return on capital. Another research investigated relationship of HC investments and companies’ profitability as well as companies’ characteristics [2]. HC investments represented dependent variable (measured through annual salary), while profit margin and return on equity were chosen as independent variables, as well as companies’ size, companies’ listing status and number of trademarks (companies’ characteristics). Verification of empirical evidence was provided through the sample of more than 12,000 EU companies within informational technology industry. In order to test specified relationship, the authors provided regression analysis. The findings confirmed the importance of HC investments whereas the knowledge is the most valuable asset capitalized through trademarks. Also, findings confirmed differences in the level of HC investment with regard to company size and listing status. Finally, the results showed that companies which investing in HC do not obtain better financial results than those with insufficient investments.

On the other hand, papers that are dealing with HC and other companies’ attributes (beside size), such as companies’ listing status and number of trademarks are particularly rare. Selected paper combines HC theory with work on initial public offering (IPOs) related to sources of financial capital of recent, publicly traded biopharmaceutical companies [20]. The results showed that to a limited extent companies having CEOs with more or better HC and strategic alliance partners were associated with biopharmaceutical IPO’s de-listing. The purpose of the next paper was to link empirically the value of intellectual capital and intellectual property to firm performance [7]. The survey was conducted within German pharmaceutical companies (HC intensive industry) and it was used to conduct regression analysis focusing on correlation between human, structural and relational capital, intellectual property and firm performance. Observed results pointed out, that including intellectual property in model linking capital to company performances enhanced the statistical validity of such models and their relevance for management. Finally, [5] confirmed statistically significant difference in performance of Croatian companies when HC expenditures are capitalized in balance sheet in the form of trademark.

1. **Empirical Research**

Research hypotheses imply that companies which are more profitable will have higher cost of employee (i.e. HC investment in a way of bonuses or extra salaries to employees) as well as that company’s size, its’ listing status and existence of intellectual property will impact the level of HC investments. These hypotheses are based on the following assumptions:

* Profitable companies are more willing to invest in HR than those with poor financial results.
* Larger companies have more funds, sources and possibilities to invest in HR than smaller ones.
* In HC intensive industry employees’ knowledge is the most valuable asset which is capitalized in company’s asset through the trademarks.
* Level of HC investments significantly differ with regard to listing status of the company.
  1. **Sample Selection**

The data for this research were obtained from Bureau Van Dijk Amadeus database of comparable financial information for public and private companies across Europe [8]. Table 1 represents detail structure of selected sample by 22 EU countries.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| EU countries\* | Number of  observations | Percent (%  of total) | EU countries\* | Number of  observations | Percent (%  of total) |
| Austria | 6 | 0.12 | Croatia | 330 | 6.62 |
| Belgium | 284 | 5.70 | Hungary | 1,203 | 24.14 |
| Bulgaria | 507 | 10.17 | Ireland | 47 | 0.94 |
| Czech Rep. | 27 | 0.54 | Italy | 386 | 7.74 |
| Germany | 27 | 0.54 | Luxembourg | 1 | 0.02 |
| Denmark | 110 | 2.21 | Latvia | 29 | 0.58 |
| Estonia | 52 | 1.04 | Netherlands | 17 | 0.34 |
| Spain | 15 | 0.30 | Poland | 9 | 0.18 |
| Finland | 267 | 5.36 | Portugal | 1 | 0.02 |
| France | 202 | 4.05 | Sweden | 952 | 19.10 |
| United Kingdom | 141 | 2.83 | Slovakia | 371 | 7.44 |
|  |  |  | Total | 4,984 | 100 |

*\*without Greece, Cyprus, Lithuania, Malta, Romania and Slovenia (no available data)*

*Source: Calculated according to the Bureau Van Dijk Amadeus database (2015)*

Table 1: Sample structure by countries.

To be more precise, annual financial reports of 19.8 million companies were reviewed and companies were selected in the sample according to the following criteria:

* All legal entities paying the profit tax in the year 2015.
* Company’s data are available for the five-year period (2011-2015).
* Company’s main activity is HC intensive industry, i. e. division 72 - information technology activities and division 73 - activities of research and development of NAICS 2012 classification (primary codes).
* Company is located in one of the 28 European Union countries.

Companies with missing or incomplete data are excluded, so final sample consists of app. 5,000 company-year observations.

* 1. **Variables Description**

Dependent variable is annual salary (AVCOSTE) exceeding average annual salary for the industry sector in each country for the each year observed which is set as proxy for HC investment, similar to [4] methodology and taking into account the limitations of the available data. Independents are defined as follows:

* Company size (CATCOMP) is defined based on Amadeus BVD classification on very large, large, medium and small. Companies are very large when they match at least one of the following conditions: listed shares, operating revenue higher than 100 million EUR, total assets higher than 200 million EUR and more than 1,000 employees. Large companies are those that are not classified as very large and match at least one of the following conditions: operating revenue higher than 10 million EUR, total assets higher than 20 million EUR and have more than 150 employees. If the companies are not large or very large, but match at least one of the following conditions: operating revenue higher than 1 million EUR, total assets higher than 2 million EUR and have more than 15 employees, they are considered to be medium sized. Lastly, if the company is not included in any of the above mentioned categories, it is considered to be small. There are a number of theoretical explanations for expecting a positive relationship between size and HC investment, e.g. [18] and [2] assumed that large and very large companies invest more in its HC as they frequently have organized HR department that provide all HR activities, while small companies are usually characterized with the inconsistency of HR development, not giving enough space as well as funds for HC to be created.
* Listing status variable (PUBQOT) implies whether the company is issuing securities that are traded on the organized capital market. It is assumed that companies whose securities are listed on the stock market have a greater incentive for corporate social responsibility and accordingly higher value of HC investment than the companies that have not issued their securities or those are no longer traded on the stock exchange.
* Profitability is measured by financial ratios return on equity (ROE) and profit margin (PROFMAR). ROE is calculated as net income divided by shareholders’ equity, and profit margin is expressed as percentage of sales that is left over after all expenses are covered by the business. In accordance with the aforementioned, it is reasonable to expect a positive relation between the level of HC investment and profitability.
* Capitalization of employees’ knowledge, skills and abilities in company’s asset are approximated with number of trademarks (NBTRAD) and expected sign of relation with HC investment is positive, indicating that companies with annual salary exceeding average annual salary for the industry sector will have more trademarks than those with annual salary below average.

Table 2 presents description of all variables and expected impact of independent variables.

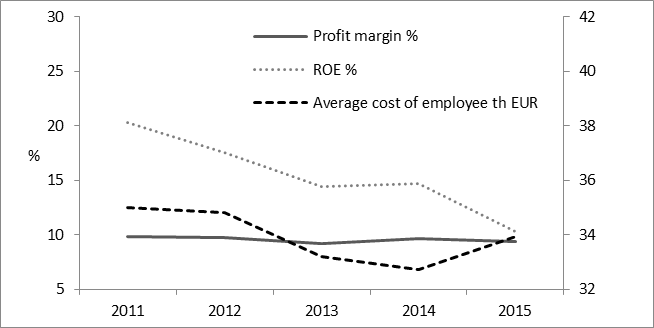
|  |  |  |
| --- | --- | --- |
| Label | Definition of variable | Expected impact |
| AVCOSTE | Average cost of employee (th EUR) | Dependent variable |
| CATCOMP | Category of company (size) | **+** |
| PUBQOT | Publicly quoted | **+/-** |
| PROFMAR | Profit margin (%) | **+** |
| ROE | ROE (%) | **+** |
| NBTRAD | Number of trademarks | **+/-** |

*Source: Author’s definition and expectations according to previous research*

Table 2: Description of variables and expected impact of independent variables.

* 1. **Research Results and Discussion**

The data that includes both crossection and time periods components of the analyzed variables are called the panel data, and the process is called the panel analysis. Dependent variable, approximated with average cost of employee, is changed to the units of observation (by company) and by the time, so the evaluation of variables, which really determine the variable HC investments, is considered a more precise [3]. Thus, the panel analysis approach is taken as more robust and reliable method than the regression analysis.



th EUR

*Source: According to the Bureau Van Dijk Amadeus database (2015)*

Figure 1: Average profit margin, ROE and average cost of employee of all selected countries

By observing average indicators for all companies per years (figure 1) it has been noted that both profitability ratios have similar trends for all the periods. On the other hand, starting from year 2013 the AVCOSTE shows inversely proportional movements in comparison to those ratios. Descriptive statistics of all observed variables are shown in the table 3. Variables size, listing status and number of trademarks for each company are constant across observed time period.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Obs** | **Mean** | **Std. Dev.** | **Min** | **Max** |
| AVCOSTE | 24,920 | 33.940 | 36.608 | 0 | 846.570 |
| CATCOMP | 24,920 | 1.318 | 0.657 | 1 | 4 |
| PUBQOT\* | 24,920 | - | - | - | - |
| PROFMAR | 24,920 | 9.605 | 24.980 | -100 | 100 |
| ROE | 24,920 | 15.455 | 96.880 | -1,000 | 998.720 |
| NBTRAD | 24,920 | 0.407 | 3.472 | 0 | 139 |

\*Binar variable (0-no, 1-yes)

*Source: Calculated according to the Bureau Van Dijk Amadeus database (2015)*

Table 3: Descriptive statistics of dependent and independent variables.

Prior to model estimation, it is necessary to check correlation between potential independent variables in order to identify potential multicollinearity problem. Correlation coefficients are shown in table 4. Calculated coefficients do not exceed 0.5 and their absolute values do not indicate the presence of multicollinearity problem between the independents [15].

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | CATCOMP | PUBQOT | PROFMAR | ROE | NBTRAD |
| CATCOMP | 1 |  |  |  |  |
| PUBQOT | 0.4631\* | 1 |  |  |  |
| PROFMAR | -0.0956\* | -0.0692\* | 1 |  |  |
| ROE | -0.0413\* | -0.0913\* | 0.3306\* | 1 |  |
| NBTRAD | 0.3219\* | 0.3704\* | -0.0501\* | -0.0417\* | 1 |

\* *p* < 0.05

*Source: Calculated according to the Bureau Van Dijk Amadeus database (2015)*

Table 4: Correlation matrix of independent variables.

The next step in the empirical analysis is an estimation of the adequate panel data model. Wooldridge test for autocorrelation in panel data () confirms the autocorrelation of the residuals and points to the implementation of a dynamic panel model [21]. The assumption of a static panel model as a quality estimator has been disturbed. Dynamic panel model effectively solves the problem of endogenity and manages the problems of heteroscedasticity and autocorrelation of residuals [3]. The empirical analysis continues with evaluation of dynamic panel models. Blundell-Bond (BB) estimator is used [17]. The selection is based on the characteristics of the sample. The number of units of observation (company) exceeds the number of periods of observation satisfying condition of applying Arellano-Bond (AB) estimator or Blundell-Bond (BB) estimator [15]. The fact that the BB model is a result of correction of AB model and that the higher number of instrumental variables in the observed set does not compromise the bias estimator determine the choice of BB model [6]. Analytical note of the model equations is as follows:

, (1)

where is the number of units of observation (4.984 companies), is the number of periods (5 years). Parameter is a constant member, is a parameter of the lagged dependent variable, are parameters of the independent variables. Furthermore, is the random variable for each unit of observation , and is the estimation error, both are assumed to follow a white noise process.

BB two-steps estimator is used for the evaluation of the dynamic panel model due to its robustness on heteroscedasticity and due being more efficient than the estimator in one step [15]. Evaluation of the model through BB estimator in two steps gives a biased estimate of the standard error [15]. Therefore, the robust option is introduced achieving non-biased estimators. The validity of the instruments that are selected for the assessment of the model is tested by the Sargan test [3]. This test cannot be performed if the robust option to estimate is used, therefore the results of the diagnostic tests without robust options are enclosed.

|  |  |  |
| --- | --- | --- |
| **Variables** | **BB2st** | **BB2st\_rb** |
|  | 0.2508\*\*\*  (0.0423) | 0.2508\*\*\*  (0.0613) |
|  | 85.8415\*\*\*  (23.7522) | 85.8415\*\*\*  (29.6637) |
|  | -54.5236  (112.9417) | -54.5236  (147.3411) |
|  | -0.0014  (0.0088) | -0.0014  (0.0089) |
|  | 0.0003  (0.0025) | 0.0003  (0.0026) |
|  | 0.1753  (3.3606) | 0.1753  (3.6612) |
| *(cons)* | -87.0431\*\*\*  (29.1877) | -87.0431\*\*  (36.0023) |
|  | 19,936 | 19,936 |
| Sargan test | 0.0760 | - |
| AR(1) test |  |  |
| AR(2) test | 0.6433 | 0.6465 |

Note: 2st – 2 steps estimator, rb – robust option

Standard errors in parentheses

, ,

*Source: Estimated according to the Bureau Van Dijk Amadeus database (2015)*

Table 5: Dynamic panel data models - average cost of employee is dependent variable.

The estimated parameters of dynamic BB panel model with and without the robust option show an equal significance (table 5). The average cost of employee from the previous year and company’s size influence significantly positively on the movement of the average cost of employee in EU companies. It turns out that larger companies have significantly greater HC investments. Profitability ratios, listing status and number of trademarks have shown no significant impact on the average cost of employee in enterprises in the EU. No significant relation between human capital investments and profitability ratio can be explained with economic imbalance as in nowadays turbulent environment, companies are mainly oriented on short-term profits rather than on long-term value creation. Significant relation between human capital investments and existence of company's trademarks was not confirmed due to characteristics of industry. Namely, in high-tech industry, companies capitalize human capital expenditures in the form of intellectual capital rather than in the form of trademarks. Also, no significant relation between the average cost of employee and listing status can be explained with the common praxis of manager compensations schemes in listing companies. These companies usually have different forms of compensations (e.g. stock options, retirement plans, insurance policies, etc.) for mid and top management which are not included in salary costs.

Selecting the non-adequate estimator can lead to dissimilar conclusions, so very often authors use models estimations with more estimators [15]. Therefore, additional panel models were estimated. The first differences were calculated for the dependent variable average cost of employee. As it was stationary, the assumption of static panel model as a quality estimator was fulfilled. Random effects and fixed effects static panel models were estimated. According to relevant tests, the introduction of the random effect for each company was not justified and the model with a fixed effect was not suitable [3]. Between effects static panel model was estimated too. The estimator of the between effects static panel model is unbiased and consistent, but it is not efficient. In this model, the influence of time component is lost due to the calculation of average values for each observation unit [14]. This indicates that in this situation multiple regression model estimate could be relevant, which is expectable in a case of stationary dependent variable and significant influence of the independent variables that are not dependent on the time. Nevertheless, the conclusions have been confirmed. Significance of the independent variables and their direction of impact on the dependent variable in all estimated models are similar and point to the same conclusions.

After the implementation of the relevant tests, the model that leads to conclusions about influence of the observed independent variables on the average cost of employee is dynamic panel BB estimator two-step model with the robust option. Positive and significant influence of category of company (size) on the average cost of employee is identified. The other variables showed no significant impact on HC investments in enterprises in the EU. Therefore, it is not confirmed that the companies which are more profitable will have a higher cost of employee (HC investment) in the EU countries.

**5. Conclusions**

Human resources are the most valuable resources for each company due to their specificities such as knowledge, skills and abilities (KSA), working experience or emotional intelligence. They are managing and directing all other groups of resources and creating company’s competitive advantage, innovating and modernizing organizational process, reinforcing overall organizational success and in this way becoming HC of each company.

The main aim of this paper was to explore the relations between HC investments and company’s profitability ratios (return on equity and profit margin). The analysis was provided through the sample of app. 5,000 EU companies within information technology industry (2011-2015). Also, the analysis was testing whether the level of HC investments significantly differ with regard to company size, listing status and number of trademarks. Previous studies about HC investments and company’s profitability ratios mostly used multivariate techniques and/or regression analysis. This paper uses panel data analysis techniques as they are more appropriate for cross-sectional time series structure of the data.

After the implementation of the relevant tests, the model that can derive conclusions about the influence of the observed independent variables on the average cost of employee is dynamic panel BB estimator two-step model with the robust option. Analysis confirmed significant influence of company’s size on the average cost of employee, meaning if the company is larger, it would have higher cost of the employee. Larger companies have even greater demand for training and development of their employees than smaller companies and are constantly seeking for the new level of their KSA. Those companies are investing in employees’ development and different training activities and by reaching the new level of their KSA it simultaneously upgrades the level of their annual salaries, on the base of their incorporated KSA. The other variables from the research showed no significant impact on HC investments in enterprises in EU.

Future researches should be oriented toward examination of HC development within different industries as well as on the existence of HC differences and their selective influence on distinct companies’ performances instead of overall business excellence. Additionally it would be excellent to provide more detailed explanation of the implication of these results for the advancement of human capital management theory, competitiveness or growth literature.

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