An analysis of human capital investments, profitability ratios and company features in the EU

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Abstract. The aim of this paper is to explore the dynamics between human capital investments and company profitability measured by return on equity and profit margin ratios using panel data analysis over a five-year period. The research hypothesis assumes that more profitable companies have higher employee costs (human capital investment) and the opposite is also true. This specially refers to companies in human-capital-intensive industries, such as the information technology industry, where a company's most valuable asset is employee knowledge. Thus, the assumption is that such entities will have a greater part of intellectual capital 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 using a sample of approx. 5,000 companies in the European Union from the information technology industry for the period 2011-2015, i.e. approx. 25,000 company-year observations using an adequate panel data analysis technique.

1. Introduction

Any company doing business depends on numerous resources, such as physical, financial, information and, last but not least, human resources (HR). The latter is a company's most important resource due to its unique characteristic and potential to create, manage and innovate across all organizational process, i.e. it is a company's essential capital. Human capital (HC) has an important role in economic growth. When considering the influence of HC on company performance and economic growth, many experts, especially in the last few decades, have researched specific relations in HC. Many have investigated the relationship between human capital investment (measured primarily in terms of employee

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expenditure or employee educational and training outcomes) and company performance (financial indicators).

Similarly, the aim of this paper is to explore within the European Union (EU) the relationship between HC investments (measure in terms of annual salaries) and company profitability (measured in terms of return on equity and profit margin ratios) over a five-year period (2011-2015). Research data was sourced from the Bureau Van Dijk Amadeus database of comparable financial information for public and private companies across Europe. The research covers the information technology industry, where employee knowledge is characterized as most valuable asset of a company, and incorporates more than 25,000 company-year observations. Thus, the premise is that such entities will have a great proportion of intellectual capital capitalized through trademarks. Furthermore, the paper analyses whether the level of HC investments differs significantly with regard to company size and listing status. The authors utilized panel data analysis to test the stated hypothesis.

2. Theoretical background

2.1. Definition of human capital

Human resources is a company's most important resource, given that such resources are valuable, unique and difficult to imitate, due to specificities such as knowledge, experience, skills, abilities and emotional intelligence [5]. Furthermore, its importance is evident in the managing and directing of all other resources, giving a company a competitive edge, including innovating and modernizing company organizational processes or reinforcing overall organizational success.

Various authors view HC as including employees possessing individual and collective knowledge, skills, abilities, attitudes, potential, behavior and emotions. It also includes the know-how, capabilities and expertise of personnel [10], [11], [16]. HC is observed from a social and also economical aspect for a company. HC can be summarized as the result of investment and accumulation of education, skills, abilities, motivation, energy and cultural development to create a group of people engaged in public reproduction, promoting economic growth and having an effect on the magnitude of revenue for company owners [19].

2.2. A review of previous research

Previous research has compared the importance of HC between high technology companies and those utilizing traditional technologies. The research has confirmed that, compared to tradition companies, high technology companies have a significantly higher overall level of intellectual capital (customer, structural and human) [16]. Similarly, [10] demonstrated that HC appears to be the most influential

component in high technology companies. The authors perceived HC as the sum of employee experience, creativity and teamwork. This research shows that HC-related factors showed higher means than other intellectual capital elements , which was explained by the fact that companies operating in the chosen industry were highly focused on having strong HC.

Furthermore, many researchers focused on investigating the relationship between HC investments and company performance, usually profitability. Various authors calculated HC investments through HR expenditure, such as salaries or training and development costs, with other researchers relying on other HC factors. Interesting research was conducted in Norway where researchers conducting regression analysis to test whether company specific variables affect individual wages [12]. The dependent variable was hourly wage rate, estimated from monthly wages divided by work hours. On the other hand, a different set of independent variables was used (including different social variables in addition to the unemployment rate). A key issue in this paper was to test whether company size and profitability affect wages. The final results suggested a positive effect from company profitability and size.

Other results from HC measurements have been noticed from the research referred to below. American research examined the relationship between HC, on the one hand, and profitability and growth, on the other hand, of small companies (owned by women and men) in the retail and service sector [9]. Researchers created a number of models where return on sales and growth rates (for sales) where chosen as the dependent variables, while the independent variables were company or owner characteristics expected to contribute to HC. These included: level of education, age, experience, involvement of partners and family history such as experience in business ownership. A multivariate (logistic regression) analysis examined the simultaneous impact of multiple independent variables on a dependent variable, increasing the likelihood of including relevant variables. The results indicated that HC variables, including education and experience, had a positive impact on the profitability of companies owned by women. Other research [13] demonstrated the relationship between HC losses (measured through voluntary turnover rates) and organizational financial performance (sales per employee). Their research reveals that HC losses have an attenuated negative effect on organizational performance when HR investments are high. However, for low investments, HC losses and organizational performance are not related in any significant manner.

The latest research has been exceptionally intriguing in that it reveals a relationship between HC and profitability. One was conducted at 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 the independent variable [1]. Based on regression results, the study revealed that staff costs significantly affected earnings per share in a positive sense, and also

the net profit margin and return on capital. Another research investigated the relationship between HC investments and company profitability as well as company characteristics [2]. HC investments were represented as a dependent variable (measured through annual salary), while profit margin and return on equity were the independent variables, as well as company size, company listing status and number of trademarks (there are the so called company character-ristics). Empirical evidence was verified using a the sample of more than 12,000 EU companies from the informational technology industry. To test the relationship, the authors conducted regression analysis. The findings confirmed the importance of HC investments, with knowledge identified as the most valuable asset capitalized through trademarks. Also, the findings confirmed differences in HC investment levels with regard to company size and listing status. Finally, the results also showed that companies investing in HC do not necessary obtain better financial results than company not making sufficient investments in HC.

On the other hand, papers that deal with HC and other company attributes (besides size), such as company listing status and number of trademarks, are particularly rare. The selected paper combines HC theory with the work on initial public offering (IPOs) and ties into sources of financial capital of recent, publicly traded biopharmaceutical companies [20]. The results, to a limited extent, show that companies run by CEOs having at their disposal more or better HC and strategic alliance partners were often associated with the IPO delisting of biopharmaceutical companies. 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 for German pharmaceutical companies (a HC intensive industry) and a regression analysis was conducted focusing on the correlation between human, structural and relational capital, including intellectual property and company performance. The obtained results showed that when intellectual property in the model linking capital to company performance, the statistical validity of the models and their relevance for management was improved. Finally, [5] confirmed the statistically significant difference in the performance of Croatian companies when HC expenditures are capitalized as trademarks in balance sheets.

3. Empirical research

Our research hypotheses imply that more profitable companies have higher employee costs (i.e., HC investment such as bonuses or higher salaries), and also indicates that company size, listing status and intellectual property affects the level of HC investment. These hypotheses are based on the following assumptions:

*   Profitable companies are more willing to invest in HR than those with poor financeal results.

• Larger companies have more funds, sources and possibilities to invest in HR than smaller ones.

• In HC-intensive industries, employee knowledge is the most valuable asset and is capitalized in the form of company assets through trademarks.

• The level of HC investments differs significantly with respect to company listing status.

3.1. Sample selection

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

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 EU member states.*

More precisely, the annual financial reports of 19.8 million companies were reviewed and companies were included into the sample based on the following criteria:
• All legal entities that paid corporate tax in the year 2015.
• Company data was available for the entire five-year period 2011-2015.

- The main company activity is a HC-intensive industry; i.e., division 72 - information technology activities, and division 73 - research and development activities from the 2012 NAICS classification (primary codes).
- Whether the company is located in one of the 28 European Union member states.

Companies for which data was missing or incomplete were excluded. The final sample consisted of approx. 5,000 company-year observations.

3.2. Variables description

The dependent variable is the annual salary (AVCOSTE) that exceeds the average annual salary for the particular industry sector in each country in an each observed year and was set as a proxy for HC investment, similar to [4] methodology and taking into account the limitations of the available data. The independent variables are as follows:

- Company size (CATCOMP) is defined based on the Amadeus BVD classification of very large, large, medium-sized and small companies. Very large companies fulfill at least one of the following conditions: listed shares, operating revenue greater than 100 million EUR, total assets greater than 200 million EUR and more than 1,000 employees. Large companies are those that are not classified as very large and fulfill at least one of the following: operating revenue greater than 10 million EUR, total assets greater than 20 million EUR and more than 150 employees. Companies that are not large or very large, but have operating revenue greater than 1 million EUR or total assets exceed than 2 million EUR or have more than 15 employees, they are considered to be medium sized. Lastly, a company not in any of the above categories is considered small. There are a number of theoretical explanations for expecting a positive relationship between company size and HC investment. For example, [18] and [2] assumed that large and very large companies invest more in HC because they often have internal HR departments conducting HR activities, whereas small companies are usually characterized as inconsistently developing their HR, not providing adequate premises nor funds for the creation of HC.
- The listing status variable (PUBQOT) implies whether the company has issued securities that trade on the organized capital market. The assumption is that companies with securities listed on the stock market are more inclined towards corporate social responsibility and therefore investment more in HC than companies that have not issued their securities or are no longer trading on the stock exchange.
- Profitability is measured by financial ratios of return on equity (ROE) and profit margin (PROFMAR). ROE is calculated as net income divided by shareholder equity, and profit margin is expressed as a percentage of sales remaining after all expenses are covered by a business. Accordingly, there is reasonable

expectation of a positive relation between the level of HC investment and profitability.

• Capitalization of employee knowledge, skills and abilities into company asset are approximated by the number of trademarks (NBTRAD) where the expected sign of relation with HC investment is positive, indicating that annual salaries in companies exceeding average annual salaries for an industry sector have a greater number of trademarks than those with below average annual salaries.

Table 2 gives a description of all variables and the expected impact of independent variables.
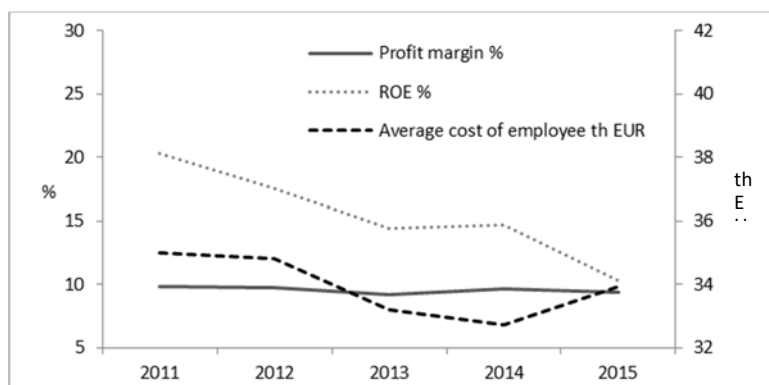
Label	Definition of variable	Expected impact
AVCOSTE	Average cost of employee (thous. EUR)	Dependent variable
CATCOMP	Category of company (size)	+
PUBQOT	Publicly quoted	+/-
PROFMAR	Profit margin (%)	+
ROE	ROE (%)	+
NBTRAD	Number of trademarks	+/-

Source: The author's definition and expectations based on previous research

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

3.3. Research results and discussion

The data that includes both cross-section and time period components of the analyzed variables are called panel data, and the process is called panel analysis. A dependent variable, approximated by the average employee cost, is converted into units of observation (by company) and by time, hence the evaluation of variables which determine the variable HC investments, is considered more precise [3]. Thus, panel analysis is a more robust and reliable method than regression analysis.

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

Figure 1: *Average profit margin, ROE and average employee cost of all selected member states*

the average indicators for all companies for the years (Figure 1) indicates that both profitability ratios have similar trends for all periods. On the other hand, starting from year 2013, AVCOSTE shows inversely proportional movements in comparison to those ratios. The descriptive statistics of all observed variables are shown in Table 3. Sizes of variables, listing status and number of trademarks for each company are constant across the 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

*Binary variable (0-no, 1-yes)
Source: Calculated according to the Bureau Van Dijk Amadeus database (2015)

Table 3: *Descriptive statistics for the dependent and independent variables.*

Estimating the model requires checking the correlation between potential independent variables in order to identify a potential multicollinearity problem. The correlation coefficients are shown in Table 4. The calculated coefficients do not exceed 0.5 and their absolute values do not indicate the presence of a 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 to estimate an adequate panel data model. The Wooldridge test for the existence of autocorrelation in panel data ($p \leq 0.001$) 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 challenged. The dynamic panel model solves effectively the problem of endogenity and manages the issue of heteroscedasticity and autocorrelation of residuals [3]. The empirical analysis is further conducted along with an evaluation of the dynamic panel models. Next, the Blundell-Bond (BB) estimator is used [17]. The selection is based on the sample characteristics. The number of observation units (company) exceeds the number of observation periods that satisfy condition for applying the Arellano-Bond (AB) estimator or Blundell-Bond (BB) estimator [15]. The fact that the BB model results from a correction of the AB model and the fact that a higher number of instrumental variables in the observed set does not compromise the bias estimator, all this is the basis for determining the choice of BB model [6]. An analytical note for the model equations is as follows:

$$AVCOSTE_{it} = \mu + \gamma AVCOSTE_{it-1} + \beta_1 CATCOMP_{it} + \beta_2 PUBQOT_{it} +$$
$$\beta_3 PROFMAR_{it} + \beta_4 ROE_{it} + \beta_5 NBTRAD_{it} + \alpha_i + \varepsilon_{it} , \qquad (1)$$
$$i = 1,2,\dots,N; t = 1,2,\dots,T,$$

where N is the number of observation units (4,984 companies), T is the number of periods (5 years). Parameter μ is a constant member, γ is a parameter of the lagged dependent variable, $\beta_1,\dots,\beta_5$ are parameters of the independent variables. Furthermore, α_i is the random variable for each observation unit i, and ε_{it} is the estimation error, where both are assumed to follow a white noise process.

The two-step BB estimator is used to evaluate the dynamic panel model due to its robustness for heteroscedasticity and being more efficient than the one-step estimator [15]. Evaluation of the model using a two-step BB estimator provides a biased estimate of the standard error [15]. Therefore, the robust option is introduced to obtain non-biased estimators. The validity of the instruments

selected for assessing the model passed through the Sargan test [3]. This test cannot be performed if the robust option to estimate is used, therefore the results from the diagnostic tests without robust options are enclosed.

Variables	BB2st	BB2st_rb
$AVCOSTE_{it-1}$	0.2508***	0.2508***
	(0.0423)	(0.0613)
$CATCOMP_{it}$	85.8415***	85.8415***
	(23.7522)	(29.6637)
$PUBQOT_{it}$	-54.5236	-54.5236
	(112.9417)	(147.3411)
$PROFMAR_{it}$	-0.0014	-0.0014
	(0.0088)	(0.0089)
ROE_{it}	0.0003	0.0003
	(0.0025)	(0.0026)
$NBTRAD_{it}$	0.1753	0.1753
	(3.3606)	(3.6612)
μ (cons)	-87.0431***	-87.0431**
	(29.1877)	(36.0023)
N	19,936	19,936
Sargan test	0.0760	-
AR(1) test	≤ 0.001	≤ 0.001
AR(2) test	0.6433	0.6465

Note: 2st – 2 steps estimator, rb – robust option
Standard errors in parentheses
$* p < 0.10$, $** p < 0.05$, $*** p < 0.01$
Source: Estimated according to the Bureau Van Dijk Amadeus database (2015)

Table 5: *Dynamic panel data models - average employee cost as a dependent variable.*

The estimated parameters of the dynamic BB panel model with and without the robust option give the same significance (Table 5). The average employee cost from the previous year and company size affect to a great extent positively average employee costs in EU companies. The results indicate that larger companies have significantly greater investments in HC. Profitability ratios, listing status and the number of trademarks show no significant impact on average employee costs in EU companies. Significant relations between human capital investments and profitability ratios cannot be interpreted using economic imbalance given that in the current turbulent environment, companies focus mainly on short-term profits rather than long-term adding value. The significant relation between human capital investments and company trademarks has not been confirmed due to industry specifics. Namely, in high-tech industries, companies monetize expenditure on human capital in the form of intellectual capital rather than

trademarks. Moreover, no significant relation between average employee costs and listing statuses can be explained using the common practice of manager remuneration schemes in listed companies. These companies have different remuneration schemes (e.g. stock options, retirement plans, insurance policies) for mid and top management and are not included in salary costs.

Selecting a non-adequate estimator may lead to different conclusions, hence authors often use models estimations with multiple estimators [15]. Therefore, for our purposes, additional panel models were estimated. The first differences were calculated for the dependent variable relating to average employee costs. Given that it was stationary, the assumption of using a static panel model as a quality estimator was satisfied. Subsequently, random and fixed effects static panel models were estimated. Based on the relevant tests, the introduction of random effects for each company was not justified, and the fixed effects model 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 the model, the effect of the time component is lost upon calculating the average values for each observation unit [14]. This indicates that the multiple regression model estimate might be relevant in this case, as expected for the case of a stationary dependent variable and a significant influence of independent variables that are not dependent on time. Nevertheless, our conclusions were confirmed. The 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 conducting the relevant tests, the model providing conclusions on the influence exerted by the observed independent variables on average employee costs is a dynamic panel two-step BB estimator model with a robust option. The positive and significant influence of the company (size) category on the average employee costs was identified. The other variables showed no significant impact on HC investments in EU companies. Therefore, whether more profitable companies have higher employee costs (i.e., HC investment) in the EU countries has not been confirmed.

4. Conclusions

Human capital is the most valuable resource for any company due to its capacity for knowledge, skills and abilities (KSA), work experience and emotional intelligence. It manages and directs all other resources and provides a competitive advantage to companies, as well as innovation and modernization of organizational process, reinforcement of overall organizational success and as such HC becomes an integral part of any company.

The aim of this paper was to explore the relationship between HC investments and company profitability ratios (return on equity and profit margin). The

analysis conducted using a sample of approx. 5,000 EU companies from the information technology industry (covering the period 2011-2015). Furthermore, the analysis tested whether the level of HC investments differ significantly with regard to company size, listing status and number of registered trademarks. Previous studies on HC investments and company profitability ratios most often used multivariate techniques or regression analysis. This paper applied techniques involving panel data analysis which are more appropriate for cross-sectional time series data structures.

Having conducted the relevant tests, the model selected to provide conclusions as to the scope of impact the observed independent variables have on average employee costs was the dynamic panel two-step BB estimator model using the robust option. The analysis confirmed that company size has a significant influence on the average employee costs, meaning that a larger company has higher employee costs. Larger companies have an even greater requirement to train and develop their employees than smaller companies, and are constantly seeking higher levels of KSA. These companies invest in employee development and various ongoing training and raising their KSA level, leads to increasing company annual salaries. The other variables in the research indicated no significant impact on HC investments in enterprises operating in the EU.

We propose that future research examine HC development in different industries, HC differences and their specific influence on company performance rather than overall business excellence. Additionally, a more detailed explanation of the implication of these results for the advancement of human capital management theory, competitiveness or growth literature would be a useful future contribution.

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