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The Role of Human Capital in Firm Valuation: An Application on BIST

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Abstract

Because of the deficiencies of accounting standards to capture the real value of a company in the new knowledge-based economy, the gap between firms' market value and book value continues to increase. The main objective of our study is to contribute to the discussions on this gap via extended Ohlson Model by adding human capital (HC) as 'other information' into the original Ohlson Model (OM) and try to find out incremental explanatory power and value relevance of HC indicators on firm value on a sample of Borsa Istanbul publicly traded industrial companies from 2004 to 2014. The obtained data are analyzed through the Stata and Eviews statistical packaged softwares using panel econometric models. The findings show that OM is suitable for the Turkish context and extended model can reveal the significant part of the unexplained variation in firm values, therefore HC can be considered as value-relevant in making business valuation decisions and as a result management should make appropriate resources planning on compensation policies to maximize firm's long-term competitiveness in the global market and also to create and manage human assets more effectively and efficiently.

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Keywords: Human capital, Value relevance, Ohlson model, Corporate value, Value creation, Turkish context

1. Introduction

Along with the changes from the traditional economy based upon industrial manufacturing and tangible assets, to knowledge economy based upon knowledge and intangible assets like intellectual capital (Moore and Craig, 2008),

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businesses have to possess a number of skills and competencies (such as; management of intangibles, knowledge, innovation and intellectual property etc.) which weren't seen in the traditional economy and were shaped the basis of the knowledge and innovation to survive and achieve competitive advantage (Al-Ali, 2003). As organizations were specialized in the management of these competencies and skills, they have begun to promise more future growth opportunities (Chang, 2007), and as a result of this process, financial statements remained insufficient to measure these growth opportunities and substantial differences between the book value and the market value of a company has become apparent, especially in the last thirty years period (Pena, 2002). In a research conducted by Lev (2002) on United States Standard & Poor's 500 companies from 1977 to 2001, it has been demonstrated that more than 80 percent of the market value of a company was not included in the financial statements (Wang, 2008). Since today's complex information-based firms increasingly became more dependent on resources which cannot be obtained from traditional accounting framework, current accounting methods remained insufficient to measure the value of these resources and value relevance of the information obtained from the financial statements has begun to decrease (Bontis, 2003; Stewart, 1998). Several studies related to explaining this gap between the market value and the book value by intangible assets such as intellectual capital rather than tangible assets were conducted by many researchers in the literature (Gavious and Russ, 2009; Eloff and de Villiers, 2015; Ferraro and Veltri, 2011; Lajili and Zeghal, 2005; Liu et al., 2009; Shakina and Bykova, 2011; Tseng and Goo, 2005; Wang, 2008). The common point of these studies is that the impact of human capital, shown among intellectual capital components by many researchers (Edvinsson and Malone, 1997; Petty and Guthrie, 2000; Stewart, 1998; Tseng and Goo, 2005; Wang, 2008), on firm value has been taken into consideration in business valuation related studies. However due to having a comprehensive definition and the difficulties experienced in measuring, human capital has not drawn attention too much in the value relevance researches which are conducted on whether an accounting information affects the decisions of financial statement users (Gavious and Russ, 2009).

Ohlson (1995) and its subsequent improvement Feltham and Ohlson (1995) valuation models (Hereafter OM) became a popular model for value-relevance testing owing to providing a direct link between the market value of an entity and its accounting numbers (Eloff and de Villiers, 2015). Starting from this framework, we extended OM by hypothesizing the use of human capital in exchange for "*other information*" which is ignored due to the challenges of calculation in previous studies (Al-Hares et al., 2011). As a result we have decided to add human capital, measured by using proxy variables, to our valuation model in order to indicate unexplained gap between the book value and market value, and we have tested whether human capital is related to stock value of companies in the Borsa Istanbul publicly traded industrial companies (XUSIN) from 2004 to 2014. Based on the results obtained in this paper, we believe that OM is suitable for the Turkish industrial companies and extended OM can reveal the significant part of the unexplained variation in firm values. Therefore it can be considered as value-relevant to market participants due to the significant relationship with the market value of a share, because of this reason the public disclosure of these human capital indicators is important in making business valuation decisions. It must be noted that, other intellectual capital components, such as relational (or customer) capital and structural (or organizational) capital, are beyond the scope of this research.

The remainder of the study is organized as follows: Section 2 provides a review of the relevant literature about value relevance, Ohlson model and human capital. Section 3 depicts research methodology, specifies the research objectives and hypotheses, sample and data selection process and lastly analyses and results of the empirical work. Finally, conclusions of the study are set out in last section.

2. Literature Review

2.1. Value Relevance and Ohlson Model

Due to the growing gap between firms' stock prices and book value obtained from the balance sheets (Pena, 2002) in recent years, standards specified by the accounting standard setters were started to be questioned and as a result, studies on these standards which are unable to measure firm values fully and correctly were started to gain weight in the accounting and finance literature (Bontis, 2003) to update standard setters' former views and to become informative about the debates on these standards (Barth et al., 2001). In these studies described as value-relevance, relationships between the market value of assets and accounting information are generally investigated. According to

International Accounting Standards Board, an accounting information will be value-relevant, if it affects the decisions of users (IASB, 2015). Similarly, Eloff and de Villiers (2015) stated that an accounting information will be value-relevant, if it contains meaningful information for the financial statement users, conversely, information will not be value-relevant in the absence of an impact on stock price.

Because OM, introduced as a benchmark model relating to how to determine the value of a firm by benefiting the accounting information, allows to directly associate market value of an asset with accounting information, it has become a popular valuation model used by many authors in value relevance research (Barth, 2000). OM is based on two pillars such as the residual income valuation model (RIV) and the linear information dynamics (LID). RIV characterize firm value as a linear function of the book value of equity and the present value of future abnormal earnings (Gümrah & Adiloğlu, 2011), additionally LID introduces the concept of "other information" expressed as information other than abnormal earnings that affects future abnormal earnings. RIV can be shown as follows:

$$p_t = bv_t + \sum_{T=1}^{\infty} R_f^{-T} E_t[\tilde{X}^a_{t+T}] \qquad \text{(RIV)}$$

p_t is company's stock value at time *t*; bv_t is book value at time *t*; R_f is 1 plus risk free rate; $E_t[.]$ is expected value operator conditioned on the time *t* information; and X_t^a is abnormal earnings (residual earnings) at time *t*. X_t^a is calculated as net income (earnings) at time *t* minus book value at time $t-1$ multiple by cost of equity capital (= risk-free interest rate given risk neutrality). Ohlson assumed the time-series behaviour of abnormal earnings, therefore abnormal earnings can be estimated with linear regression analysis by including two accounting variables (abnormal earnings and the information other than abnormal earnings) and their equations for period $t+1$ is defined as (Wang, 2008):

$$\tilde{X}^a_{t+1} = \omega X_t^a + v_t + \tilde{\varepsilon}_{1,t+1} \qquad \tilde{v}_{t+1} = \gamma v_+ + \tilde{\varepsilon}_{2,t+1} \qquad \text{(LID)}$$

v_t is information other than abnormal earnings at time *t; ω* is parameter of persistence for abnormal earnings to evaluate the sustainability of abnormal earnings; γ is parameter of persistence for information other than abnormal earnings to evaluate the sustainability of information other than abnormal earnings; and $\tilde{\varepsilon}_{1,}$and $\tilde{\varepsilon}_2$ represent the terms of stochastic errors assumed for having mean zero and normal distribution. By combining the RIM with the LID, we obtain the following linear valuation function of OM:

$$p_t = bv_t + \alpha_1 X_t^a + \alpha_2 v_t \qquad \text{(OM)}$$

As a result, Ohlson (1995) characterized firm value as a linear function of the book value of equity, the present value of future abnormal earnings and the "*other information*" rather than abnormal earnings that affect future abnormal earnings. Al-Hares et al. (2011) claim that such other information (v_t) which is generally removed in previous valuation studies due to the challenges of calculation, may be useful for the estimation of future accounting variables and if these variables are relevant, then v_t becomes value relevant in firm valuation. The variables in the accounting systems are still insufficient in predicting v_t. Therefore**,** it is generally omitted from the valuation equations, because of being unobservable or very hard to observe. But it is essential part of OM, and therefore, its omission would deteriorate the fit of OM (Ota, 2000). For this reason, studies towards presenting v_t in the models by using various accounting information are widely seen in OM literature (Barth et al., 1999; Dechow et al., 1999; Hand and Landsman, 1998). In this paper, we try to improve OM by adding human capital as other information and try to find out whether human capital is value relevant or not.

2.2. Human Capital and its Valuation

While firms relied heavily on tangible assets for value creation in the traditional economy, intangibles like intellectual capital (IC) have become important for value creation in the emerging knowledge economy. Along with the new economy, numerous conceptual frameworks have been created to understand, systematize and measure the

IC (Abeysekera and Guthrie, 2004). IC which is expressed by Brooking (1997) as the difference between the market value and the book value, is generally discussed in three different components: Internal (structural/organizational) component; external (relational/customer) component; and human component which is providing the interaction between internal and external components to create value (Brennan and Connell, 2000; Guthrie et al., 2004; Sveiby, 1997). Mobilizing, managing and measuring of Human capital (HC), as one of the most important components of the IC, might be the only way to succeed for today's companies (Gavious and Russ, 2009), because in the literature there are many studies concluded that human capital directly affects firm performance (Özer et al., 2015).

Human capital which is defined by Stewart (1998) as skills, talents and competencies possessed by people and groups, is not seen as an entity that is legally owned by firms. Therefore, it can also be defined as the knowledge that employees take with them when they leave the firm (Meritum, 2002). There are number of alternative methods to measure and then to valuate human capital due to the lack of harmony on any single framework**.** Generally speaking, there are two measurement approaches: Monetary measurement, expressing the value of HC with monetary figures, and non-monetary measurement, facilitated by Likert-type scales (Chen and Lin, 2004).

Depending on the purposes and goals of the valuation framework, each model has advantages as well as disadvantages. According to our objectives in this paper and following Sydler et al. (2014), we aim to apply a monetary measurement model for two reasons: Firstly, the selected method needs to allow us to collect publicly available data from companies' financial statements, because these valuation approaches rely mostly on established accounting regulations; secondly it needs to allow us to benchmark companies' HC with others in order to provide reliable and consistent testing opportunity. For these reasons, we have preferred to determine value indicators which are valid and accurate for human capital. In accordance with the suggestions in the literature, only one or two indicators should be selected in order to keep the analysis simple while still providing a meaningful picture (Wang, 2008), and also taking into account the quantity and quality characteristics of intangibles (Shakina and Barajas, 2014), we decided to choose personnel expenses per employee as a volume of investment in human capital following the works of Ballester et al. (2002), Lajili and Zéghal (2005), Ooghe et al. (2006), and Widener (2006) and effectiveness of personnel as a human capital quality. We measure personnel effectiveness by using net sales per employee as a proxy variable following the works of Nogueira et al. (2010), Wang (2008), and Yu and Zhang (2008).

3. Methodology

3.1. Research Objectives

The main objective of our study is to contribute to the discussions on gap between firms' market value and book value. Starting from this point, firstly we will examine the validity and value relevance of the OM for Turkish context, and then we will extend the OM by adding HC as '*other information*' and try to find out incremental explanatory power and value relevance of HC indicators on firm value.

3.2. Research Hypotheses

Validity and value relevance studies regarding OM which describe the company's stock price as a linear function of its book value, abnormal earnings and other information, were carried out by many researchers (Bernard, 1995; Dechow et al., 1999; Gümrah & Adiloğlu, 2011; Silvestri and Veltri, 2012; Ota, 2000). The findings of these researches provide evidence on the significance of book value and abnormal earnings in explaining firm's stock price. In this context, an accounting parameter is considered as value-relevant if it has a significant relationship with the market value of a security (Eloff and de Villiers, 2015). Thus, value relevance of book value and abnormal earnings means the significant statistical dependence on share price (Al-Hares et al., 2011) and consistent with previous studies we also expect positive coefficients for both of them. In the light of the OM literature, our first group research hypotheses in connection with the value relevance of basic accounting variables are as follows:

H1: OM parameters have a jointly significant relationship in explaining firm's stock price.

H1a: There is a significantly positive relationship between firm's book value and its stock price, and thus book value has value relevance.

H1b: There is a significantly positive relationship between firm's abnormal earnings and its stock price, and thus abnormal earnings have value relevance.

As mentioned in the above sections, the growing gap between firms' market and book value is generally attributed to the intangible assets rather than tangible assets, because intangible assets are considered as significantly associated with future earnings **(**Lev, 2002; Swartz et al., 2006; Wang, 2008; Yu et al., 2009). In the book, entitled "The Know-How Company", written by Sveiby in 1986 on how intangible assets should be managed, it has been suggested that the ability and experience of employees should be taken into account in business valuations (Chang, 2007) and also it is suggested that intangible assets, such as human resources, skills, knowledge, processes and innovation capabilities, have to be considered to determine the real value of a company (Wang, 2008). Also it is highlighted that human capital is the primary source of sustainable competitive advantage (Ferraro and Veltri, 2011) due to its direct impact on firm performance (Özer et al., 2015). For these reasons we believe that HC, by using in exchange for other information in firm valuation, can reveal the major part of the unexplained variation in firm values and therefore it can be considered as value-relevant due to the significant relationship with the market value of a security. Also we believe that two aspects of HC will positively affect the firm's market value. When we consider the quantitative aspects of HC, qualified and skilled labor force will demand a higher salary, so we expect a positive relationship between average salary and the firm financial performance **(**Ballester et al., 2002)**.** For qualitative aspects of HC**,** increasing net sales per employee means that employees provide more contribution to the firm's value. Given the arguments above and the results of prior literature, we will extend the OM by adding HC as '*other information*' and try to find out incremental explanatory power and value relevance of HC indicators on firm value, so our second group research hypotheses came up as follows:

H2: Involvement of HC in OM reveals incremental explanatory power on market value of the firm.

H2a: There is a significantly positive relationship between firm's personnel expenses and its stock price, and thus personnel expenses have value relevance.

H2b: There is a significantly positive relationship between firm's net sales and its stock price, and thus net sales have value relevance.

3.3. Research Design

OM which regresses company's stock value on book value, abnormal earnings and other information, can be modified in accordance with the econometric panel data analysis to test value relevance of basic accounting variables. Initially, as in all previous studies, we remove other information from the model, so OM became the following:

$$MV_{i,t} = \beta_0 + \beta_1 BV_{it} + \beta_2 X^a_{it} + \varepsilon_{it} \quad (1)$$

Where $MV_{i,t}$ is the closing price of company *i*'s share at the last official release of the annual reports in year *t+1*, since the accounting information in year *t* may not have become publicly available until the release date in year *t+1* (Such as, Ferraro and Veltri, 2011; Swartz et al. 2006; Yu et al. 2009). BV_t is firm *i*'s book value per share at the end of year *t*; X^a_t is firm *i*'s abnormal earnings per share (residual earnings) at the end of year *t.* As seen in the model (1), researchers simplified the equation (1) by setting '*other information*' to zero or assuming it to have effects that are entirely absorbed in the intercept (Ferraro and Veltri, 2011; Liu et al.,2009; Wang, 2008). But, as we discussed above, its omission would deteriorate the fit of OM (Al-Hares, 2011; Ota, 2000). For this reason, to investigate the market's perception on human capital value which is a broad value relevance researches neglect to include it, we extended OM by adding HC as '*other information*' and try to find out incremental explanatory power and value relevance of HC indicators on firm value. After these assumptions, our extended OM came up as follows:

$$MV_{i,t} = \beta_0 + \beta_1 BV_{it} + \beta_2 X^a_{it} + \beta_3 PE_{it} + \beta_4 NS_{it} + \varepsilon_{it} \quad (2)$$

Where PE_{it} is firm i's personnel expenses per employee at time *t*, personnel expenses includes all types of related expenses; wages, salaries, bonuses, employee insurance and other employee benefits. NS_{it} is firm i's net sales per employee at time *t*. Thus we consider that PE_{it} is proxy for quantitative aspect of HC and NS_{it} is proxy for qualitative aspect of HC. A significantly positive β_3 and β_4 would indicate that the quantitative and qualitative aspects of HC positively affect the firm's market value, respectively. Similarly, a significant increase in R^2 resulting from addition of HC to model (1) would reveal the incremental explanatory power of HC on market value of the firm.

3.4. Sample and Data

Our sample includes Borsa Istanbul publicly traded industrial companies (XUSIN) from 2004 to 2014. The values relating to variables were obtained from official websites of Public Disclosure Platform and Borsa Istanbul. Our starting sample consists of 1,360 firm-year observations in XUSIN. After subtracting observations with missing data, we obtain 948 observations**.** Consistent with prior literature we restrict our sample to firms which have positive book value (Wang, 2008) and therefore 932 samples remained. Finally, to mitigate the effect of outliers, we trim one-half percent of the data based on the dependent variable (Core et al., 2003; Gavious and Russ, 2009). The deletion procedure results in a final full sample of 922 observations. Data were analyzed through the Stata 13.1 and Eviews 8 statistical packet program.

Table 1: Descriptive statistics

Variables	Observation	Mean	Maximum	Minimum	St. Deviation
MV	922	10.76	137.8	0.672	23.818
BV	922	6.805	70.23	0.367	11.604
X^a	922	0.015	6.773	-5.194	1.346
PE	922	43.69	112.3	10.452	21.475
NS	922	512.9	1,503	98.658	361.82

**Variable definitions:* MV *is the closing price of company i's share at the last official release of the annual reports in year t+1;* BV *is firm i's book value per share at the end of year t;* X^a *is firm i's abnormal earnings per share (residual earnings) at the end of year t;* PE *is firm i's personnel expenses per employee at time t,* NS *is firm i's net sales per employee at time t.*
***PE and NS are scaled 1,000 TL*

Table 2: Correlation matrix of variables

	MV	BV	X^a	PE	NS
MV	1,000				
BV	0.564	1,000			
X^a	0.269	0.140	1,000		
PE	0.273	0.158	0.167	1,000	
NS	0.159	0.161	0.221	0.565	1,000

**All correlations are significant at 0,01.*
***See table 1 for definitions of all variables.*

Table 1 reports the descriptive statistics of each variable and displays some important findings: In the research period, mean market value is about 1.6 times of mean book value which means that USA and West European companies whose ratio is about 3-8 times (Yu and Zhang, 2008) can create higher market value than Turkish companies with the same financial resources. Mean volume of investment in human capital 43,690 TL which means that our sample firms pay their employees 43,690 TL per year that is quite normal in the conditions of Turkey but rather less compared to other developed countries. Mean of net sales per employee is 512,900 and show effectiveness of personnel which is quite normal compared with previous studies (Nogueira et al., 2010). Table 2 reports the correlations for the variables to be used in the valuation model and consistent with Yu et al. (2009), displays that market values of firms are positively and significantly correlated with all independent variables in the predicted

directions. Major finding of table 2 is strong and positive correlation between personnel expenses per employee and net sales per employee which means that as one variable increases, other also increases. On the other hand, we utilized the variance inflation factor (VIF) to avoid multicollinearity problem among the variables and the results obtained (untabulated) are between 1.51 and 1.05 which indicates that there is no serious collinearity among the variables in regression models.

3.5. Analyses and Results

In order to test the six hypotheses regarding the value relevance of basic accounting variables and value indicators of HC and therefore incremental explanatory power of extended OM on firm valuation, we applied two econometric panel data regression models (model 1 and 2) on a sample of XUSIN companies from 2004 to 2014. Initially, we run model specification tests for pooled vs. fixed effects, pooled vs. random effects and random effects vs. fixed effects models via F (Chow) test, Breusch-Pagan Lagrange Multiplier test and Hausman test, respectively, in order to decide which panel data estimation technique is more appropriate to our data set. According to the results we have obtained (untabulated), we have decided to employ fixed effects (Hereafter FE) model. FE model analysis results of model (1) and (2) and serial correlation, heteroskedasticity and cross-sectional dependence tests summaries are presented in the table 3 column 1 and column 2, respectively.

Table 3: FE analysis results of model (1) and (2) and serial correlation, heteroskedasticity and cross-sectional dependence tests summaries

Column 1							**Column 2** [III]		
Models	Indep. Var. [I]	Coefficients (β_k)	t Statistic [II]	Adjusted R^2	F Values	P Values	Serial Correlation	Heteroskedasticity	Cross-Sectional Dependence
Model (1)	Cons.	7.290	16.19***	0.791	57.84	0.000	P-value 0.000 Serially Correlated	P-value 0.000 Heteroscedastic	P-value 0.000 Cross Sectionally Dependent
	BV	0.296	8.56***						
	X^a	1.355	16.19***						
Model (2)	Cons.	-1.423	-1.32	0.811	53.64	0.000	P-value 0.000 Serially Correlated	P-value 0.000 Heteroscedastic	P-value 0.000 Cross Sectionally Dependent
	BV	0.317	5.76***						
	X^a	1.064	6.85***						
	PE	0.151	6.38***						
	NS	0.003	1.80*						

[I]See Tables 1 for definitions of all variables. PE and NS are scaled 1,000 TL. [II]Arterisks ***, **, * indicate that significance at the 1, 5 and 10 per cent levels, respectively. [III]Serial correlation was tested via Wooldridge Test by utilizing *xtserial* user-written command in Stata (Drukker, 2003) under the null hypothesis that residuals aren't serially correlated. Heteroskedasticity was tested via Modified Wald Statistic for Groupwise Heteroskedasticity in Fixed Effect Model by utilizing *xttest3* in Stata under the null hypothesis that residuals are Homoscedastic. Cross-Sectional Dependence was tested via Pesaran Test for Cross-Sectional Dependence by utilizing *xtcsd, pesaran abs* user-written command in Stata (De Hoyos and Sarafidis, 2006) under the null hypothesis that residuals aren't cross sectionally dependent.

Before interpreting the results presented in table 3 column 1, it should be noted that FE model established to solve Model (1) and (2) seems to have serial correlation, heteroskedasticity and cross-sectional dependence problems, as seen in table 3 column 2. Because ignoring possible failure to comply with the assumptions on regression residuals can lead to biased statistical inferences (Hoechle, 2007), we employed three different robust standard errors estimation techniques to have heteroscedasticity consistent standard errors that are robust to very general forms of cross-sectional and/or temporal dependence in order to ensure validity of the statistical results. As it is shown in the table 4, firstly we have estimated clustered standard errors which produces consistent standard errors if the residuals are heteroscedastic and correlated within but uncorrelated between entities (in our case, firms). Later, we have estimated panel corrected standard errors and then Driscoll Kraay standard errors both of which are consistent when residuals are heteroscedastic, autocorrelated and cross-sectionally dependent. While panel corrected standard errors technique can only estimate pooled OLS regressions, on the other hand clustered standard errors and Driscoll Kraay standard errors can estimate both pooled OLS and FE regressions. In spite of the all these similarities and differences, three

robust estimation techniques have demonstrated similar results, therefore we only interpret the results according to Driscoll Kraay standard errors technique in order to ensure the simplicity of expression.

Table 4: Robust standard errors for panel regressions summaries

Column 1		**Column 2** Clustered Standard Errors				**Column 3** Panel Corrected Standard Errors				**Column 4** Driscoll Kraay Standard Errors [III]			
Models	Indep. Var. [I]	Coef. (β_k)	t Stats [II]	Within R^2	F Value [II]	Coef. (β_k)	t Stats [II]	R^2	Wald chi2 [II]	Coef. (β_k)	t Stats [II]	Within R^2	F Value [II]
Model (1)	Cons.	7.290	7.39***			7.195	4.63***			7.290	6.08***		
	BV	0.296	1.97*	0.127	3.08**	0.163	4.49***	0.122	22.07***	0.296	5.75***	0.127	30.00***
	X^a	1.355	2.28**			1.933	2.22**			1.355	5.53***		
Model (2)	Cons.	-1.42	-0.65			1.114	0.99			-1.42	-0.95		
	BV	0.317	2.51**			0.388	4.73***			0.317	6.84***		
	X^a	1.064	1.96*	0.213	7.94***	0.899	2.10**	0.162	24.97***	1.064	6.35***	0.213	148.1***
	PE	0.151	3.30***			0.063	2.01**			0.151	6.04***		
	NS	0.003	1.72*			0.003	1.69*			0.003	6.21***		

[I]See Tables 1 for definitions of all variables. PE and NS are scaled 1,000 TL. [II]Arterisks ***, **, * indicate that significance at the 1, 5 and 10 per cent levels, respectively. [III]Driscoll Kraay standard errors can be run by utilizing *xtscc* user-written command in Stata (Hoechle, 2007).

According to our robust Driscoll Kraay standard errors analysis results in table 4 column 4, OM's (model 1) *F-value* is 30.00 and model *P-value* is 0.000 which means that the model's validity cannot be rejected. The within R^2 of this model is 0.127 which is very low compared adjusted R^2 of FE (in table 3) because within R^2 gives us the goodness of fit measure for the within individual mean data ignoring all the between information in the data, but we can compare it between different models over the same estimation method. The coefficients on book value and abnormal earnings in all estimated regressions are consistently positive and significant at the 0.01 level of significance, as expected. Consistent with previous researches (Al-Ali, 2003; Eloff and de Villiers, 2015; Liu et al., 2009; Yu et al., 2009), these findings approve OM's suitability which means that *BV* and X^a have explanatory power over the market value. As a result, *H1* cannot be rejected at the 0.01 level of significance, and because *BV* and X^a are positively and highly significantly related to *MV*, also *H1a* and *H1b* cannot be rejected at the 0.01 level of significance.

Driscoll Kraay standard errors analysis results of model 2 which is obtained from the involvement of value indicators of HC into OM are displayed in table 4 column 4. We observed that *BV* and X^a are significantly and consistently positive again, like in the model 1. Likewise, the coefficients on personnel expenses and net sales per employees are also statistically and positively significant, so these two variables positively affect the firm's market value, as expected. If we economically interpret the results, for 1,000 Turkish Liras increase in PE (NS), firm's equity value is expected to increase by 0.151 (0.003) TL, holding all other variables constant. In short, consistent with the previous literature **(**Ballester et al., 2002; Yu and Zhang, 2008**)** the quantitative and qualitative aspects of HC which is measured by PE and NS, respectively are positively affect the firm's market value and therefore we can say that these variables have value relevance. On the other hand, we observe that the model 2's *F-value* is 148.1 and *P-value* is 0.000 which means that the model as a whole has statistically significant predictive capability on firm equity value. Furthermore, after the involvement of value indicators of HC (model 2) in OM (model 1), the explanatory capacities of the models significantly increase from 0.127 to 0.213. A significant increase in within R^2 resulting from addition of HC to OM would reveal the incremental explanatory power of HC on market value of the firm. These findings are in line with our expectations. As a result *H2* cannot be rejected, and also *H2a* and *H2b* cannot be rejected at the 0.01 level of significance.

4. Conclusion

We based our study on the Ohlson (1995) and Feltham and Ohlson (1995) models to examine the value relevance

of basic accounting variables and the indicators of HC in the context of Borsa Istanbul publicly traded industrial companies. Determining whether HC is value-relevant or not is crucial for accounting and finance literature due to the growing gap between firms' market and book value and the deficiencies of generally accepted accounting standards to capture this gap. Based on the evidence presented in this paper, we believe that Ohlson model is suitable for the Turkish industrial companies and HC indicators used to capture the "other information" in firm valuation can reveal the significant part of the unexplained variation in firm values. Therefore HC can be considered as value-relevant to market participants due to the significant relationship with the market value of a security, because of this reason the public disclosure of these HC indicators is important in making business valuation decisions. From the accounting standards perspective, we provide empirical evidence showing that market participants treat HC indicators, especially personnel expenses, as a value-creating investment and therefore HC related information needs to be reported in financial statements. When viewed from the business management perspective, our empirical evidences suggest that management should make appropriate resources planning on compensation policies to create and manage human assets more effectively and efficiently and also to maximize firm's long-term competitiveness in the global market. These findings are consistent with the literature on business valuation (Al-Ali, 2003; Silvestri and Veltri, 2012), intangible assets (Eloff and de Villiers, 2015; Gümrah & Adiloğlu, 2011; Liu et al., 2009; Yu et al., 2009) and human capital **(**Ballester et al., 2002; Gavious and Russ, 2009; Lajili and Zéghal, 2005) studies. Different from the other research, we carried out our human capital study moving from the framework of Ohlson valuation model in the context of Turkey and provided empirical evidence for quantitative and qualitative aspects of human capital. Although this study is just conducted on publicly traded Turkish industrial companies**,** we believe that the findings might be transferable to all types of organizations as well as to more advanced stock markets because of the growing importance of human factor in the new world. But, it is recommended that further researches can be conducted on other sectors, and also in different countries for the generalizability of findings. On the other hand other components of intellectual capital, such as relational (or customer) capital and structural (or organizational) capital, were excluded from the scope of this research.

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