Examining the Relationship between Human Resource Expenses and Enterprise Value: Focusing on Companies Listed on the Korean Financial Markets

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Abstract. In today's rapidly changing environment, the importance of human resource is growing, but it is necessary to review whether human resource expenditure such as welfare expenses and education & training expenses is a just expense or can create value like an asset in the future. This study attempts to analyze the effect of spending on human resources, such as welfare expenses and education & training expenses on the enterprise value of listed companies in the Korean financial markets from 2000 to 2021, and the total sample size is 24,195 companies. In this study, the relationship between human resource expenses and enterprise value is analyzed. Specifically, in this study, Ohlson (1995) firm valuation model is used to analyze the relationship between education & training expenses and welfare benefits expenses and stock prices by studying the relationship. In particular, this study investigated linear and nonlinear impacts of human resource expenses on enterprise value. Human resource expenses proxy measures included welfare, training, and total costs. Regression analyses based on the Ohlson model revealed statistically significant positive linear effects of all three expense factors on firm value. However, nonlinear specifications indicated inverted U-shaped relationships, suggesting value gains up to an optimal threshold before turning negative at higher cost levels. This research provides evidence that determines whether expenditure on human resource is only an expense element or an asset that can generate future long-term cash flows. The findings highlight the potential of human resource expenses to enhance enterprise value, while emphasizing the need for targeted investment balancing positive returns and excess cost risks. It also provides evidence to review the specific value relevance form of human resource expenses and provides a basis for the implementation of a company expense policy on human resource.

Keywords: enterprise value, nonlinear value relevance, education & training expenses, value relevance, enterprise value relevance of inverted u-shape, welfare expenses

1. Introduction

The World Bank Report divided the national wealth (total wealth of a country) of 192 countries around the world into four categories namely, production capital, natural resources, social capital, and human capital. Of the resources that the World Bank has promulgated, there are human capital and production capital that can bring about a sustained competitive advantage directly to the business (World Bank 2011).

In general, human capital is also called a human asset. Although human assets are not recorded in the company's financial statements, no one denies that it is a major factor in enhancing corporate competitiveness. Nonetheless, the fact that human assets are not recorded in financial statements is due to ambiguity in recording human assets as tangible assets in the company's balance sheet and ambiguity in recording them as intangible assets, and also to measure the value of accurate human assets.

The notion of human assets was asserted by Adam Smith (1776), and he suggested that intangible abilities, such as the technical abilities, know-how, and intuition that each individual possesses, are cultivated by human endeavor.

Today, the main factor that brings human resource to increase the competitiveness of enterprises is the creative ability of human resource and proficiency through hard work for a long time. It is a reality that other companies cannot imitate the competitiveness of companies that are based on the creative and skilled abilities of this human resource.

For this reason, the importance and value of human resource in businesses today are steadily increasing. Securing corporate competitiveness through human resource is more effective when firms pay more attention to education & training for workers and this education & training improves the abilities of the workers, which are then applied to the job. In addition to investment in education & training, the competitiveness of companies can increase greatly if expenses for welfare benefits increase to help workers become comfortable and to enjoy working in the enterprise. Investing in human resource is one of the most common but costly capacity-building activities. In today's rapidly changing business environment, companies are investing more in education and training for workers in order to be competitive (Kraiger, 2003).

However, human resource is not recorded as an asset in the financial statements of a company, even though it is a major resource for enhancing its competitiveness. Investments in human resource are recorded only in the form of expenses, such as education & training expenses and welfare benefits expenses in the income statement. Research that examines corporate valuation factors so far has mainly focused on whether investment in technology assets, such as R&D investment, leads to an increase in enterprise value or not.

In terms of corporate competitiveness, the enhancement of human resource capabilities is linked to the strengthening of corporate competitiveness. It can be said that education & training of employees is very important in order to strengthen the capacity of human resource. In addition, it can be said that welfare benefits are important so that employees can work stably. Through employee education and training, employees can grow by setting individual career paths while strengthening individual capabilities step by step. In addition, if the company has well-established welfare benefits, employees will be able to work in a stable environment while striving for the goals of the organization.

In general, it can be said that the performance of an organization depends on the capabilities, attitudes, and environment of its employees. Education and training of human resource directly affect the performance of the organization. In addition, it can be said to be welfare support that enables employees to work in a stable environment.

Studies on the enterprise value relevance of accounting variables have been developed based on the Ohlson (1995) model that verifies many linear relationships. However, actual social phenomena cannot be explained only linearly, and there is a fundamental limitation in that a large amount of information and external changes in the real world are overlooked only with a linear relationship model assuming a deterministic situation. These limitations can also be found in the verification of the relationship

between human resource expenses and enterprise value. Therefore, it is necessary to verify whether the relationship between human resource expenses and enterprise value is linear or nonlinear.

Therefore, this study attempts to analyze how investment in human resource, such as welfare and education & training expenses affect the increase in enterprise value of listed companies in the Korean financial markets from 2000 to 2021. In particular, this study focuses on verifying whether the relationship between human resource expenses and enterprise value is linear or nonlinear.

This analysis can be used to judge whether investment in human resource is merely an expense element or an asset that has the ability to generate future long-term cash flows. In addition, this study may provide a basis for how to make policies on investment in human resource such as welfare benefits expenses and education & training expenses, to increase enterprise value. Therefore, this study aimed to analyze the linear and nonlinear impacts of human resource expenses on enterprise value using data from Korean public companies. Human resource expenses proxy measures included welfare, training, and total costs.

To this end, this study consists of five sections. Section 1 describes the purpose of research and raises research questions as an introduction. Section 2 examines the study of human resource investment as a theoretical background. Section 3 sets up a hypothesis with a research model and hypothesis setting, as well as a research model for analysis in this study. Section 4 explains the empirical results and the interpretation of results. Finally, Section 5 summarizes the empirical results of the study, and describes the implications of the study.

2. Theoretical Background

2.1. Human resource investment in firm

Human capital includes all of the intellectual, technical, and proficiency levels of the members of an organization. In the past, Adam Smith (1776) suggested that intangible assets, such as know-how and the skills of individuals who are corporate members, can be learned through education or training. Nelson & Phelps (1966) also suggest that the level of human capital plays a crucial role in plugging the gap between technological innovation and new technology among countries. The impact of investment in human resource on increases in enterprise value has been explored either theoretically or conceptually, but there has been some difficulty in measuring this from an empirical point of view.

In general, it is common to think that intangible assets are formed through research and development activities. However, it is human to develop the technology of a company, and it is human to use new technology or advanced equipment. Therefore, training and educating human beings to utilize it as much as the technological development activities themselves require it, and creating an environment where they can work freely, it can be said that it contributes to increasing the enterprise value.

Especially among enterprises in modern society, the level of technology demanded by the workers is increasing gradually. At this point, it is necessary to provide technical education and training for workers of modern enterprises. If these successes go towards the formation of human assets through education & training enhancement within the enterprise, human capital will accumulate in the enterprise. This accumulation will increase labor profitability and productivity, and will eventually go towards an increase in enterprise value (Bassi & McMurrer, 1998). Former researches also discuss the importance of human capital formation through education & training. They argue that companies can grow in the long-term and stabilize through human assets created within the enterprise (Arrow 1962; Uzawa 1965; Romer 1986; and Lucas 1988; Lee and Choi 2019; Andon and Svetlozar 2020).

However, GAAP (Generally Accepted Accounting Principle) and accounting practices, which are generally accepted, do not recognize intangible assets of human resource expenses. Moreover, it is difficult to verify the causal relationship among human resource that would result in increased productivity and enterprise value, even if they are already formed. Generally, because education, training investments, welfare benefits, as well as R&D investments are uncertain (Hall 1993), even if successful, there may be a time lag in the actual application of educated skills and knowledge (Black

and Lynch 1996). It does not appear immediately in the year, but it appears with a time lag, over various periods of time (Lillard and Tan 1992). Many past studies suggest that investment in human resource leads to a rise in long-term enterprise value. If expenditure on human resource leads to a rise in enterprise value, current accounting standards and accounting practices, which treat investment costs for human resource as expenses, need to be changed. Accordingly, this study examined related literature under the assumption that human resource costs can affect value rather than simply cost. Many scholars have emphasized the importance of human resources, naming them human capital. Although costs related to human resources cannot be capitalized under the current accounting system, investment in human resources can be said to be very important.

2.2. Education and training

Companies are investing heavily in the education and training of their employees in order to strengthen corporate competitiveness and respond to rapidly changing industries. It can be said that investment in education and training is important to strengthen the capabilities of employees in order for companies to continuously grow and strengthen their competitiveness (Lee & Yang 2011). Companies that invest in employee training see a difference in their financial performance. Studies have shown that companies that spend more on training receive higher value than companies that consider training as a simple expenditure (Bassi & McMurrer, 1998). Additionally, investing in education and training can have a positive impact not only on individuals, but also on companies and the economy (Blundell et al. 1999).

Since the 2000s, new and disruptive technologies have been continuously appearing, and many technologies are emerging to the extent that they are now called the 4th Industrial Revolution. A company will be able to continuously demonstrate its competitiveness only when there are employees who continuously acquire these disruptive new technology and knowledge and strengthen their capabilities. From this point of view, it can be said that corporate investment in education and training is very important as a way to support employees to learn and utilize new technology and knowledge.

With the advent of these new technology and knowledge, the industrial structure is also changing. A new convergence industry is emerging. With the advent of such convergence industries, companies can collapse in an instant. In this way, a hyper-competitive environment has arrived in which competition is abnormal (D'aveni, 2010). It can be said that the ability of employees to respond to such an industrial environment is very important. It can be said that the ability to respond to changes in the industry as well as technology applies to all members of the organization, not just the management field.

2.3. Employee welfare benefit

A company's competitiveness can be said to be based on the competence, attitude, and creativity of its employees. A company must have a stable working environment in order to increase employees' competence, goal-oriented attitude, and creativity. Employee welfare can be said to be the sum of various welfare benefits and rewards that companies provide to their employees (Lee and Yang, 2011). In order for a company to have a competitive edge, it is important not only to strengthen the competence of employees related to work, but also to create an environment outside of work. From this point of view, it can be said that the promotion of welfare benefits for employees is important.

Employee welfare is shown as an expense in the accounting balance sheet, but it should not be considered simply as an expense, but should be considered as an investment to enhance the capabilities of employees. Investing in welfare benefits for companies creates a stable business environment so that employees can focus on their corporate goals (Lee and Yang, 2011).

In addition, a stable welfare environment enables excellent talent to continuously demonstrate their capabilities in the company. Education and training are linked to strengthening employees' competencies. In addition, the promotion of welfare benefits is also linked to the creativity and innovation of employees.

3. Hypothesis and Empirical Model

3.1. Research method and hypothesis

Ohlson (1995) is credited with providing the theoretical basis for empirical analysis of firm valuation in the field of accounting research. Ohlson (1995) developed the excess profit model into a sophisticated mathematical model, which brought about a major revolution in corporate valuation research. Since Ohlson (1995), many studies have conducted research on corporate valuation based on Ohlson (1995) corporate valuation model. But Burghstahler & Dichev (1997) and Zhang (2000) found that Ohlson (1995) firm valuation model has errors in reflecting the value relationship in the real world because Ohlson (1995) firm valuation model assumes a linear relationship between accounting information and enterprise value. It is argued that the error can be solved by assuming a nonlinear relationship.

So far, most of the previous studies that have analyzed the relationship between human resource expenses and enterprise value assume a linear relationship between human resource expense and enterprise value, but the research results have not shown consistent results in the form of the value relationship of human resource expenses. It may be because it is a nonlinear form rather than a linear form.

The same case can be found in studies on the valuation of donations. Previous studies analyzing the enterprise value relevance of donations showed inconsistent empirical analysis results, However, Choi et al. (2009) and Shin et al. (2011) present empirical evidence that it is because of the nonlinear relationship in the shape of an inverted U.

In this study, human resource expenses will bring about an increase in enterprise value through an increase in cash flow within the company up to a certain level. It is predicted that the increase in various expenses caused by the overspending of human resource expenses will become larger, resulting in a decrease in enterprise value.
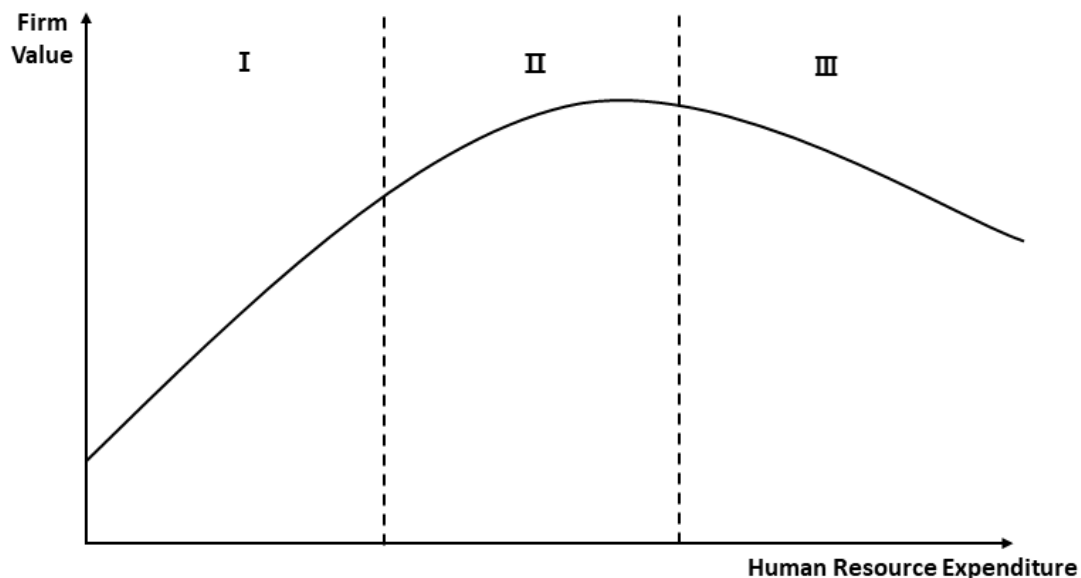

Fig. 1: Assuming a nonlinear relationship between human resource expenditure and enterprise value

Figure 1 shows the expected relationship between human resource expenses and enterprise value. If expenditure on human resource is low compared to the optimal scale (firms are located in zone I), then the relationship between human resource expenses and enterprise value for firms in zone I is a linear positive (+) which will indicate the relevance. On the other hand, when firms' human resource expenses are higher than optimal (firms are located in zone II), there will be no relationship between human resource costs and enterprise value. (Firms are located in zone Ⅲ), a linear negative (-)

relationship will appear. However, in reality, it is rare for companies to spend excessive human resource expenses beyond their capabilities. Therefore, in this study, if the relationship between human resource expenses and enterprise value is assumed to be linear, it is expected to show a positive (+) relationship, and if a nonlinear relationship is assumed, it is expected to appear in an inverted U-shape.

This study uses a modified version of Ohlson (1995) corporate valuation model to verify this concept. Ohlson (1995) corporate valuation model has been mathematically verified and is stable, and Choi et al. (2009) and Shin et al. (2011) apply the analysis method used in the study to verify the non-linear value relationship of human asset cost. Bassi and McMurrer (1998) found training investments improved financial performance, and Black and Lynch (1996) identified time lag in the actual application of educated skills and knowledge, in line with potential nonlinear impacts. Additionally, Choi et al. (2009) and Shin et al. (2011) also confirmed an inverted linear nonlinear relationship in a study of corporate donations. By combining these existing studies, the hypothesis of this study is presented.

The purpose of the study is to verify whether human resource expenses has a significant relationship with enterprise value in the Korean financial market over the period from 2000 to 2021, and to determine whether the relationship between human resource investment and enterprise value is linear or nonlinear. To this end, this study verifies the following 2 hypotheses.

Hypothesis 1: human resource expenses have significant value relevance in listed Korean financial markets.
Hypothesis 2: human resource expenses have a nonlinear relationship with enterprise value in listed Korean financial markets.

3.2. Empirical model

This study is primarily aimed at verifying whether human resource expenses information has value relevance in the pricing of capital markets or not. This study analyzes the enterprise value relevance of human resource expenses by studying its relationship with stock price using Ohlson (1995) enterprise valuation model developed as the main model. The study verifies whether the expenditure of human resource has a significant meaning as a determinant of enterprise value, or not. Further, this study uses the nonlinear relevance test method (Morck et al., 1988) to investigate whether the effect of human resource expenses on enterprise value is linear or nonlinear. To investigate the hypothesis of this study, this study uses the following empirical models.

$$\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIW_{i,t}}{S_{i,t}} + a_3 \frac{WEL_{i,t}}{S_{i,t}} + \varepsilon_{i,t} \quad (1)$$

$$\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIW_{i,t}}{S_{i,t}} + a_3 \frac{WEL_{i,t}}{S_{i,t}} + a_4 \left(\frac{WEL_{i,t}}{S_{i,t}}\right)^2 + \varepsilon_{i,t} \quad (2)$$

$$\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIT_{i,t}}{S_{i,t}} + a_3 \frac{TRE_{i,t}}{S_{i,t}} + \varepsilon_{i,t} \quad (3)$$

$$\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIT_{i,t}}{S_{i,t}} + a_3 \frac{TRE_{i,t}}{S_{i,t}} + a_4 \left(\frac{TRE_{i,t}}{S_{i,t}}\right)^2 + \varepsilon_{i,t} \quad (4)$$

$$\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NITW_{i,t}}{S_{i,t}} + a_3 \left(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}\right) + \varepsilon_{i,t} \quad (5)$$

$$\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NITW_{i,t}}{S_{i,t}} + a_3 \left(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}\right) + a_4 \left(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}\right)^2 + \varepsilon_{i,t} \quad (6)$$

Where, $MV_{i,t}$: $MV_{i,t}$: Stock price at the end of fiscal year t, where year t is the event year, $BV_{i,t-1}$: Book value of equity at the end of year t-1, $NI_{i,t}$: Accounting earnings in period t, $NIT_{i,t}$: Accounting

earnings in period t before deducting education & training expenses($TRE_{i,t}$), $NIW_{i,t}$: Accounting earnings in period t before deducting welfare expense($WEL_{i,t}$), $NITW_{i,t}$: Accounting earnings in period t before deducting education & training expenses($TRE_{i,t}$) and welfare expense($WEL_{i,t}$), $WEL_{i,t}$: Total amount of welfare expenses in the income statement and manufacturing costs statement for the period t, $TRE_{i,t}$: Total amount of education & training expenses in the income statement and manufacturing costs statement for the period t, $S_{i,t}$: Total sales in period t, $\varepsilon_{i,t}$: A normally distributed error term.

All the variables used in this study are standardized to total sales ($S_{i,t}$) to control heteroscedasticity.

4. Empirical Analysis

4.1. Sample selection

The empirical data used in the study are all taken from KIS-VALUE Database. Among the data so extracted, all of the following are excluded:

1) Samples not to be included in December end closing
2) Samples included in administrative issues in Korean financial markets
3) Samples included in capital encroachment companies
4) Samples without financial variable data required for empirical analysis

The reason why companies that did not settle accounts at the end of December are excluded is because the timing of settlement is different between companies that do not settle accounts at the end of December, making it difficult to compare empirical analysis results. Companies included in administrative issues and companies in capital encroachment are excluded because their financial status and management performance are not normal compared to general companies, so the analysis data contains many extreme values and is not normal, which may cause problems in comparability with general companies. In addition, corporate samples from which the data necessary for the empirical analysis of this study cannot be extracted are excluded for the validity of the empirical analysis. This paper controls extreme data by excluding samples for the absolute value of studentized residuals is more than 1 and which Cook's Distance is more than 0.5. Table 1 shows the extraction process of sample data used in the empirical analysis of this study.

Table 1: Selection procedure for companies included in the sample

Number of sample data collected from KIS-VALUE DATABASE at the end of 2000–2021 (firm-year)	59,334
Number of samples excluded (-):	-35,139
Samples not to be included in December end closing Samples included in administrative issues in Korean financial markets Samples included in capital encroachment companies Samples without financial variable data required for empirical analysis	
Number of total samples (firm-year)	24,195

4.2. Empirical analysis

4.2.1. Descriptive statistics

Table 2 presents the descriptive statistics of main variables used in this study. A total of 24,195 companies are included. Every variable is standardized by total sales. The minimum market value of equity ($\frac{MV_{i,t}}{S_{i,t}}$) is 0.00444, the maximum value is 278,400, the median is 20.20751, the minimum book value of equity ($\frac{BV_{i,t-1}}{S_{i,t}}$) is 0.00294 and the median is 3.96684. The minimum value of accounting earnings before deducting education & training expenses ($\frac{NIT_{i,t}}{S_{i,t}}$) is -3,532, the maximum value is 622.0532, and the median is -0.34596; the minimum value of accounting earnings before deducting welfare expense ($\frac{NIW_{i,t}}{S_{i,t}}$) is -3483, the maximum value of accounting earnings before deducting welfare and education & training expense ($\frac{NITW_{i,t}}{S_{i,t}}$) is 622.2963, the median value is -0.32146. The minimum

value of welfare expenses ($\frac{WEL_{i,t}}{S_{i,t}}$) is 0.0000129, the maximum value is 49.31392, and the median is 0.0245. The minimum value of education & training expenses ($\frac{TRE_{i,t}}{S_{i,t}}$) is 0.0000000302325, the maximum value is 19.08015, and the median is 0.00215. The maximum value of sum of welfare and education & training expenses ($\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$) is 59.85049, the median is 0.02665, and the standard deviation is 0.60146.

Table 2: Descriptive statistics

Number	Variable	Median	Standard Deviation	Minimum	Maximum
24,195	$\frac{MV_{i,t}}{S_{i,t}}$	20.20751	1,816	0.00444	278,400
	$\frac{BV_{i,t-1}}{S_{i,t}}$	3.96684	218.4853	0.00294	33,132
	$\frac{NIT_{i,t}}{S_{i,t}}$	-0.34596	27.17884	-3,532	622.0532
	$\frac{NIW_{i,t}}{S_{i,t}}$	-0.32362	26.79108	-3,483	622.2892
	$\frac{NITW_{i,t}}{S_{i,t}}$	-0.32146	26.74895	-3,483	622.2963
	$\frac{WEL_{i,t}}{S_{i,t}}$	0.0245	0.51563	0.0000129	49.31392
	$\frac{TRE_{i,t}}{S_{i,t}}$	0.00215	0.12711	0.0000000302325	19.08015
	$\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$	0.02665	0.60146	0.0000622	59.85049

Note: $MV_{i,t}$: $MV_{i,t}$: Stock price at the end of fiscal year t, where year t is the event year, $BV_{i,t-1}$: Book value of equity at the end of year t-1, $NI_{i,t}$: Accounting earnings in period t, $NIT_{i,t}$: Accounting earnings in period t before deducting education & training expenses($TRE_{i,t}$), $NIW_{i,t}$: Accounting earnings in period t before deducting welfare expense($WEL_{i,t}$), $NITW_{i,t}$: Accounting earnings in period t before deducting education & training expenses and welfare expenses, $WEL_{i,t}$: Total amount of welfare expenses in the income statement and manufacturing costs statement for the period t, $TRE_{i,t}$: Total amount of education & training expenses in the income statement and manufacturing costs statement for the period t, $S_{i,t}$: Total sales in period t.

4.2.2. Correlation analysis

Table 3 presents the Pearson correlation analysis of the variables used in the empirical tests. The market value of equity ($\frac{MV_{i,t}}{S_{i,t}}$) and the book value of equity ($\frac{BV_{i,t-1}}{S_{i,t}}$) show a significant negative correlation with the net income before the deduction of the education & training expenses ($\frac{NIT_{i,t}}{S_{i,t}}$), the net income before the deduction of the welfare benefits ($\frac{NIW_{i,t}}{S_{i,t}}$), and the net income before the deduction of the expenses of human resource ($\frac{NITW_{i,t}}{S_{i,t}}$). However, the market value of equity ($\frac{MV_{i,t}}{S_{i,t}}$) and the book value of equity ($\frac{BV_{i,t-1}}{S_{i,t}}$) show a positive correlation with the book value of equity ($\frac{BV_{i,t-1}}{S_{i,t}}$), welfare expenses ($\frac{WEL_{i,t}}{S_{i,t}}$), education & training expenses ($\frac{TRE_{i,t}}{S_{i,t}}$), and total expenses of human resource ($\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$) at 1% level of significance.

The net income before the deduction of education & training expenses ($\frac{NIT_{i,t}}{S_{i,t}}$) shows a statistically significant negative correlation at the 1% level with both, the welfare benefits ($\frac{NIW_{i,t}}{S_{i,t}}$) and education & training expenses ($\frac{NIT_{i,t}}{S_{i,t}}$). The net income before the deduction of the welfare benefits ($\frac{NIW_{i,t}}{S_{i,t}}$) and The net income before the deduction of the sum of welfare and education & training expenses ($\frac{NITW_{i,t}}{S_{i,t}}$) also show a statistically significant

negative correlation with the welfare benefits ($\frac{WEL_{i,t}}{S_{i,t}}$) and education & training expenses ($\frac{TRE_{i,t}}{S_{i,t}}$) at the 1% level.

Table 3. Pearson correlation

Variables	$\frac{MV_{i,t}}{S_{i,t}}$	$\frac{BV_{i,t-1}}{S_{i,t}}$	$\frac{NIT_{i,t}}{S_{i,t}}$	$\frac{NIW_{i,t}}{S_{i,t}}$	$\frac{NITW_{i,t}}{S_{i,t}}$	$\frac{WEL_{i,t}}{S_{i,t}}$	$\frac{TRE_{i,t}}{S_{i,t}}$	$\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$
$\frac{MV_{i,t}}{S_{i,t}}$	1	0.98139	-0.89201	-0.89151	-0.89247	0.71938	0.09247	0.63627
		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
$\frac{BV_{i,t-1}}{S_{i,t}}$	0.98139	1	-0.84831	-0.84726	-0.84798	0.72481	0.12955	0.64876
	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
$\frac{NIT_{i,t}}{S_{i,t}}$	-0.89201	-0.84831	1	0.99996	0.99994	-0.83661	-0.3357	0.78817
	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001
$\frac{NIW_{i,t}}{S_{i,t}}$	-0.89151	-0.84726	0.99996	1	0.99999	-0.83236	-0.3336	0.78408
	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001
$\frac{NITW_{i,t}}{S_{i,t}}$	-0.89247	-0.84798	0.99994	0.99999	1	-0.83078	-0.32937	0.78183
	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001
$\frac{WEL_{i,t}}{S_{i,t}}$	0.71938	0.72481	-0.83661	-0.83236	-0.83078	1	0.60816	0.98583
	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001
$\frac{TRE_{i,t}}{S_{i,t}}$	0.09247	0.12955	-0.3357	-0.3336	-0.32937	0.60816	1	0.73271
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001
$\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$	0.63627	0.64876	-0.78817	-0.78408	-0.78183	0.98583	0.73271	1
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

Variable Definitions: see Table 2, two-sided test.

4.2.3. Regression results on the enterprise value relevance of human resource expenses

Table 4 presents the regression results on the enterprise value relevance of human resource expenses and the results of verifying whether there is a nonlinear relationship between human resource expenses and enterprise value for total samples by using four empirical models, or not. The Adjusted R-square value which point out the rate at which independent variables account for dependent variables ranged from 0.5722 to 0.8993 across analysis models 1 to 6.

In analysis models 1, 3, and 5 the welfare expenses ($\frac{WEL_{i,t}}{S_{i,t}}$), education & training expenses ($\frac{TRE_{i,t}}{S_{i,t}}$), and total expenses of human resource ($\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$) show statistically significant positive coefficient at the 1% level. This implies that welfare ($\frac{WEL_{i,t}}{S_{i,t}}$), education & training expenses ($\frac{TRE_{i,t}}{S_{i,t}}$), and total expenses of human resource ($\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$) are the main value factors that increase enterprise value. In the analysis of the models 2, 4 and 6 that verify the nonlinear value relevance, the square of the welfare benefits ($(\frac{WEL_{i,t}}{S_{i,t}})^2$), the square of the education & training expenses ($(\frac{TRE_{i,t}}{S_{i,t}})^2$) and the square of total expenses of human resource ($(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})^2$) show a statistically significant negative value at the 1% level. These results imply that the value relevance form of welfare benefits, education & training expenses and total expenses of human resource represent an inverted U-shape. The analysis results in Table 4 indicate that investment in human resource below a certain level helps increase enterprise value, but excessive human resource expenses can rather decrease enterprise value.

The reason for this result is that human resource expenses up to a certain level increases corporate value by improving the company's technological level and know-how, but human asset investment exceeding certain limit increases investment inefficiency within the company, thereby increasing the company's corporate value. It is thought to reduce its value.

This result shows that the positive linear correlation of human resource investment with corporate value is consistent with Bassi and McMurrer (1998), and the inverted U-shaped pattern of correlation with corporate value is consistent with Black and Lynch (1996).

Table 4: Regression results on the enterprise value relevance of human resource investment

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	-3.6243***	-4.89836***	-1.36419***	-6.42119***	-3.76888***	-3.79575***
$\frac{BV_{i,t-1}}{S_{i,t}}$	2.46380***	3.87125***	2.73068***	3.73591***	2.40713***	2.37528***
$\frac{NIW_{i,t}}{S_{i,t}}$	-8.4259***	-14.87562***				
$\frac{NIT_{i,t}}{S_{i,t}}$			-9.85503***	-15.82227***		
$\frac{NITW_{i,t}}{S_{i,t}}$					-9.26391***	-9.37331***
$\frac{WEL_{i,t}}{S_{i,t}}$	176.56325***	-91.56839***				
$\frac{TRE_{i,t}}{S_{i,t}}$			398.20373***	768.50653***		
$\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$					192.42250***	185.26384***
$(\frac{WEL_{i,t}}{S_{i,t}})^2$		-60.76847***				
$(\frac{TRE_{i,t}}{S_{i,t}})^2$		-		-4,768.99975***		
$(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})$						-25.81778***
Industry Dummy	Included	Included	Included	Included	Included	Included
Year Dummy	Included	Included	Included	Included	Included	Included
F-Value	1,612.49***	3,499.78***	1,114.71***	7,184.57***	1,749.54***	1,599.87***
Adj R-Sq	0.6593	0.8129	0.5722	0.8993	0.6774	0.6651
Number of Samples After Deleting Outlier	24,154	24,158	24,151	24,138	24,152	24,153

1) Variable Definition: see Table 2,

2) Model 1: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIW_{i,t}}{S_{i,t}} + a_3 \frac{WEL_{i,t}}{S_{i,t}} + \varepsilon_{i,t}$, 3) Model 2: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIW_{i,t}}{S_{i,t}} + a_3 \frac{WEL_{i,t}}{S_{i,t}} + a_4 \left(\frac{WEL_{i,t}}{S_{i,t}}\right)^2 + \varepsilon_{i,t}$,

4) Model 3: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIT_{i,t}}{S_{i,t}} + a_3 \frac{TRE_{i,t}}{S_{i,t}} + \varepsilon_{i,t}$, 5) Model 4: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIT_{i,t}}{S_{i,t}} + a_3 \frac{TRE_{i,t}}{S_{i,t}} + a_4 \left(\frac{TRE_{i,t}}{S_{i,t}}\right)^2 + \varepsilon_{i,t}$,

6) Model 5: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NITW_{i,t}}{S_{i,t}} + a_3 (\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}) + \varepsilon_{i,t}$,

7) Model 6: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NITW_{i,t}}{S_{i,t}} + a_3 \left(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}\right) + a_4 (\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})^2 + \varepsilon_{i,t}$

10) The number of sample data used in this analysis is calculated by excluding samples that have an absolute value of studentized residuals greater than 1and a Cook's Distance of greater than 0.5.
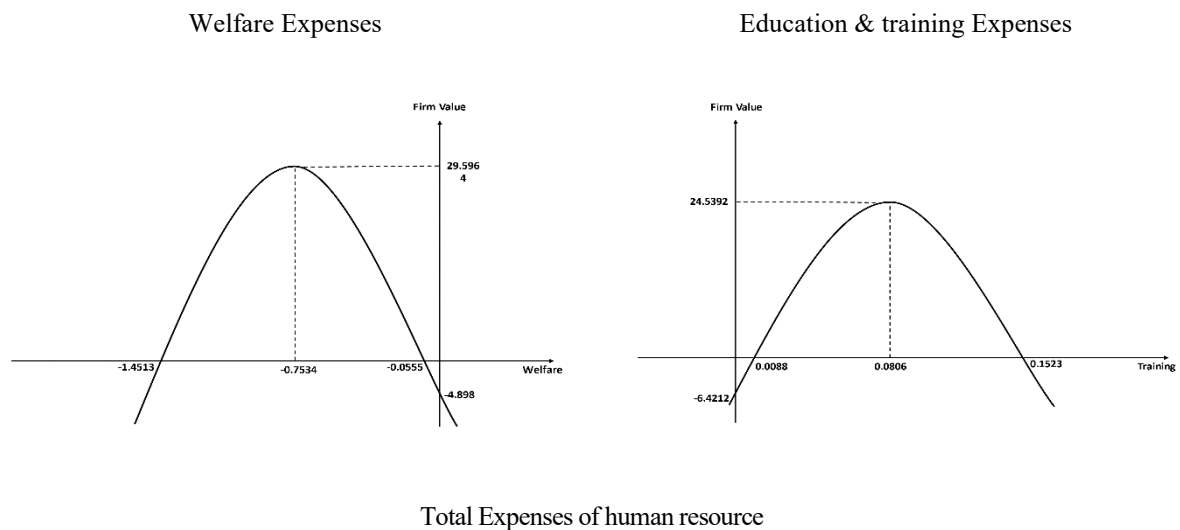
11) *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Figure 2 shows the form of enterprise value relevance of human resource expenses (welfare

expenses, education & training expenses, and total expenses of human resource) based on the coefficients found in the analysis results of Models 2, 4, and 6 in Table 4. The left-hand section of the X-axis is where the welfare and education & training expenses are negative (-), and it is a section that does not exist in reality. On the contrary, the right-hand section of the X-axis exists in the real world because it is a section in which the welfare and education & training expenses are positive (+).

Figure 2 presents that the enterprise value relevance of welfare benefits, education & training expenses and total expenses of human resource are an inverted U-shaped in the entire left and right sections of the X-axis. In the positive (+) sectors in reality, both education & training expenses and total expenses of human resource show an inverted U-shaped nonlinear value relationship with respect to the increase in enterprise value. However, Figure 2 also shows that welfare benefits are also an inverted U-shaped in the entire left sections (-) of the X-axis.

As shown in Figure 2, the welfare expenses, education & training expenses and the total expenses of human resource go towards an increase in enterprise value up to a certain threshold, but rather a decrease in enterprise value when it exceeds a certain threshold. In addition, Figure 2 shows that in the case of welfare benefits, the relationship between enterprise values in the form of an inverted U is theoretically shown, but in reality, as expenses increase, enterprise value decreases.
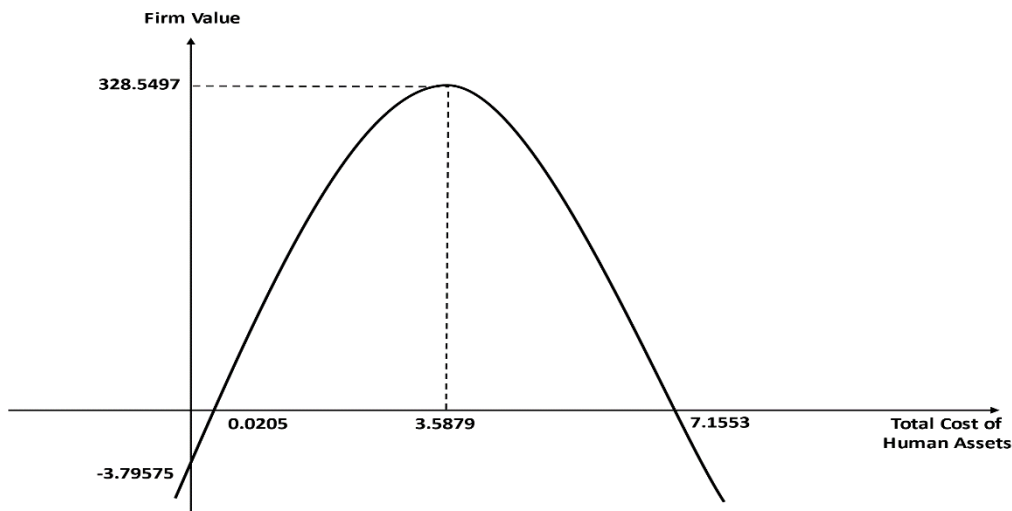

Welfare Expenses

Education & training Expenses

Total Expenses of human resource

Fig. 2: Graphs on enterprise value relevance of welfare expenses, education & training expenses, and total expenses of human resource: Total samples

4.2.4. Regression results on the enterprise value relevance of human resource expenses: KOSPI vs. KOSDAQ

Table 5 shows the results of analyzing the enterprise value relevance and form of human resource expenses by dividing the sample firm into companies affiliated to KOSPI (Korea Composite Stock Price Index) and companies affiliated to KOSDAQ (Korea Securities Dealers Automated Quotation). The adjusted R-Square value, which indicates the explanatory power of independent variables, is between 0.8210 and 0.9220 for the KOSPI sample and between 0.6414 and 0.9311 for the KOSDAQ sample.

The analysis results of research models 1, 3, and 5 show that the variables of welfare expenses $(\frac{WEL_{i,t}}{S_{i,t}})$, education & training expenses $(\frac{TRE_{i,t}}{S_{i,t}})$, and total expenses of human resource $(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})$ are statistically significant positive (+) value at the level of 1%. In the analysis of research models 2, 4, and 6 that verify the nonlinear value relevance, the results on the variables of welfare expenses $(\frac{WEL_{i,t}}{S_{i,t}})$, education & training expenses $(\frac{TRE_{i,t}}{S_{i,t}})$, and total expenses of human resource $(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})$ are different.

In the analysis of the KOSDAQ group, the square of education & training expenses $((\frac{TRE_{i,t}}{S_{i,t}})^2)$ shows statistically significant negative (-) values at the level of 1%, but the square of welfare expenses $((\frac{WEL_{i,t}}{S_{i,t}})^2)$ and the square of the total expenses of human resource $((\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})^2)$ show statistically significant positive (+) values at the level of 1%. In the analysis of the KOSPI group, the square of the total expenses of human resource $((\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})^2)$ and education & training expenses $((\frac{TRE_{i,t}}{S_{i,t}})^2)$ statistically show a significant negative (-) value at the 1% level, but the square of the square of the welfare expenses $((\frac{WEL_{i,t}}{S_{i,t}})^2)$ shows a statistically insignificant positive (+) value.

This result shown in Table 5 suggests that in the KOSPI group, the form related to the enterprise value of education & training expenses and total expenses of human resource has an inverted U-shape, but the value relevance form of welfare expenses is not nonlinear. In addition, this result shows that the enterprise value-related form of and education & training expenses in the KOSDAQ group is in an inverted U-shape, whereas the enterprise value-related form of the welfare benefits and the total

expenses of human resource show a U-shape.

The analysis results in Table 5 show that companies belonging to the KOSPI market increase enterprise value as they invest in welfare benefits, whereas investments in education & training costs and human resource increase enterprise value up to a certain level, but the investment exceeds a certain level. This means that doing so can reduce the value of the company. In addition, in the case of companies belonging to the KOSDAQ market, investment in welfare benefits and the total expenses of human resource do not have the effect of increasing enterprise value up to a certain level, but investing beyond a certain level can bring about an increase in enterprise value, while the education & training costs shows the opposite trend.

The reason for this result is that normal human resource costs up to a certain level increase corporate value by improving the company's technology level and know-how, but human resource costs exceeding a certain limit increase inefficiency in human resource costs within the company. This is thought to reduce corporate value.

This result shows that the positive linear correlation of human resource costs with corporate value is consistent with Bassi and McMurrer (1998), and the inverted U-shaped pattern of correlation with corporate value is consistent with Black & Lynch (1996).

Table 5: Regression results on the enterprise value relevance of human resource expenditure: KOSPI vs. KOSDAQ

Variables	KOSPI firms						KOSDAQ firms					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	-0.32327***	0.50499***	0.15971	0.66961**	0.02819	0.45410**	-6.39077***	-4.45901**	-9.46132**	-7.95788***	-11.43540***	-4.71834***
$\frac{BV_{i,t-1}}{S_{i,t}}$	1.06339***	0.93211***	0.95666***	0.91970***	0.95366***	0.93049**	4.38525***	3.93817**	5.43738**	5.19073***	6.33301***	4.42955***
$\frac{NIW_{i,t}}{S_{i,t}}$	0.02295***	0.06270***					-4.34534***	-4.25844**				
$\frac{NIT_{i,t}}{S_{i,t}}$			-0.02684	0.06657**					-9.60004**	-12.77496***		
$\frac{NITW_{i,t}}{S_{i,t}}$					0.95366	0.06208**					-5.54115***	-3.72705***
$\frac{WEL_{i,t}}{S_{i,t}}$	49.6864***	22.31872***					156.86261***	119.66513***				
$\frac{TRE_{i,t}}{S_{i,t}}$			529.81015***	163.56445***					1543.52863***	581.58972***		
$\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}$					51.50569***	25.36738***					59.42462***	57.96894***
$(\frac{WEL_{i,t}}{S_{i,t}})^2$		15.18615						258.55498***				
$(\frac{TRE_{i,t}}{S_{i,t}})^2$				-746.48352***						-4229.01814***		
$(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})^2$						-9.15214						328.48579***
Industry Dummy	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Year Dummy	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
F-Value	2,502.58	1,596.03	4165.44	1,528.01	1552.95	1,600.62	1816.01	830.45	4284.96	6,271.95	4010.10	1,193.08

Adj R-Sq	0.8765	0.8240	0.9220	0.8370	0.8210	0.8244	0.7907	0.6414	0.8992	0.9311	0.8929	0.7199
Number of Samples After Deleting Outlier	10,219	10,220	10,219	10,221	10,218	10,220	13,932	13,914	13,934	13,927	13,941	13,916

1) Variable Definition: see Table 2,

2) Model 1: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIW_{i,t}}{S_{i,t}} + a_3 \frac{WEL_{i,t}}{S_{i,t}} + \varepsilon_{i,t}$, 3) Model 2: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIW_{i,t}}{S_{i,t}} + a_3 \frac{WEL_{i,t}}{S_{i,t}} + a_4 \left(\frac{WEL_{i,t}}{S_{i,t}}\right)^2 + \varepsilon_{i,t}$,

4) Model 3: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIT_{i,t}}{S_{i,t}} + a_3 \frac{TRE_{i,t}}{S_{i,t}} + \varepsilon_{i,t}$, 5) Model 4: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NIT_{i,t}}{S_{i,t}} + a_3 \frac{TRE_{i,t}}{S_{i,t}} + a_4 \left(\frac{TRE_{i,t}}{S_{i,t}}\right)^2 + \varepsilon_{i,t}$,

6) Model 5: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NITW_{i,t}}{S_{i,t}} + a_3 \left(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}\right) + \varepsilon_{i,t}$,

7) Model 6: $\frac{MV_{i,t}}{S_{i,t}} = a_0 + a_1 \frac{BV_{i,t-1}}{S_{i,t}} + a_2 \frac{NITW_{i,t}}{S_{i,t}} + a_3 \left(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}\right) + a_4 \left(\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}}\right)^2 + \varepsilon_{i,t}$

10) The number of sample data used in this analysis is calculated by excluding samples that have an absolute value of studentized residuals greater than 1 and a Cook's Distance of greater than 0.5.

11) *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Figure 3 shows the relationship between welfare expenses and enterprise value based on research model 2. The left part of the X axis is the part where the welfare cost is negative (-), and this part does not actually exist. On the contrary, the right part of the X-axis is a section that actually exists as a part with positive (+) welfare benefits. As shown in Figure 3, in the X-axis section, the shape of the relevance of welfare benefits to the enterprise value is U-shaped for KOSDAQ group. However, in the positive (+) section of the X-axis that actually exists, the relevance of the enterprise value of welfare expenses in the KOSDAQ group increases the enterprise value. In the KOSPI market, a nonlinear graph cannot be displayed because the coefficient value of the square of welfare expenses $\left(\left(\frac{WEL_{i,t}}{S_{i,t}}\right)^2\right)$ is not statistically significant. Therefore, in KOSPI-affiliated companies, the form of enterprise value relatedness of welfare benefits can be said to be linear, not nonlinear. However, Figure 3 shows that in the area where actual expenses are spent on both the KOSPI and KOSDAQ, the more welfare expenses are spent, the higher the enterprise value.
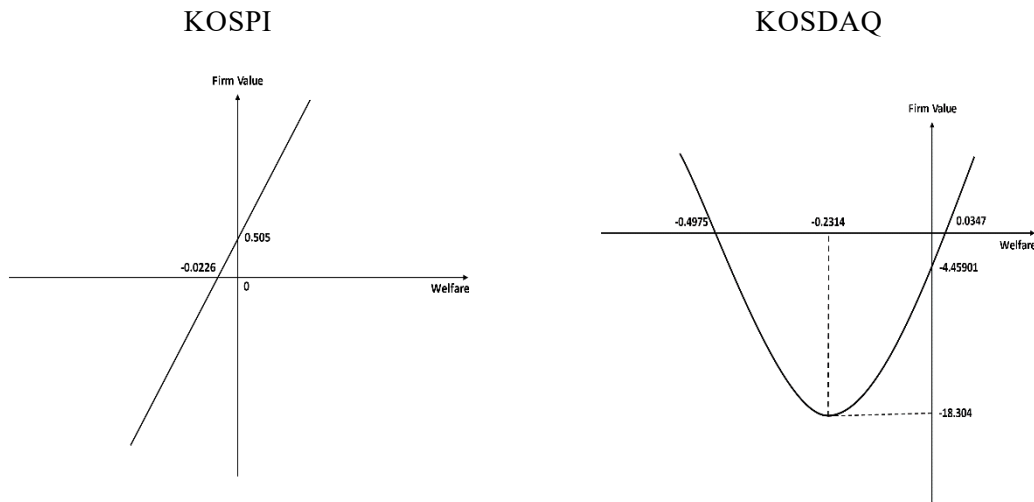
KOSPI   KOSDAQ

Fig. 3: Graphs on enterprise value relevance of welfare expenditure: KOSPI vs. KOSDAQ

Figure 4 shows the shape of the enterprise value relevance of education & training costs based on the coefficient values obtained from the analysis of model 4.

Figure 4 shows the type of relevance to the enterprise value of education & training costs is U-shaped in both the KOSDAQ and KOSPI corporate groups. In the positive (+) sector that actually exists, both the KOSDAQ and KOSPI groups show an inverted U-shaped value relationship. This means that

for both KOSPI and KOSDAQ companies, education & training expenses up to a certain level increase enterprise value, but education & training expenses exceeding a certain level bring about a decrease in enterprise value.
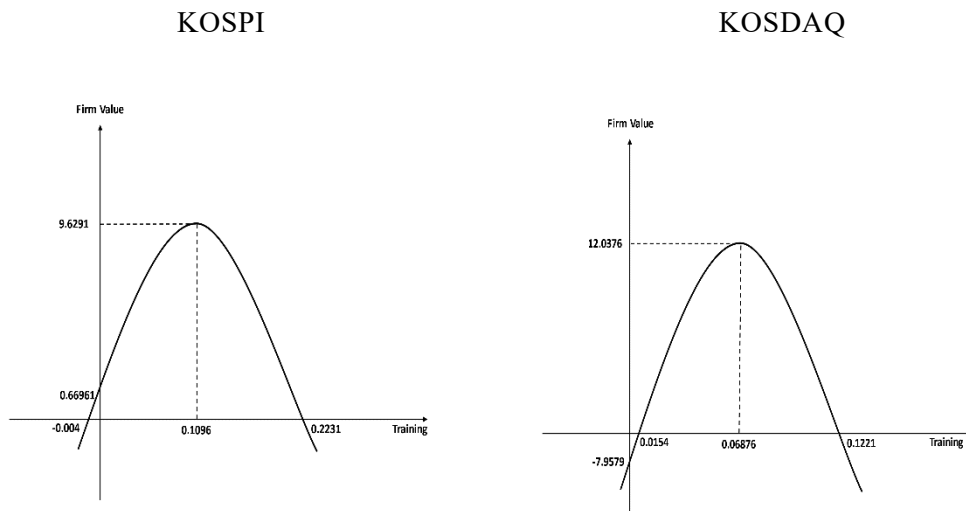
KOSPI

KOSDAQ

Fig. 4: Graphs on enterprise value relevance of education & training costs: KOSPI vs. KOSDAQ

Figure 5 shows the relationship between the total costs of human resource and the enterprise value based on the coefficient value obtained from the analysis result of research model 6. Figure 5 shows that the relationship between total expenses of human resource $((\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})^2)$ and enterprise value in KOSDAQ-affiliated companies is U-shaped. On the other hand, companies belonging to the KOSPI show a linear rather than nonlinear form of value relationship. However, in the actual realm of total expenses of human resource $((\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})^2)$, both the KOSPI and KOSDAQ companies show that as the total expenses of human resource increases, the enterprise value also increases. This means that as investment in total expenses of human resource $((\frac{TRE_{i,t}+WEL_{i,t}}{S_{i,t}})^2)$ increases in both KOSPI and KOSDAQ companies, enterprise value also rises.
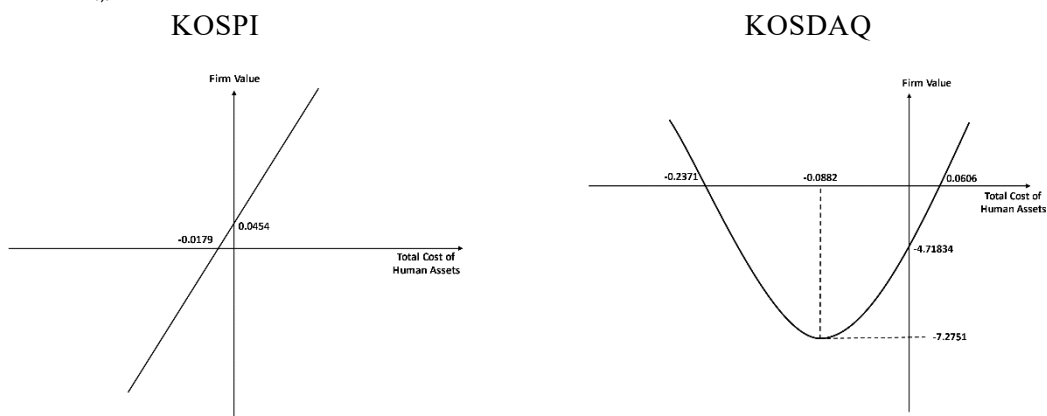
KOSPI

KOSDAQ

Fig. 5: Graphs on enterprise value relevance of total costs of human resource: KOSDAQ

5. Conclusions

This study examines the impact of human resource expenses, such as welfare expenses, education & training expenses, and total expenses of human resource, on the enterprise value of companies listed on the Korean financial markets from 2000 to 2021. The relationship between these three factors and enterprise value are examined according to subgroups classified as corporate characteristics by dividing

them into welfare expenses, education & training expenses, and total expenses of human resource.

The empirical results of this study show that education & training expenses, welfare expenses, and total expenses of human resource have a statistically significant effect on the increase in enterprise value. These results support the hypothesis 1 of the study (human resource expenses have significant value relevance in listed Korean financial markets). This suggests that human resource expenses, such as education & training expenses and welfare benefits, are not simple cost factors, but can be asset factors capable of generating future cash flows.

All the proxy variables for verifying the nonlinear form of human resource expenses show significant negative (-) coefficient values at the 1% level. These results provide empirical evidence that human resource expenses have an inverted U-shaped relationship with enterprise value in Korea's capital market. The empirical evidence shows that in Korea's capital market, when human resource expenses is at a lower level than the optimal level, the relationship between human resource expenses and enterprise value is positive (+). It also shows that there is an insignificant relationship between human resource expenses and enterprise value, and a negative (-) relationship appears in areas where human resource expenses is extremely high. The results support the hypothesis 2 of the study (human resource expenses has a nonlinear relationship with enterprise value in listed Korean financial markets).

The results imply that human resource expenses up to a certain limit can increase enterprise value by providing positive cash flows within the company, whereas excessive human resource expenses above a certain limit can rather decrease enterprise value. In other words, a company's excessive human resource expenses may result in actual losses due to excessive costs associated with the company's future cash flow increase, which may adversely affect the company's value as a result.

As such, the study is expected to provide a new logic and perspective on the relationship between human resource expenses and enterprise value by verifying the nonlinear value relationship of human resource expenses, which has rarely been attempted in prior studies. The study can be used to determine whether human resource expenses are just a cost factor or an asset that can generate long-term cash flow in the future. In addition, this can be said to suggest that future studies on the relationship between human resource-related expenses and enterprise value should not only be conducted under the assumption of linearity, but also nonlinearity. The findings contribute uniquely to the accounting literature by documenting potential non-linear impacts of human resource expenses.

However, this study has limitations in measuring substitution variables of human resource expenses. In this study, education & training expenses and welfare benefits expenses were used as substitute variables for human resource expenses. In future research, it is necessary to study the field using various measurement tools such as education and training participation rates and education & training hours. Moreover, further research should investigate these dynamics across diverse economic contexts.

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