

# How Does Labor Union Affects Domestic Education?

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## ABSTRACT

This work discusses about the effect of labor unions in education. In this work, the correlation between the labor unions and education quality is demonstrated by examining union density and PISA grades of European Union members through the linear regression model. A turning point changed the correlation of the two variables was found in this study. Over the turning point, the linear model shows a strong positive correlation between union density and PISA grades. Furthermore, this work shows the significance of the labor unions in domestic issues of education. This work speculates that the identity of former Warsaw Pact members, such as Czech Republic and Slovak, contributes to the different correlation on each side of the diagram. Further study can research on this speculation and attempt to prove that.

**Keywords:** Labor Unions, Education, European Union

## 1.INTRODUCTION

Education and labor rights are the hot spots in global social debate since the millennium. 2 of the 17 Sustainable Development Goals (United Nations [UN], n.d.) raised by the UN, Quality Education, Decent Work, and Economic Growth essentially consist of them. A recent education reform movement about charter schools in the United States attracted people's sights to education options. (Forbes, 2021), As education becomes more important in modern society, an increasing number of social groups, such as the American Federation for Children, are seeking a fairer education environment, which is like the goal of labor unions, who appeal to a fairer environment of the living standard of labor. Thus, in this study, this work assumed that the children's educational level of chosen EU member states shows a positive correlation with the participation rate of labor unions. The data was collected from OECD.org, which includes the PISA scores (mathematics, reading, and science), compensation of employees, average wages, and distribution. This work measured the correlation between the labor unions' density and education quality by using regression models. The compensation of employees and average wages for this study was introduced to diminish the error of the model, because we assumed that compensation of employees and

average wages could verify the available effect of labor union. This work found a strong positive correlation between union density and PISA grades when the union density is over 33.00 of whole. In the literature review this work briefly discussed the past and recent studies about unions and education, which assist us to determine the direction of study and conclude the guess of result. In methodology this work introduced the linear regression model and the statistic digits gained from the model. In conclusion this work summarized the findings and indicated the weaknesses of this study, also there are some interesting topics generated from this finding for the further studies in the field of education and unions.

## 2.LITERATURE REVIEW

A good amount of past economic studies focused on labor rights in labor unions. Some studies showed the influence of unions to achieve social optimum. A social influence of the labor unions was found by Edward L. Bernays, who studies on influences of propaganda in decision making. He stated the labor union protects the rights of both the employers or the employees, enhances the living standard, and motivates the market positively. [1]However, most of the studies in the late twentieth century paid too much attention to revealing the effect of labor unions on business, such as Hirsch and Addison's study examining union's effect on firm's profit

in the 1980s. (1986) In recent years, more studies have noticed the effect of unions on education, for example, a report about the connection between labor unions and the education of labor points out the British union’s effort in educating workers and affecting the U.K. government to promote adult education; [11] A study indicates unions conducted educational programs every year, and about over 100,000 Canadian workers were involved in the program in Canada; [7] Tom Nesbit completed a study of labor education in Canada, his studies discussed sufficiently the adult education provided by Canadian labor unions. [4] Another report about the unions’ effort to children's education, published in the Worker’s Daily of China, shows the aids provided from unions to children who lived below the poverty line helped those children to pay the tuition in the schools. [10] Although many studies demonstrate the effect of the unions on education, few studies research the relationship between the labor unions and children’s education.

**3.METHODOLOGY**

Once this work investigated the correlation between Labor Union and Educational Factors, this work sought an explanatory module, which will reveal a relationship between the explanatory variable, Union Density, and explained variable, Educational Factor.

**3.1.Data & Materials**

To minimize selection bias, this work collected and organized data from OECD.org, a global organization that provides statistics eliminating the biases, that considering the information transparency and data integrity, as well as the political, geographical, and demographic similarities. Eventually, the states in EU are relatively fair on these criterions was found due

to policies and regulations of EU. This work examined 15 members of the EU countries, excluding the nations fairly provide little data. Those countries are Austria, Belgium, Czech Republic, Denmark, Germany, Estonia, Finland, Ireland, Italy, Latvia, Luxembourg, Netherlands, Slovak, Spain, and Sweden. This work set the PISA test (Program of International Student Assessment) as the indicator of the quality of domestic education, considered that the PISA test, which is held by OECD each 3 years in order to evaluate 15-year-old students’ capability in mathematics, reading and sciences. In order to measure students’ academic ability comprehensively, this work used average scores as the dependent variable. The UD (union density) in percentage was the independent variable. The UD quantified how popular labor union is in each state. -- was the independent variable. Because the PISA grades were uploaded once every three years, all of the data was measured triennially, started from 2003 to 2018, about 6 observations of years for each country.

**3.2.Data Analysis**

This work used Microsoft Office Excel as the major data analytic tool, for the accessibility and universality of it. Therefore, the data processing, including regression and correlation analysis, are all done in Excel.

**3.2.1.Initial Analysis**

To demonstrate the assumption, the correlation between UD (Union Density) and PISA Avg. (Average PISA Score) can be described as the following formula:

$$avg.PISA = \beta_0 + \beta_1UD + \epsilon$$

The result of regression is revealed in Table 1 and Fig 1:

**Table 1.** Summary of Regression for UD to avg.PISA

	Coefficient	Standard Err.	P-Value
Intercept	462.743923816241	10.37760865552	4.52120171E-31
UD (%)	0.72142460767153	0.178117940807	0.000291651832

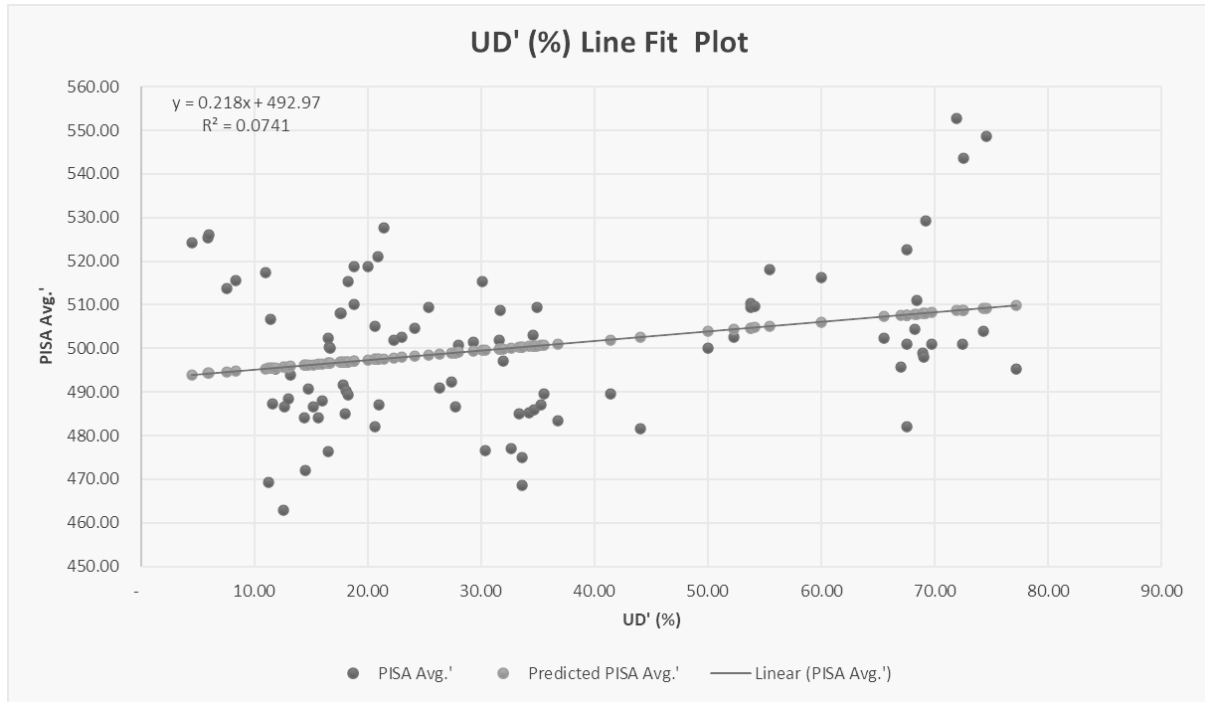


Fig 1. Line Fit Plots of Regression

As shown in Table 1, the *p-value* denotes the statistical significance of the result, and the positive coefficient denotes that *UD* (Union Density in percentage) and *PISA Avg.* (average PISA score), as expected, has a positive correlation, yet is relatively weak based on Figure 1. The low intensity of correlation indicates the necessity of introducing new variables if it tends to stick with the original topic.

### 3.2.2. Diagram of Scatter Points

Addressing unsatisfying results from the initial analysis, this work tended to figure out the reason for outliers. Thus, a scatter points diagram was generated following.

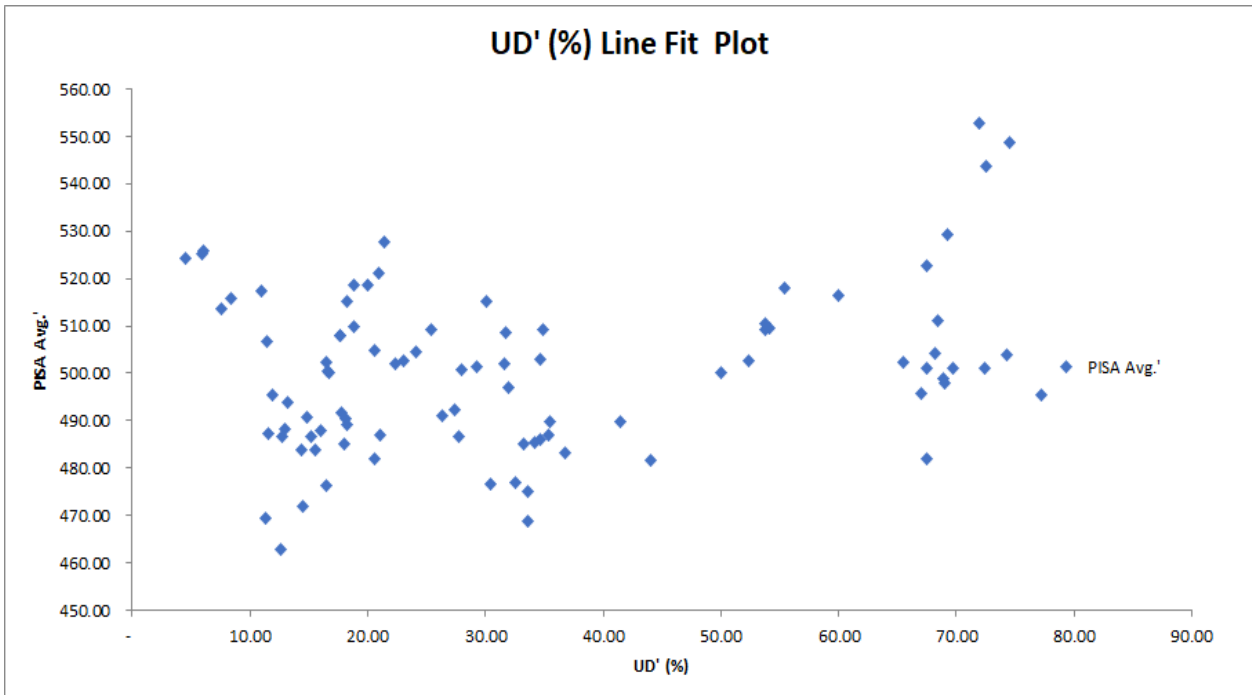


Fig 2. Scatter Diagram of The Sample

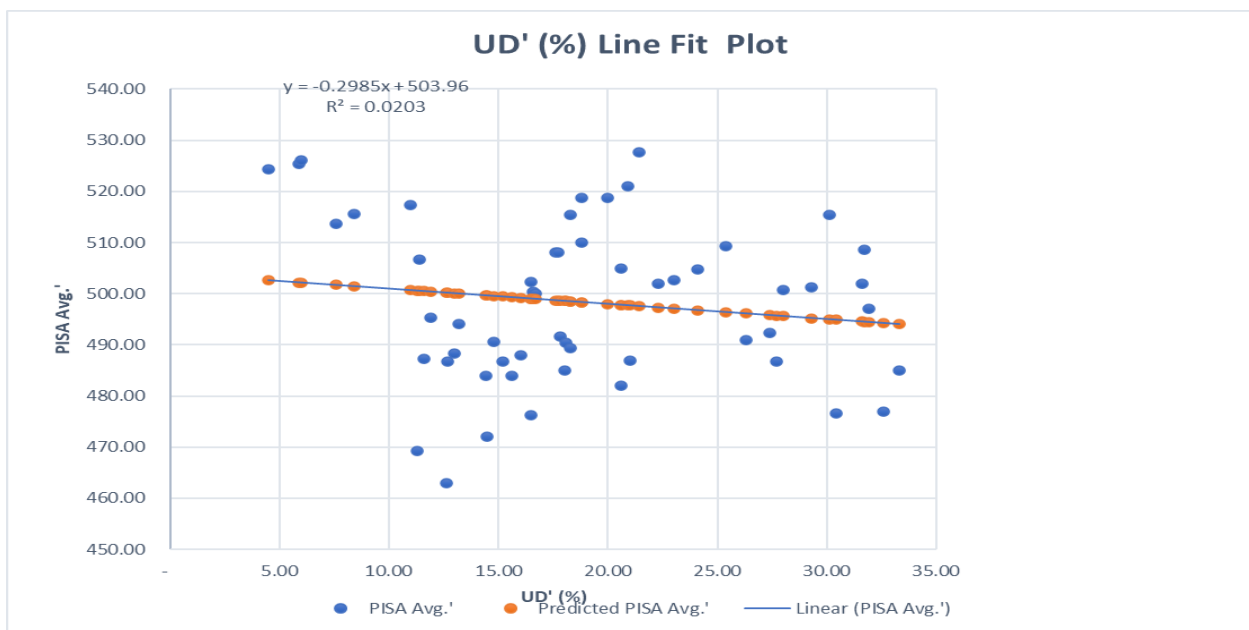
The distribution of the points in Figure 2 does not significantly show a trend of the linear relationship. Besides, obvious gatherings appear on both sides of the diagram. Thus, this work separated the diagram since the average of the independent variable, 0.33, into two areas, from 0.00 to around 0.33, and from around 0.33 to 1. After, the diagram shows a distinct linear relationship on the right-hand side of the newly separated area.

### 3.2.3. Further Analysis

To visualize the turning point of  $UD \sim 33$ , this work ran regressions on  $UD|0 < UD < 33$  and on  $UD|33 < UD < 100$ , the result shows in Table 2, Fig 3, and Table 3, Fig 4.

**Table 2.** Summary of Regression for  $UD|0 < UD < 33$  to  $avg.PISA$

	Coefficient	Standard Err.	P-Value
Intercept	503.963866269485	5.78308844806697	6.60360108E-59
$UD$ (%)	-0.2984718161193	0.28476463533280	0.299332705772



**Fig 3.** Line Fit Plots of Regression for  $UD|0 < UD < 33$  to  $avg.PISA$

The  $p$ -value is over 0.05, which infers that the result is statistically insignificant, also there is no correlation between  $UD$  and  $avg.PISA$  (see Table 2 & Fig 3).

**Table 3.** Summary of Regression for  $UD|33 < UD < 100$  to  $avg.PISA$

	Coefficient	Standard Err.	P-Value
Intercept	462.743923816241	10.37760865552	4.52120171E-31
$UD$ (%)	0.72142460767153	0.178117940807	0.000291651832

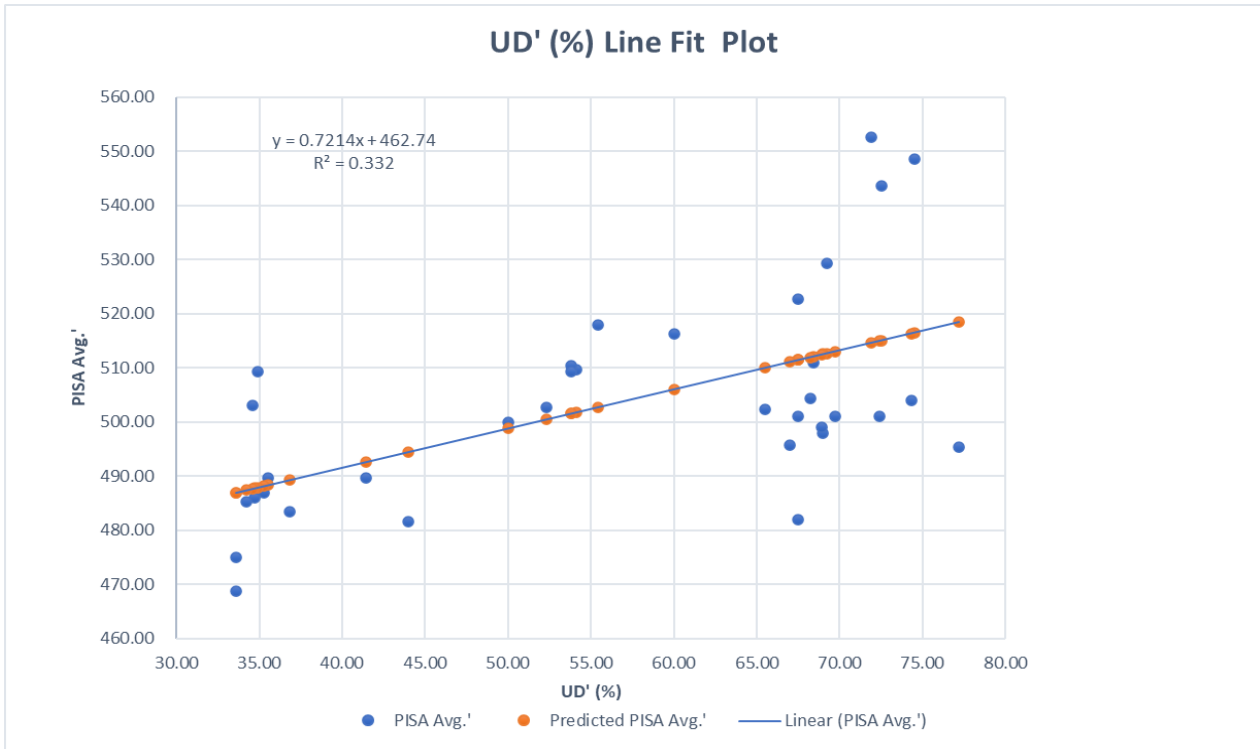


Fig 4. Line Fit Plots of Regression for  $UD|33 < UD < 100$  to  $avg.PISA$

Differ from the result of previous regression which is when  $UD$  is less than 33%, the result of regression, as shown in Table 3 and Figure 4, when  $UD$  is more than 33% contains a higher Multiple  $R = 0.58$ . This illustrates a relatively stronger, positive correlation between  $UD$  and  $avg.PISA$  when  $UD > 33$ .

### 3.3. Verify the turning point: $UD \sim 33$

Depending on previous results, this work assumed there is a turning point that splits the regression model into 2 parts, and its value approximately is  $UD = 33$ . In order to eliminate the contingency and enhance the reliability of such a turning point, this work analyzed the effect of turning point on variables correlated to  $UD$  ( $PISA Avg.$  excluded), as shown in the following Table 4.

Table 4. Result Correlation Analysis

	$UD (%)$	$avg. W$	$comp.$
$UD (%)$	1		
$avg. W$	0.453554	1	
$comp.$	0.397021	0.334305	1

To testify the turning point of  $UD \sim 33$  is not a coincidence, this work introduced several variables correlated with  $UD$ : average wages converted in US Dollar ( $avg.W$ ), compensation of employees by activity ( $comp.$ ). This work will run regression analyses on total,  $UD|0 < UD < 33$  to  $avg.W$  and  $comp.$ ,  $UD|33 < UD < 100$  to  $avg.W$  and  $comp.$

3.3.1. Turning point on UD to avg.W

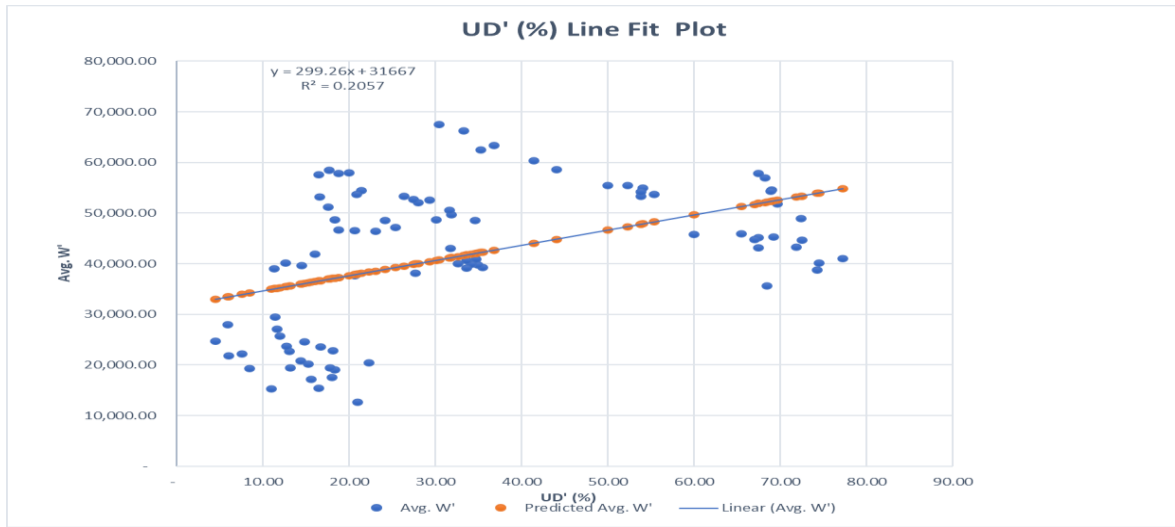


Fig 5. Line Fit Plot when  $UD|0 < UD < 100$

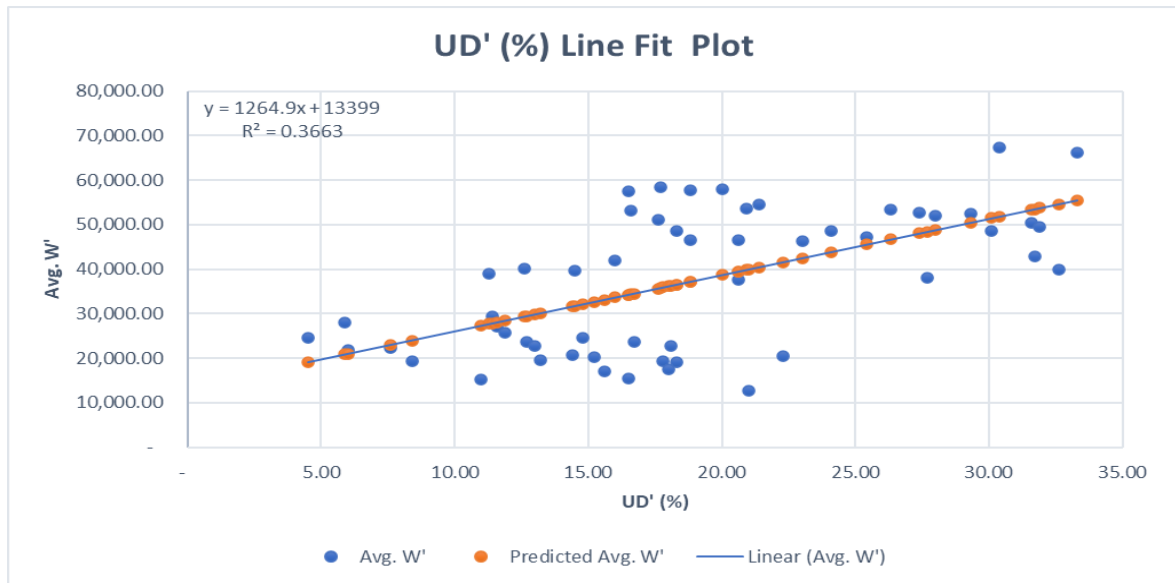


Fig 6. Line Fit Plot when  $UD|0 < UD < 33$

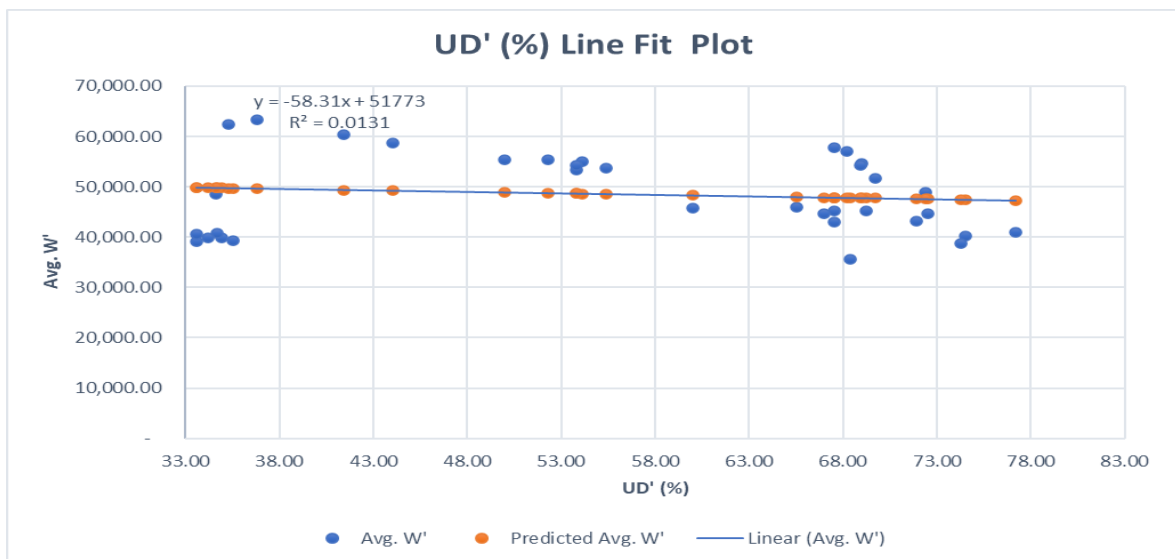


Fig 7. Line Fit Plot when  $UD|33 < UD < 100$

As Figure 5-7 revealed, there is a positive correlation between independent variable *UD* and dependent variable *PISA.avg*, when the value of *UD* is less than 33, non-surprisingly, there is no correlation between them when the value of *UD* is over 33. Hence the value range of independent variable *UD* has a decisive effect on the

correlation between *UD* and *avg.W*. Therefore, the turning point of *UD*~33 is valid in this case.

3.3.2. Turning point on *UD* to comp.

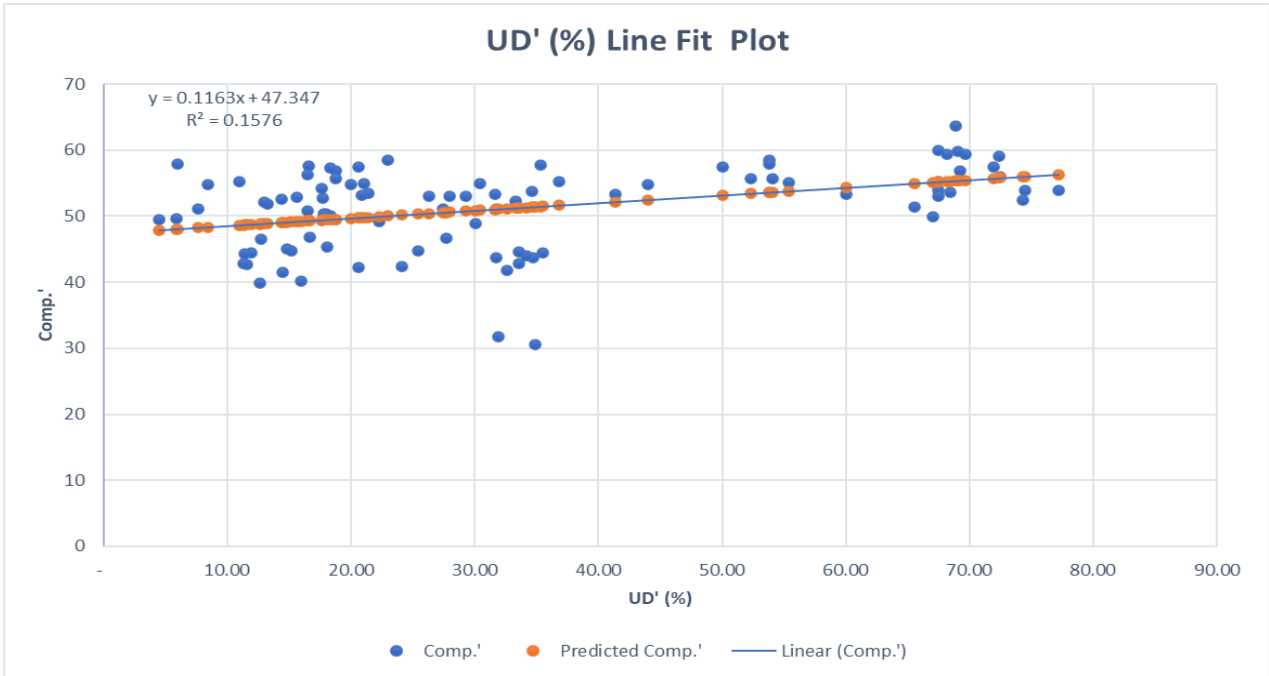


Fig 8. Line Fit Plot when  $UD|0 < UD < 100$

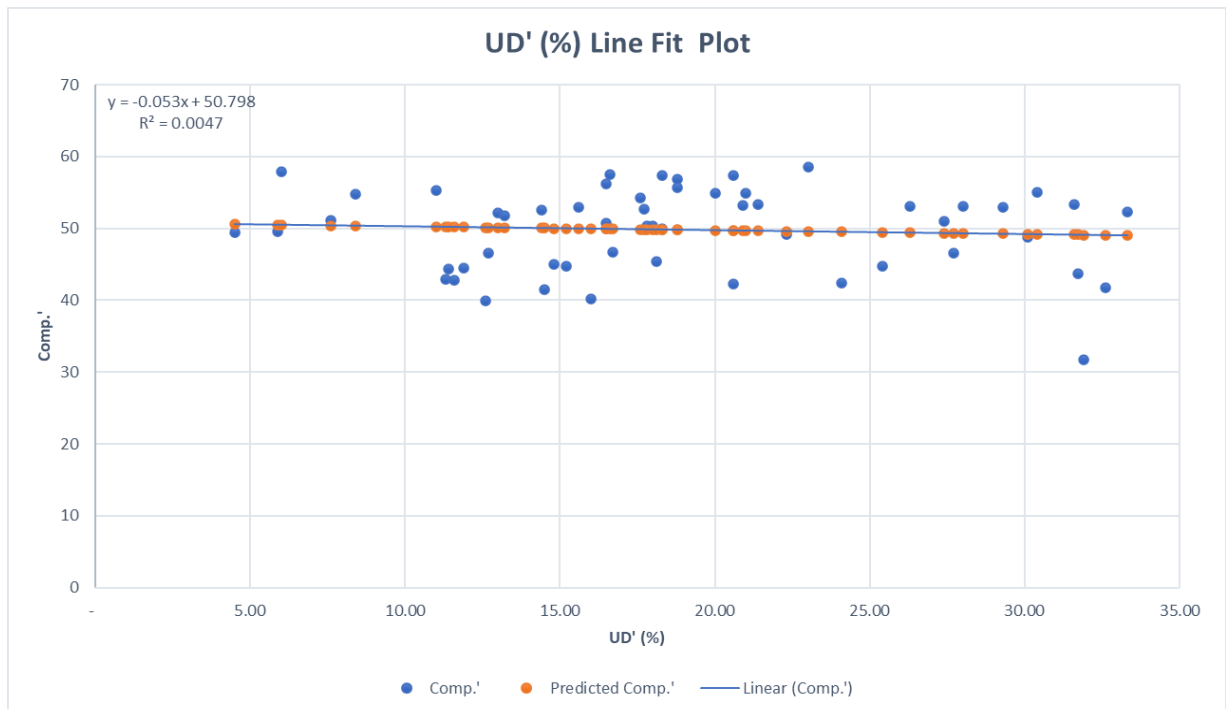


Fig 9. Line Fit Plot when  $UD|0 < UD < 30$

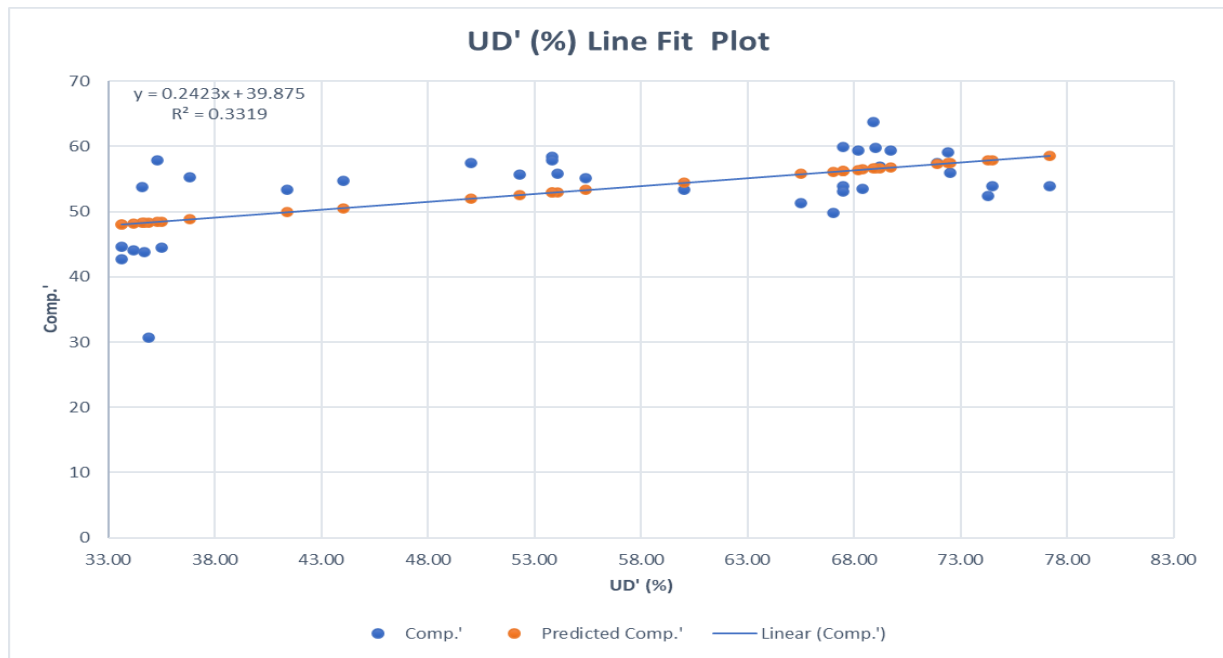


Fig 10. Line Fit Plot when  $UD|33 < UD < 100$

When the values of  $UD$  are less than 33, there is no correlation between independent variable and dependent variable, while when it is more than 33, they are positively correlated. Thus, the value range of independent variable has a decisive effect on their correlation. The turning point of  $UD \sim 33$  is valid again (see Figure 8-10).

#### 4.CONCLUSION

In this study, the data of union density and PISA grades was examined, which demonstrated the correlation between the two variables. The union density has a strong correlation with the PISA grades when the independent variable Union Density is greater than 33.00. However, when the independent variable is below 33.00, the correlation is less significant between the two variables.

This work ignored some countries in the EU which do not provide sufficient data for the study, such as Lithuania, which is only available in the database in one year of 2018. The study has already eliminated the biases during selecting the data, some errors still exist objectively because of the lack of the data in certain counties, although the data this work selected is relatively representative. The linear model is not significantly ideal in the first-time measuring. Although some mediate variables, such as working hour, were introduced to improve the model, the model did not provide the significant result desire in the study. However, this study shows interesting findings between the two variables. A turning point changed the correlation of education, wages, and compensation of employees around 33.00 of whole could be further studied the connection shows in this point. This work speculates the identity of former

Warsaw Pact members, such as Czech Republic and Slovak, contributes to the result on the left-hand side of the diagram, which exhibits a different type of correlation between the two variables. Further study can research on this speculation and attempted to prove that. This study points out the significance of labor union in domestic area, providing a possible approach of developing unions for the governments of EU members to improve education level.

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