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Econometric Analysis of the Efficiency of Using Tax Incentives

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Abstract

The article is devoted to the consideration of the econometric analysis of the efficiency of the use of tax incentives, which includes the analysis of the literature sources within the scope of the subject. Relevant conclusions and proposals have been developed in reliance several econometric models.

Keywords: *Tax, Tax Incentive; Industry; Investment; Taxpayer; Expenses*

Introduction

Tax incentives depend on each country's tax laws and regulations. In general, tax incentives are economic attitudes designed to encourage certain behaviors or activities that are considered beneficial to the economy or community.

The availability of tax incentives may vary depending on a number of factors, such as the type of activity being encouraged, the size of the company or entity, and the income level of the taxpayer (Rajul, Engelschalk, 2018). It is important for business entities to consult with tax experts or government authorities in order to determine the right to use tax incentives and to ensure compliance with tax laws and regulations.

Literature Review

O. Morrissey and C. Donoghue (2014) have examined the impact of tax incentives on the location choices of companies in the United Kingdom. They use a difference–in–differences approach to compare companies location decisions before and after the introduction of regional investment tax incentives. They have found out that tax incentives have made a positive effect on companies' location choices, particularly in regions with relatively low levels of economic development.

In addition, the authors also find that the effect of tax incentives on location decisions is stronger for firms that are relatively mobile and have more flexibility in their location choices.

The study provides empirical evidence of the effectiveness of tax incentives in promoting investment and economic development in certain regions and emphasizes the significance of considering the mobility of companies in the development of tax policies.

European scholars Schmieder–Ramirez and Mallette (2015) studied the relationship between tax incentives and job creation in small businesses.They note in their research that tax incentives can provide small businesses with the resources they need to create jobs, but they also point out that the effectiveness of these incentives depends on various factors, such as the financial soundness of the business and the level of cooperation with the local community.

Foreign scholars–economists D. Gamage and D. Shanske (2018) provide a historical and international perspective on the effectiveness of tax incentives. They review empirical evidence on the effects of tax incentives on investment, economic growth, and job creation in the United States and other countries.

Scholars have determined that tax incentives are effective under certain conditions, when they are targeted at specific industries or regions. The study comprehensively analyzed the use and effectiveness of tax incentives in supporting the development of the economy, and emphasized the importance of careful development and evaluation of tax policy.

Moreover, the factors affecting the effectiveness of tax incentives have been econometrically modeled and researched by several scholars.

Chinese economists–scholars Liu, Wang, and Wei (2001) used a fixed effect estimator model based on panel data to estimate the effect of tax incentives on foreign direct investment in China. Their dependent variable selected foreign direct investment (FDI) inflows to different provinces in China, and included tax incentives, market size, labor costs, infrastructure, and institutional quality as independent variables (Liu, Wang, and Wei 2001).

In the opinion of these authors, tax incentives have a positive and statistically significant effect on FDI inflows to Chinese provinces, controlling for other factors. They also have found that market size, labor costs, infrastructure and institutional quality are significant determinants of FDI inflows. Foreign economists Barrios and Fatika (2018) used a general equilibrium model to analyze the impact of tax incentives on business investment and employment in the European Union. Their dependent variables are company’s investment and employment, while the independent variables include tax incentives, wage expenditures, and other macroeconomic variables such as GDP growth, interest rates, and labor productivity.

The researchers’ general equilibrium model allowed them to promote the effects of tax incentives on a number of variables, including investment, employment and welfare. Furthermore, they used counterfactual simulations to assess the potential impact of alternative tax policies on the behavior and economic performance of the company. In general, their research shows that tax incentives can make a positive impact on the company’s investment and employment, but they hypothesize that the effectiveness of these incentives depends on a number of other economic factors.

Bachas and Evans (2019) used a randomized controlled trial to examine the impact of tax incentives on private investment in Jamaica.

They measured the impact of tax incentives on investment outcomes, the amount of investment, the number of new companies and the number of new jobs created.

Analysis and Results

In reliance upon panel data we have developed econometric models of the effectiveness of the use of tax incentives.

Panel data regression analysis is a statistical technique used to analyze data that includes cross–sectional and time–series data (Park, 2011).

In panel data regression analysis, researchers use panel regression models to estimate the relationship between the dependent variable and independent variables while controlling for individual and time–specific effects.

Panel data is particularly useful in econometric modeling because it enables the control of unobserved individual heterogeneity, and it provides greater variation in both the dependent and independent variables, which can improve the precision of the estimates and increase statistical reliability (Blundell, Griffith, Reenen 1995).

Panel data can also be used to estimate dynamic relationships over time, such as the effects of policy changes or the evolution of economic variables.

An overview of panel data models is as follows:

Panel data is a type of data set that includes both cross–sectional and time–series dimensions that allow the observation of individual behavior over time.

The symbol X_{It} denotes the value of the variable x for individual i at time t, where i represents the cross–sectional unit and t represents the time period. Using panel data in econometric modeling allows researchers to control for unobserved individual heterogeneity and estimate dynamic effects over time.

Pooled OLS estimator (POLSE) is a technique used in econometrics to estimate the parameters of a linear regression model for pooled OLS panel data (Breitung, 2005).

This method combines data across individuals and time periods, treating all observations as if they were drawn from a single cross–sectional data set.

The model assumes that the relationship between the dependent variable and the independent variable is the same for all persons and time periods.

This method can use the ordinary least square (OLS) approach or the method of least squares to estimate a panel data model (Eakin et al., 1988). According to it, a regression is created based on data on factor i and time t.

The pooled OLS estimator model looks like this:

$$y_{it}=\beta_0+\beta_1 x_{it}+\varepsilon_{it} \quad (1),$$

where

y_{it}- is the dependent variable for observation i at time t, x_{it} – is the independent variable for observation i at time t, β_0 is the intercept term, **b1** is the slope coefficient for x_{it}.

ε_{it} is an error term that represents the deviation of the actual y_{it} from the value predicted by the model.

A fixed effects estimator is actually the model used in econometrics to estimate the relationship between a dependent variable and one or more independent variables (Greene, 2004).

The fixed effects estimator method is widely used in applied econometrics, especially in panel data analysis, where the same individuals, firms, or countries are observed over time (Baltagi, 2008).

It has several advantages over other estimation methods, such as being used to produce consistent estimates even when the regressors are associated with fixed effects.

However, it also has some limitations, such as the inability to estimate the effect of time–invariant variables and the potential loss of efficiency when the number of fixed effects is large relative to the sample size.

Fixed effects estimator (FEE) uses time decreasing variables and expresses fixed effects in the following form.

$$y_{it} - \overline{y} = \beta_1(x_{1it} - \overline{x}_{1i}) + \beta_2(x_{2it} + \overline{x}_{2i}) + (u_{it} + \overline{u}_i) \quad (2)$$

Random effects estimator (REE) is a model used in econometrics to estimate the relationship between a dependent variable and one or more independent variables. (Bushway, 1999).

Unlike fixed effects models, random effects models allow the inclusion of both time–varying and time–invariant variables in the mode.

A random effects model uses within–group and between–group variation to estimate the effect of the independent variable on the dependent variable.

Within–group variability captures variation in the dependent variable and independent variables within each group (e.g., individuals, firms, or countries), while between–group variability captures variation in the dependent variable and independent variable between groups (Maddala, 1971).

The random effects estimator (REE) model has several advantages over fixed effects models. This allows for the inclusion of time–varying variables that fixed effects models cannot, and also enables to produce more efficient estimates when random effects are associated with independent variables.

According to it, the model is expressed below:

$$y_{it} - \theta\overline{y}_I = \beta_0 + \beta_1(x_{1it} - \theta\overline{x}_{1i}) + \beta_2(x_{2it} - \theta\overline{x}_{2i}) + (a_i - \theta\overline{a}_I) + (u_{it} + \theta\overline{u}_I) \quad (3)$$

According to our research, based on the panel data of the relationship between the practice of using tax incentives in 14 regions and the production of industrial output in 11 years in the national economy, econometric equations were developed based on the Pooled OLS estimator (POLSE), Fixed effects estimator (FEE), Random effects estimator (REE) models.

They are used for the testing procedures performed to assess the validity and reliability of the econometric models applied in the study. The significance of the Gauss–Markov hypothesis, which assumes that the errors in the model are normally distributed with a mean value of zero and constant variance, and that they are unrelated to each other and independent variables, has been verified.

Durbin Watson, Shapiro Wilk, Breusch–Pagan tests have been used to assess whether the assumptions of autocorrelation, normality, and heteroskedasticity in the errors have been met.

In addition, the Vif test has been applied to check for multicollinearity, which occurs when two or more independent variables are highly correlated with each other. In general, these tests are essential to ensure the accuracy and reliability of econometric models and to obtain accurate and meaningful results.

Creating graphic tables and determining the direction and density of indicators, analyzing and interpreting the results of econometric models of the developed model variables are significant to ensure that they are valid and reliable for the study. The following hypothesis has been reflected in the construction of the econometric model for this research paper.

According to our hypothesis, the hypothesis that can be formulated in the analysis of the relationship between tax incentives and industrial output is that tax incentives make a positive impact on the manufacturing of industrial products.

The hypothesis illustrates that enterprises that receive tax incentives invest more in their activities, which results in the increase in the production of industrial output.

In addition, tax incentives can reduce the cost of production, which further increases the production of industrial output.

To test this hypothesis, the econometric model that included tax incentives as an independent variable and industrial production as a dependent variable, has been developed.

Other factors that may affect the production of industrial output, the number of enterprises, agricultural products and investment in fixed capital have been included in the model as additional independent variables.

The data obtained from the State Tax Committee and the Statistics Committee Variables have been used for the econometric models developed for this research.

They were expressed in the following way.

Y – Production volume of industrial output in the national economy (resultant indicator), ***X1*** – tax incentives on budget income of legal entities (factor sign), ***X2***–number of companies operating in the national economy (factor sign), ***X3***– the volume of production of agricultural output in the national economy (factor sign) and ***X4***– the volume of investment in fixed capital in the national economy by sources of financing (factor sign).

According to the research, in 2011–2021, the number of observations on 14 regions of our Republic constituted 154, and the analytical graphic matrix of the indicators of the resultant signs and factor signs was as follows (see Figure 1).

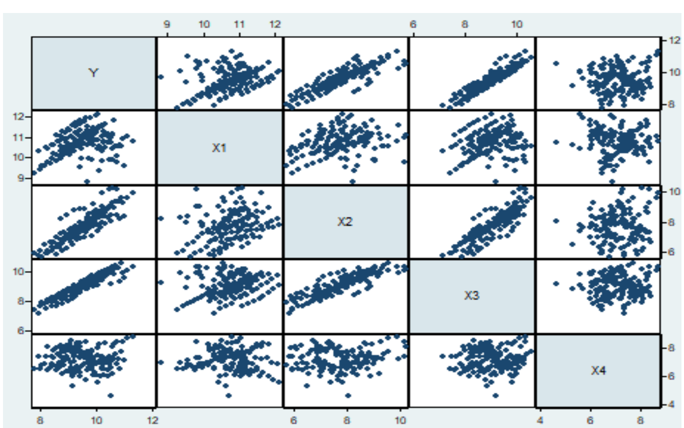

Figure 1. A graphical matrix of the relationship between the resultant sign and the factor signs[1].

[1]Worked out by the author using Stata software.

On the top of the figure, the resultant factor and factor signs have a strong density effect on the graphic matrix, in this case there is a relationship between the factors.

The histogram of the resultant sign and factor signs of the study can be demonstrated in the following way (see Figure 2).

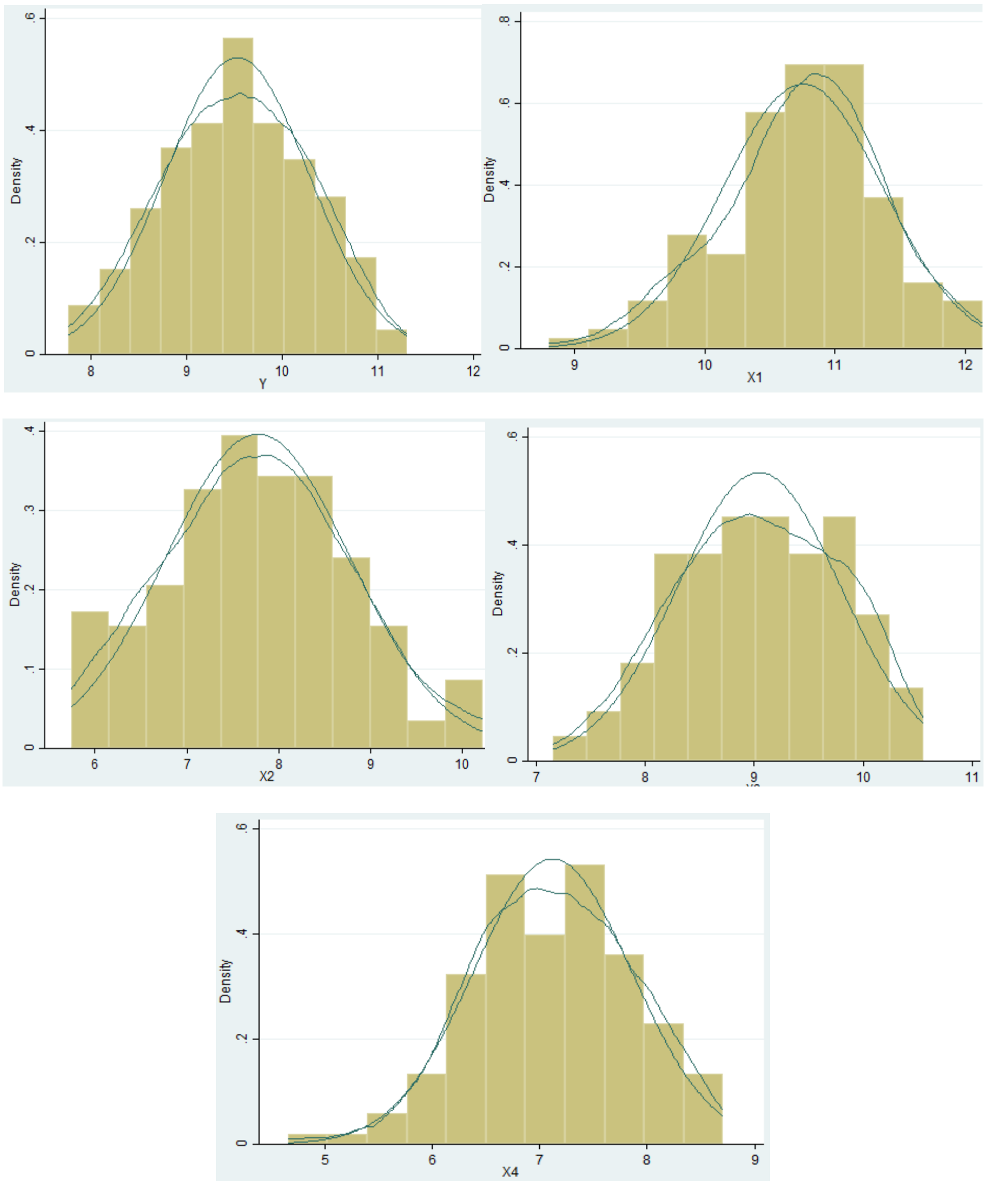

Figure 2. A histogram of the resultant sign and factor signs[2]

In Figure 2 we can observe a graphical representation of the resultant sign and the factor sign respectively. A histogram enables to visualize the frequency or ratio of the values of each variable, which makes it possible to understand the shape and state of the data.

We also examined the relationship between each of the outcome variables and factor variables in the study using a correlation matrix or "correlations" using Stata software. Correlation testing is an

[2]Worked out by the author using Stata software.

important part of statistical analysis because it provides insight into the relationships between different variables in a study and identifies significant predictors of outcomes of interest (see Table 1).

Table 1. Correlation matrix of connections between the resultant sign and factor signs[3]

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
(1) Y	**000**				
(2) X1	.452	000			
	(0.001)				
(3) X2	.467	0.251	.000		
	(0.000)	(0.02)			
(4) X3	.856	.184	.136	.000	
	(0.000)	(0.027)	(0.070)		
(5) X4	.717	.201	0.09	.827	.000
	(0.000)	(0.016)	(0.023)	(0.000)	

According to Table 1, the correlation coefficients between the dependent resultant variable and the sign factors are presented. The table demonstrates that the correlation between the factors is high, moderately significant, and there are inverse relationships.

Moreover, it is alsothat there is no multicollinearity between the influencing factors. The absence of multicollinearity indicates that the independent variable provides unique information and does not replicate the effects of other factors.

In general, the existence of a strong and meaningful relationship between the dependent variable and the independent variable indicates that measures have been undertaken to ensure the reliability and validity of the statistical analysis. The reliability coefficient of the research model accounted for ***0.72*** percent.

Research has been conducted using panel data and various econometric models have been developed to analyze the data.

In particulary, the ***POLSE model***, the ***FEE model***, and the ***Random Effects Estimator REE model*** have been used to estimate the coefficients of the regression model for panel data.

In addition, several statistical tests have been performed to assess the validity of the hypothesized models. Gaussian–Markov assumptions have been examined, including the assumptions of linearity, exogeneity, homoscedasticity, and uncorrelation of the errors.

[3]Worked out by the author using Stata software

Other tests such as the Breusch–Pagan test for heteroskedasticity, the Durbin Watson test for autocorrelation, and the Durbin Watson test for normality have been also performed to assess the quality of the regression models.

Finally, a Hausman test has been performed to determine whether a Fixed Effects Estimator (FEE) or a Random Effects Estimator (REE) was more appropriate.

The Hausman test helps researchers choose the best fit model for their data based on the characteristics of the panel data and the assumptions of the models.

Overall, it shows that this study has been done with a high degree of rigor and that the researchers focused on evaluating the assumptions of their econometric models and using appropriate statistical tests to assess the quality of their results (see Table 2).

Table 2. Indicators of econometric models based on the research–based panel data[4]

№	Model indicators	Model 1	Model 2	Model 3
		POLSE Model	**FEE model**	**REE Model**
1	**Y**	*	*	*
2	**X1**	0.15 (0.07)	0.02 (0.03)	0.02 (0.03)
3	**X2**	0.14 (0.05)	0.07 (0.02)	0.07 (0.02)
4	**X3**	1.06 (0.10)	1.003 (0.07)	1.006 (0.07)
5	**X4**	0.05 (0.08)	0.12 (0.05)	0.12 (0.05)
6	**F test**	105.30 (0.0000)	706.78 (0.0000)	
7	**R^2**	0.75	0.74	0.74
8	**Chi–square**			2846.48 (0.0000)
9	**Adj R^2**	0.74		
10	**Breusch Pagan**	0.27		
11	**Durbin Watson**	0.33		
12	**Shapiro–Wilk**	0.12		
13	**Vif**	2.19		
14	**Hausman**			0.91

From the data presented in Table 2 it is obvious that panel data based econometric models have been analyzed for each of the indicators and tests.

1. Analtsis of Pooled OLS Estimator (POLSE) Model

The analysis of econometric equation indicators according to the pooled OLS estimator model is presented below (see Table 3).

[4]Worked out by the author using Stata software

Table 3. Econometric equation of the resultant and factor signs under the Pooled OLS estimator (POLSE) model[5]

Y	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
X1	.159	.071	2.26	.025	.02	.299	**
X2	.148	.059	2.49	.014	.03	.265	**
X3	1.062	.104	10.25	0	.857	1.267	***
X4	.059	.08	0.74	.0562	-.1	.218	*
Constant	-5.083	.94	-5.41	0	-6.942	-3.225	***
Mean dependent var	7.774		**SD dependent var**		1.006		
R-squared	0.753		**Number of obs**		143		
F-test	105.299		**Prob > F**		0.000		
Akaike crit. (AIC)	216.476		**Bayesian crit. (BIC)**		231.291		

**** p<.01, ** p<.05, * p<.1*

According to Table 3, in compliance with the Pooled OLS estimator model, the factor signs were ***0.15, 0.14, 1.06***, and ***0.05***, respectively, and the standard errors were ***0.07, 0.05, 0.10***, and ***0.08***.

The fair value in the ANOVA table is ***F=105.29*** and the value of ***R–squared=0.75*** and the adjusted coefficient of determination are also ***Adjusted*** $R^2=0.74$.

In reliance upon the research the hypothesis test has been conducted using the Pooled OLS estimator (POLSE) model. The zerp hypothesis (H_0) is that the dependent variable (***y***) is zero, and the alternative hypothesis (H_1) is that ***y*** is not zero. The results of the test demonstrate that the ***F–statistic*** was less than **0.05** and the **t–statistic** was also less than ***0.05***, indicating that the zero hypothesis was rejected in favor of the alternative hypothesis. The results of the hypothesis test using the Pooled OLS model show statistical significance and practical significance in understanding the relationship between the dependent variable and independent variables in the model.

The Pooled OLS estimator (POLSE) model developed by the research was as follows.

Y=0.15X1+0.14X2+1.06X3+0.05X4-5.08(5) [6]

We have tested the Gaussian Markov significant terms on the econometric equation Model 1 Pooled OLS estimator and it has appeared like that.

The results of several statistical tests performed to test Gaussian Markov assumptions in the Pooled OLS econometric equation have been reported. Durbin Watson, Shapiro Willke, and Breusch–Pagan test have been conducted and the results show that the null hypothesis (H_0) $H_0: y=0$ and $H_1: y\neq 0$ is meaningful when the significance level is ***p>0,05***. Therefore, the alternative hypothesis was rejected in this research.

To check for multicollinearity in the model, the VIF indicator has been also calculated and it accounted for ***2.19,*** indicating that there is no significant multicollinearity in the model, which is supported by a confidence interval of ***[1, 10]*** for this value.

Overall, the study shows that various statistical tests have been used to ensure the validity of the results of Gaussian Markov conditions in the econometric equation, and the absence of multicollinearity

[5]Worked out by the author using Stata software
[6]Worked out by the author using Stata software

in the model is also an essential finding because it indicates that the independent variables are not highly correlated with each other.

2. Analysis of the Random Effects Estimator (REE) Model.

The results of the econometric equation according to the Fixed effects estimator (FEE) model of the study are presented in Table 4 below.

Table 4. Econometric equation of the resultant and factor signs under the Random effects estimator (REE)[7]

Y	**Coef.**	**St.Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	**Sig**
X1	.023	.034	0.68	.494	-.043	.09	
X2	.073	.028	2.60	.009	.018	.127	***
X3	1.006	.071	14.21	0	.867	1.145	***
X4	.123	.05	2.45	.014	.025	.222	**
Constant	-3.104	.57	-5.44	0	-4.222	-1.987	***
Mean dependent var	7.774		**SD dependent var**		1.006		
Overall r-squared	0.742		**Number of obs**		143		
Chi-square	2846.478		**Prob > chi2**		0.000		
R-squared within	0.957		**R-squared between**		0.509		
**** p<.01, ** p<.05, * p<.1*							

According to Table 4, the results of the Random effects estimator (REE) model show values of several factors of ***0.02, 0.07, 1.006***, and ***0.12***, respectively, along with their standard errors of ***0.03, 0.02, 0. 0.07*** and ***0.05***. These values describe the effect of the independent variables on the dependent variable in the model.

Furthermore, the ANOVA table indicates a high **Chi–square** value of ***2846.47***, which indicates that there is a significant difference between the observed values and the expected values. This indicates that the model fits the data and that the independent variables are good predictors of the dependent variable.

The ***R–squared*** value was ***0.74***, indicating that the model specifies 74% of the variation in the dependent variable. This indicates that the model fits the data and that the independent variable is a significant predictor of the dependent variable.

Overall, this illustrates that the results of the Random effects estimator (REE) model are statistically significant and have practical value in understanding the relationship between the dependent variable and independent variables in the model.

The Random effects estimator (REE) model developed for theis research is presented in the following way.

$$Y=0.02X1+0.07X2+1.006X3+0.05X4-3.104 \quad (6)$$ [8]

Random Effects of the Hausman test conducted in the Random effects estimator (REE) econometric model demonstared the value of ***0.91***. According to the results of this test, the zero hypothesis (H_0) $H_0: y=0$ and $H_1: y\neq 0$ is meaningful when the significance level is $p>0.05$. In this study, the

[7]Worked out using Stata software
[8]Worked out by the author using Stata software

alternative hypothesis that the random effects model is a better fit to the data than the fixed effects model was rejected.

In addition, a value of ***p > 0.05*** is noted by the Test, which indicates that the condition of the Hausman test is fully met. This shows that they applied the Hausman test appropriately to their data and the results are reliable.

In general, the relevant econometric model was thoroughly tested and statistical testing was used to ensure the validity of the results. Rejection of the alternative hypothesis suggests that a random–effects model is a more appropriate model for their data than a fixed–effects model.

3. Analysis of Fixed Effects Estimator (FEE) Model

The results of the econometric equation according to the Fixed effects estimator (FEE) model of the study are presented in Table 5 below.

Table 5.Analysis of Fixed effects estimator (FEE) Model[9]

Y	**Coef.**	**St.Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	**Sig**
X1	.02	.034	0.59	.055	-.047	.088	*
X2	.07	.028	2.49	.014	.014	.126	**
X3	1.003	.072	13.88	0	.86	1.146	***
X4	.125	.051	2.44	.016	.024	.226	**
Constant	-3.041	.56	-5.43	0	-4.148	-1.933	***
Mean dependent var	7.774		**SD dependent var**		1.006		
R-squared	0.747		**Number of obs**		143		
F-test	706.784		**Prob > F**		0.000		
Akaike crit. (AIC)	-127.870		**Bayesian crit. (BIC)**		-113.055		
**** p<.01, ** p<.05, * p<.1*							

According to Table 5, the results of the Fixed effects estimator (FEE) model amount to ***0.02, 0.07, 1.003*** and ***0.12***, respectively, along with the values of several factors and their standard errors, ***0.03, 0.02***, ***0.07*** and ***0.05*** respectively. These values illustrate the impact of the independent variables on the dependent variable in the model. The fair value in the ANOVA table is ***706.78*** and has a high value of ***R–squared=0.74.***

The fixed effects estimator (FEE) model developed for this study has the following appearance:

Y=0.02X1+0.07X2+1.003X3+0.12X4–127.87 (7)[10]

Conclusions and Proposals

The following proposals and recommendations have been developed as a result of the analysis and conclusions of the research on the interaction of the influence of the volume of production of industrial output on the incentives in the national economy.

[9]Worked out using Stata software
[10]Worked out by the author using Stata software

1. According to the econometric equation ***Y=0.15X1+0.14X2+1.06X3+0.05X4-5.08*** of the Pooled OLS estimator (POLSE) model based on panel data:

1.1. A ***1%*** increase in tax incentives on the budget income of legal entities results in a ***0.15%*** increase in the production volume of industrial output in the national economy.
1.2. An increase in the number of enterprises operating in the national economy by ***1%*** results in an increase in the production volume of industrial output in the national economy ***by 0.14%***.
1.3. A ***1%*** increase in the volume of production of agricultural output in the national economy results in an increase in the volume of production of industrial output in the national economy by ***1.06%***.
1.4. A ***1%*** increase in the volume of investment in fixed capital in terms of financing sources in the national economy results in an increase in the volume of production of industrial output in the national economy by ***0.05%***.

2. According to the econometric equation ***Y=0.02X1+0.07X2+1.006X3+0.05X4-3.104*** of Random effects estimator (REE) model based on panel data:

2.1. A ***1%*** increase in tax incentives on the budget income of legal entities results in a ***0.02%*** increase in the production volume of industrial output in the national economy.
2.2. An increase in the number of enterprises operating in the national economy by ***1%*** results in an increase in the production volume of industrial output in the national economy ***by 0.07%***.
2.3. A ***1%*** increase in the volume of production of agricultural output in the national economy results in an increase in the volume of production of industrial output in the national economy by ***1.006%***.
2.4. A ***1%*** increase in the volume of investment in fixed capital in terms of financing sources in the national economy results in an increase in the volume of production of industrial output in the national economy by ***0.05%***.

3. According to the econometric equation ***Y=0.02X1+0.07X2+1.003X3+0.12X4-127.87*** of Fixed effects estimator (FEE) model based on panel data:

3.1. A ***1%*** increase in tax incentives on the budget income of legal entities results in a ***0.02%*** increase in the production volume of industrial output in the national economy.
3.2. An increase in the number of enterprises operating in the national economy by ***1%*** results in an increase in the production volume of industrial output in the national economy ***by 0.07%***.
3.3. A ***1%*** increase in the volume of production of agricultural output in the national economy results in an increase in the volume of production of industrial output in the national economy by ***1.003%***.
3.4. A ***1%*** increase in the volume of investment in fixed capital in terms of financing sources in the national economy results in an increase in the volume of production of industrial output in the national economy by ***0.12%***.

4. Based on the panel data of the research and in reliance upon the data of 3 models, specified above, the panel data has been analyzed to study the impact of the industrial production volume on the tax incentives in the national economy. In addition, Random effects estimator (REE) model and Fixed effects estimator models have been compared.

According to the results, we came to the conclusion that the Random effects estimator (REE) model is suitable for their analysis.

This conclusion shows that the ***p–value*** of the Hausman test is ***p=0.91***, which indicates that there is no significant difference between the coefficients estimated by the two models. Their conclusion that the random effects estimator (REE) model is appropriate can be considered optimal, assuming that the research model followed appropriate procedures and assumptions for analyzing the data.

The ***p–value*** of the Hausman test proves that the random–effects model is a better fit than the fixed–effects model for their data because it shows the random–effects assumption.

This conclusion is based on the specific data and model specifications used in the study. In addition, it is important to consider other factors such as model fit, robustness, and theoretical coherence when evaluating the appropriateness of a model for a particular analysis.

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