Migration Letters

Volume: 20, No: S11(2023), pp. 348-357

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)

www.migrationletters.com

Analysis of the tax collection of the Environmental Tax on Vehicular Pollution and how it affects the tax on environmental promotion from 2012 to 2020 in the case of Ecuador

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Abstract

The purpose of this research is to analyze the tax collection of the Environmental Tax on Vehicular Pollution (IACV) and how it affects the Environmental Development Tax (IFA) for the period 2012-2020. A documentary research design methodology was implemented, where theoretical information is collected to be able to execute this topic; In addition, a type of comprehensive correlational research was used, applying the ordinary least squares method, where the API was taken as the dependent variable and the IACV as the independent variable. In conclusion, the tax collection of the IACV has a high explanatory significance in the variable of the IFA.

Keywords: *IFA, BTI, automobiles, taxes.*

Introduction

Ecuador is a multicultural country recognized by different international entities; being praised for its diverse forests, flora and fauna that inhabit it, so in Ecuador the Ministry of the Environment was created as detailed below.

"To guarantee a healthy and ecologically balanced environment to make the country a nation that conserves and sustainably uses its biodiversity; maintains and improves its environmental quality, promoting sustainable development" (Ministry of the Environment of Ecuador [MAE], 2012).

This organization was created within the country, in order to promote an Ecuador friendly to the air, soil, fauna and flora, despite the existence of these ministries of environment, in the assembly they realized that they needed more rigid measures towards the people to protect the pacha mama. "The State shall encourage natural and legal persons, and collectives, to protect nature, and shall promote respect for all the elements that make up an ecosystem" (Constituent Assembly of Ecuador, 2008).

Despite encouraging the use of environmentally friendly practices, a tax was created that would fall largely on all the vehicular masses that existed and continue to exist in

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Ecuador. The Internal Revenue Service (SRI, 2011) mentions that it is a tax levied on environmental pollution produced by the use of motor vehicles for land transport.

All cars over 1500cc cylinders must pay this tax; since they are the ones that do the most damage to the air and people with their CO2 emissions, apart from being applied to those old cars that lacked an updated system and are very dangerous for the environment.

"Respiratory diseases, asthma and allergies are all associated with external and internal air pollution. The relationship between air pollution and health is becoming more and more known" (Vargas, 2005, p. 117). It is because of all these worrying anomalies that this tax should be maintained and thus motivate the population to obtain other types of cars as another alternative means of transport.

This tax also leaves the country with notable collections each year since in turn it can be used in different areas, once the tax is repealed or a reduction in its collection can directly affect the public SRI system and in turn the environment since the public sector is not financed nor the environment in which we live is preserved.

As part of the tributes are taxes, which have a strong capacity to obtain these resources, depending on how they have been created or modified by the laws of each country. One of the reforms carried out in Ecuador gives way to the creation of two environmental taxes, in search of an improvement of the environment and environmental awareness (Camacho, 2016).

Who should pay this tax?

For the present application of the Environmental Tax on Vehicular Pollution, we will define a vehicle according to the International Automobile Federation: "A land vehicle moved by its own means, which slides on at least four wheels arranged in more than one alignment and which are always in contact with the ground, and of which at least two are directives and two are propulsion. The Environmental Tax on Vehicular Pollution (IACV) must be paid by all owners of land transport motor vehicles whose cylinder capacity is greater than 1500cc.(Valencia, 2016)

Tax control

In order to control the payment of taxes, the Tax Administration is permanently accountable to the Government and the public for the results of tax management. Through the official website of the Internal Revenue Service, an executive report of tax collection is published on a monthly basis, a work report presented quarterly and annually is also made known to the public, and finally, the annual statistical bulletin is published.

Methodology

The purpose of this study is to analyze the tax collection of the Environmental Tax on Vehicular Pollution and its impact on the environmental promotion tax and the total annual collection period 2012-2020. An exhaustive bibliographic search was carried out in high-impact journals, as well as; Data obtained through the official website of the Internal Revenue Service (SRI) was extracted. The method used is a documentary research design, where theoretical information is collected in order to execute this topic.

Therefore, the data obtained in the SRI platform was inserted into an Excel sheet for its respective observation and analysis, in order to obtain relevant data; this work will be supported by using Gretl software to produce graphs, tables and the respective econometric analyses; as well as an equation, which will be used to estimate proximate values. Using as support an econometric model of ordinary least squares, through a statistical analysis of correlations taking as a dependent variable (tax on environmental promotion).

The variables used are (IACV) environmental tax on vehicular pollution as an independent variable and as a dependent variable the (IFA) environmental promotion tax, in which its significance in the model will be measured by applying logarithm to smooth the global model for its greater stabilization of variables

The equation is presented in its regressive form:

$$Yi = \beta 1 + \beta 2 x_i + u_i$$

Yi = Dependent variable (API) imposed on environmental development

X = independent variable (IACV) environmental tax on pollution

Ui = This is the error or residue between observations and models.

Its logarithmic regressive form is also presented:

$$\log Yi = \propto + \beta \log_x + u_i$$

Hypothesis

- H0 (null): The independent variable has little significance in the dependent variable
- H1 (alternative): The independent variable has high significance in the dependent variable.

This research will lead to the conclusion:

Taxes are important because the state can obtain the resources to provide education, health, security, justice, public works, fight poverty, and boost economic sectors that are fundamental to the growth of the country's economy (Polin, 2017).

Based on this, the model is sustained, that is, in the face of an eminent increase in the rate of the environmental tax, it will practically generate revenue for the state, but a decrease for the sectors, for example, the automotive sector. Therefore, the aim is to find the relationship between the variables. The purpose of the specification of the econometric model of the proposed theory is to build a quantified basis of the causal relationships of the variables worked.

Results

To obtain a result and verify whether or not there is a relationship between the chosen variables and determine if there is a positive or negative effect between them, a least squares model will be applied to obtain the coefficient of determination R^2, with which the proportion of variability between the variables can be measured.

Table 1: MCO estimates using the 108 observations 2012:01-2020:12

Dependent variable: IFA

Variable	Coefficient	Desv. typical	t-statistic	P-value
const	5341,81	482,499	11,0711	<0.00001
BTI	0,68759	0,0568083	12,1037	<0.00001

Average of the var. Dependent = 10608.6

Standard deviation of the var. Dependent. = 3328.09

Sum of squares of waste = 4.9753e+008

Standard deviation of waste = 2166.49

R2 = 0.580197

Corrected R2 = 0.576237

Degrees of freedom = 106

White's Heteroscedasticity Contrast -

Null hypothesis: No heteroscedasticity

Contrast statistic: TR2 = 35.7731

With p-value = P (Chi-Square(2) > 35.7731) = 1.70593e-008

Source: Prepared by the authors 2023.

The results show that the alternative hypothesis was accepted, that is, that the model is explanatory since the independent variable (Environmental Tax on Vehicular Pollution) significantly influences the dependent variable, however, its coefficient of determination R2 is very low since it is at a value of 0.576237 and this must be close to 1. The independent variable does have significance, that is, it provides information to the model.

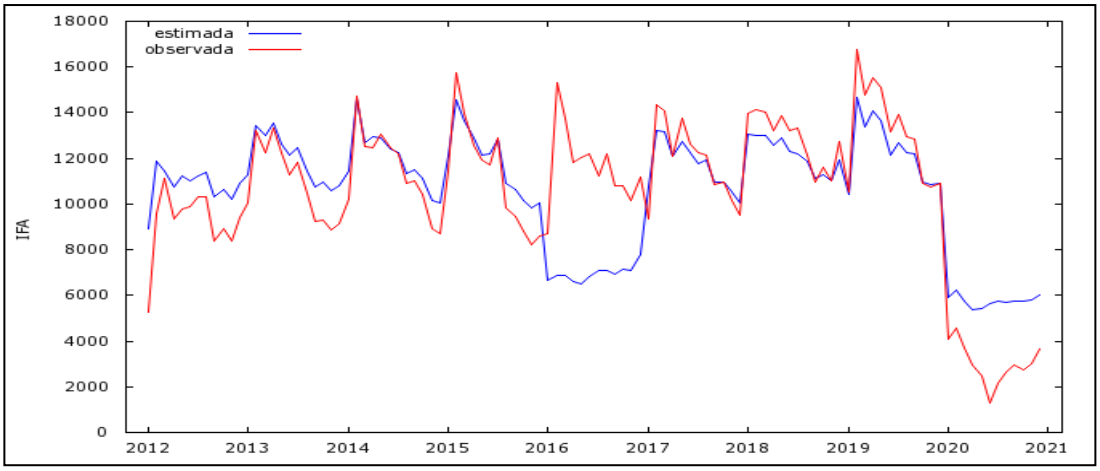

Figure 1. IFA Variable Weather Series

Source: Prepared by the authors 2023.

The graph shows the dependent variable throughout the time series where it can be determined that it follows a sequence below the estimated line with respect to the observed one, but with the same trend until an approximation of the year 2016, where the estimated timeline has a positive trend and the observed one has a negative trend until the year 2017. From that year on, the lines resume a very similar temporal sequence.

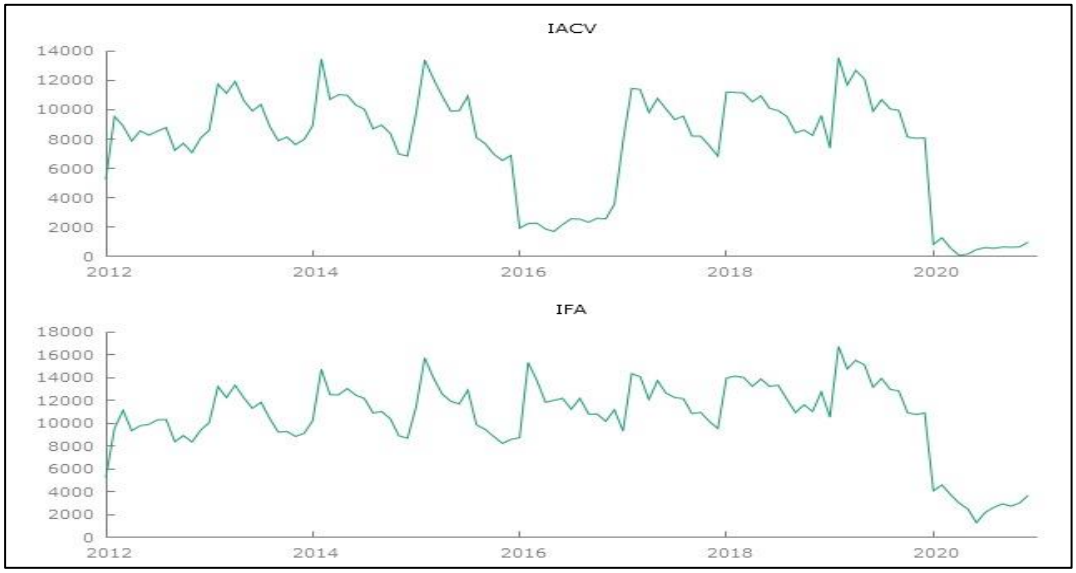

Figure 2. Time series of IACV and IFA variables

Source: Prepared by the authors 2023.

In the two graphs it is shown that the variables of our IFA, IACV study do not show a constant trend over time, on the contrary, they have a great variability and an irregular sequence, so it is inferred that the 2 variables are not stationary from a non-formal analysis. This is largely attributed to the volatility of the vehicle fleet and the lack of transparency in tax collection.

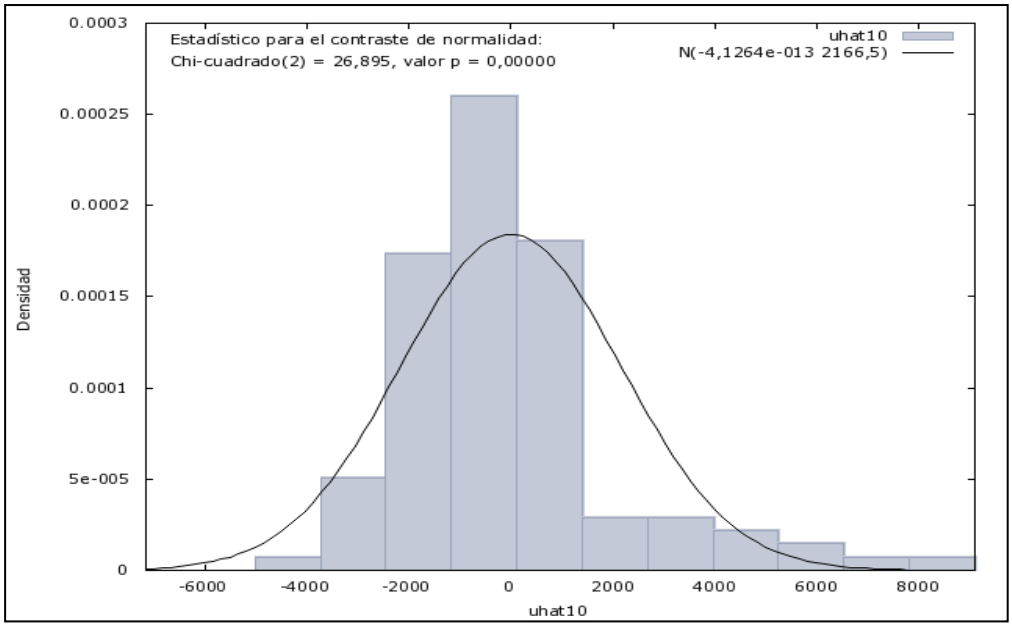

Figure 3. Residual Normality Contrast

Source: Prepared by the authors, 2023.

It can be seen that there is a normal distribution in the variables, it is denoted that it is biased or asymmetric to the right. This can be determined more clearly in the residue normality test, so that there is a normality of the Prob value. It must be greater than 0.05,

Waste Normality Contrast -

Null hypothesis: The error is normally distributed

Contrast statistic: Chi-square (2) = 26.8948

With p-value = 1.445e-006

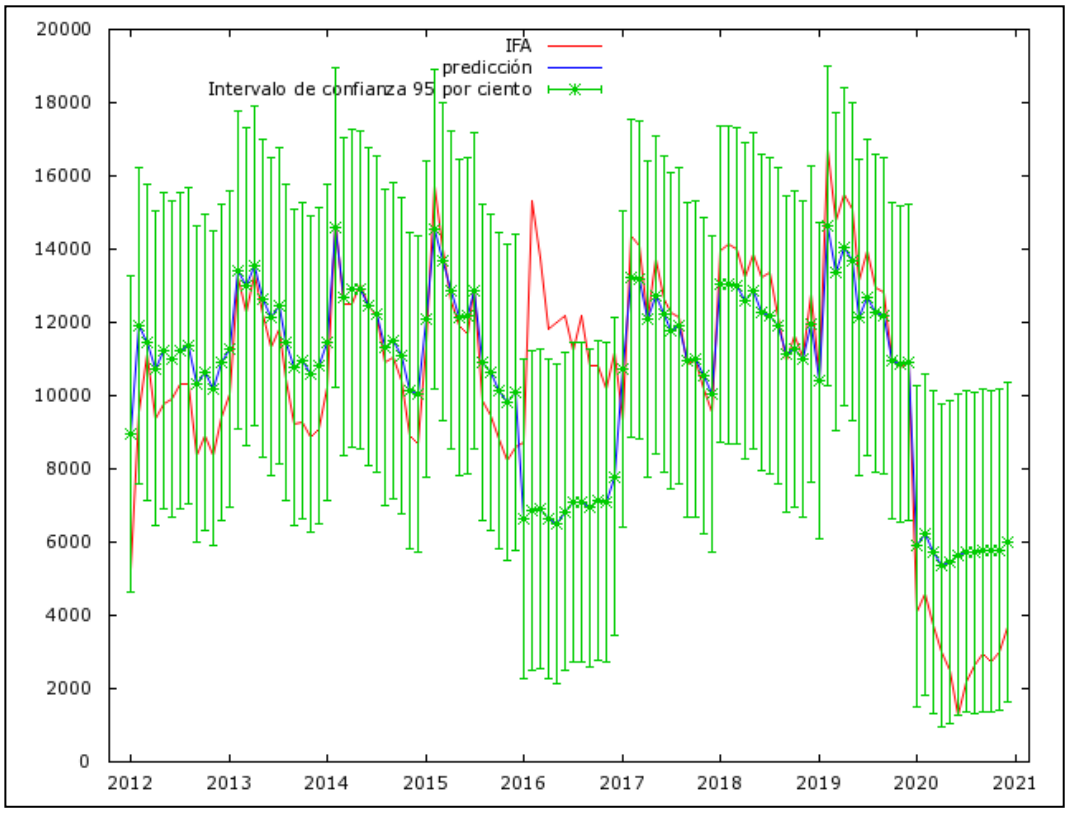

Figure 4. IFA Variable Prediction

Source: Prepared by the authors, 2023.

The predictions shown in the graph have a 95% confidence interval, where their prediction line is decreasing. In other words, the collections of the Environmental Pollution Taxes dropped significantly considering that the vehicle fleet is constantly evolving.

Applying logarithms to the model

By applying the logarithms to the model, it is possible to see a greater adjustment of the variables in a global way since all the values are adjusted, and there is a greater estimation of the R2

Table 2. MCO estimates using the 108 observations 2012:01-2020:12

Dependent variable: l_IFA

Variable	Coefficient	Desv. typical	t-statistic	P-value
const	5,85986	0,217525	26,9387	<0.00001
l_IACV	0,384519	0,0249688	15,4000	<0.00001

Average of the var. Dependent = 9.18617

Standard deviation of the var. Dependent. = 0.479482

Sum of squares of waste = 7.59868

Standard deviation of residues = 0.267742

R2 = 0.721106

Corrected R2 = 0.701192

Degrees of freedom = 106

White's Heteroscedasticity Contrast -

Null hypothesis: No heteroscedasticity

Contrast statistic: TR2 = 40.7349

With p-value = P (Chi-Square(2) > 40.7349) = 1.42736e-009

Source: Prepared by the authors, 2023.

Logarithms were applied to the same data to estimate the same function of the previous model, where it is shown that its variables are smoothed and reflect a greater significance in the dependent variable, yielding an R2 equal to 0.721106, compared to the previous model where an R2 of 0.576237 is obtained, it can be analyzed that the application of logarithms to the model increased the R2 which allows us to determine that the model is a little more reliable for making forecasts using the independent variable.

Logarithms help measure the changes in percentage terms of the I_IACV variables and their effect with respect to the dependent variable I_IFA.

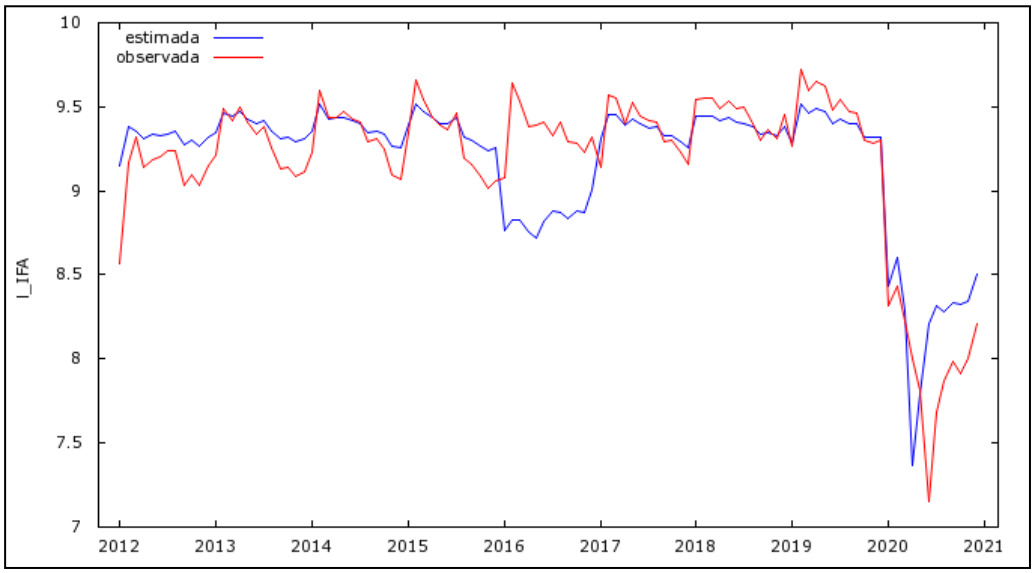

Figure 5. Series Against Variable Time I_IFA

Source: Prepared by the authors, 2023.

It is observed that there is a greater adjustment between the estimated variable and the data, therefore, they follow the same distribution and trend until 2016 where the data of the estimated l_IFA take an upward trend and the observed one a downward trend, it is the only irregularity in the data in the trend over time.

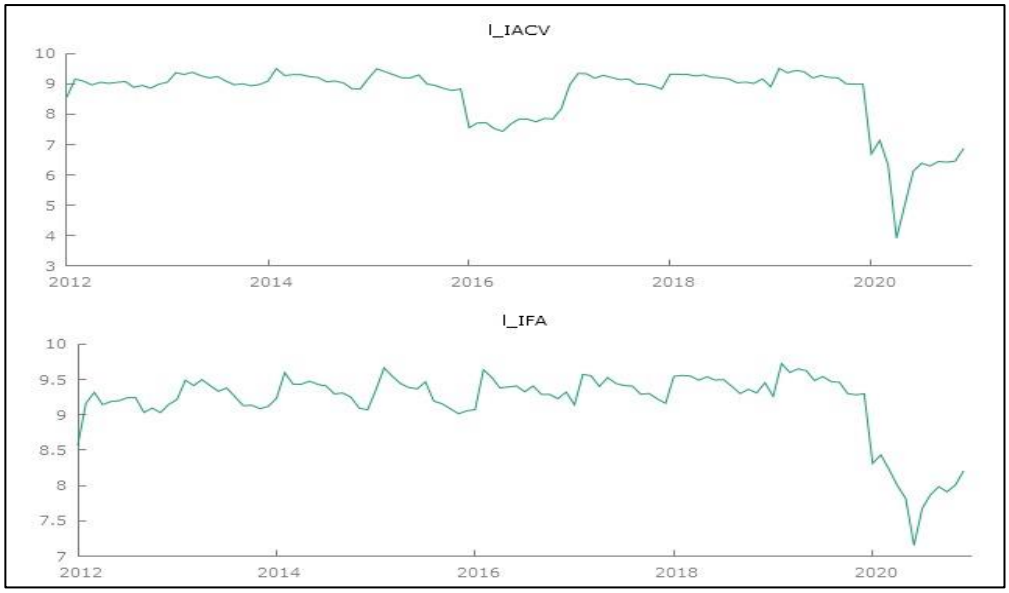

Figure 6. Time series of the variables I_IAC and I_IFA

Source: Prepared by the authors, 2023.

When applying the logarithms, it can be seen that the variables I_ACV and I_IFA have a smaller variation of change in the time series, but it continues to maintain a large variation of the data throughout the period from 2012 to 2020, the variables represent volatility, however, they are related in their behavior as a variable demonstrates a decreasing behavior, the other variable responds similarly. Denoting the highest peak in the I_IACV variable in 2014 and its lowest peak in 2020, Following the trend, the I_IFA variable maintain high points between 2015, 2016 and 2019 and its lowest point in 2020.

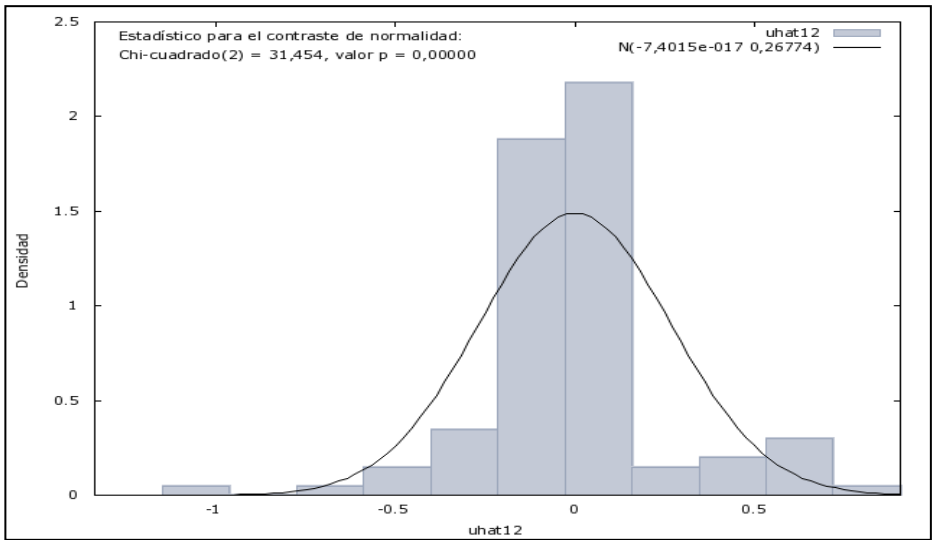

Figure 1. Residual Normality Contrast

Source: Prepared by the authors, 2023.

The normality contrasts of the model were corrected, its data is a little more focused, but it still has an asymmetry to the right, For a greater estimation and veracity, the residual normality test is applied.

Waste Normality Contrast -

Null hypothesis: The error is normally distributed

Contrast statistic: Chi-square (2) = 31.454

With p-value = 1.4786e-007

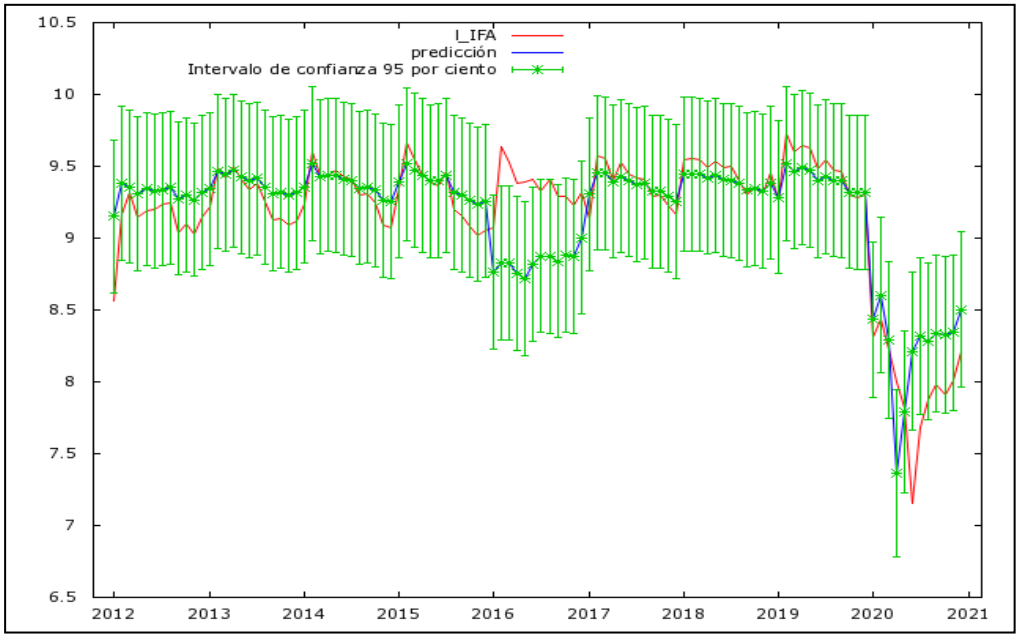

Figure 2. Predicting the I_IFA variable

Source: Prepared by the authors, 2023.

The predictions were corrected significantly, there is a greater adjustment in them. However, at the end of 2019 it has a negative trend until 2020.

Discussion

Ecuador is one of the countries of the Andean Community that has an Environmental Tax on Vehicular Pollution (IACV), it was created as an environmental tax applied to vehicles that due to their cylinder capacity and age are harmful to the environment, which was born under the argument or basic environmental principle of "whoever pollutes the most must pay more" however it can be determined that this tax was created with the objective of tax collection and not to improve the environment, since since 2012 when it came into force no action has been observed to improve the environment and that public transport vehicles, which are the ones that emit the most polluting gases, are exempt from this tax. (Zambrano, 2019)

Not being able to reduce vehicular circulation is implicit in not being able to reduce vehicular pollution, since this problem has become very significant and has become a topic of global knowledge, so it is necessary to take prudent measures. In order not to affect the health of the nation's inhabitants while other dynamic solutions are sought, that is, by not decreasing production, the population will not stop increasing and therefore will not stop consuming. According to Zanzzi et al. (2017)You can't reduce production, because the population is not going to stop growing and it's not going to stop consuming.

In order to achieve the effectiveness of the vehicle tax, mechanical instruments or different technologies must be created and used to reduce vehicular pollution caused by the use of fuel. An environmental tax, in order to be efficient, should be accompanied by other fiscal instruments that support its diligence, protect it and help it to achieve the environmental purpose for which it was created.

Conclusion

The environmental tax for vehicular pollution that exists in Ecuador is mandatory in which it is collected by the government, so it is distributed for education, health, public works, the fight against poverty and the promotion of economic sectors.

It is worth mentioning that the vehicles that produce the most environmental pollution do not pay taxes such as taxis, buses, vans, trucks, etc. On the other hand, vehicles for private use do pay this value corresponding to the environmental tax on vehicular pollution.

On the other hand, this shows that in Ecuador the behavior of the variables taken does not depend on their past behavior, at least at the level of collections.

However, the government's objective with this reform is not only to collect the money, but to insist on the behavior of taxpayers since we know that this tax makes the value of the license plate more expensive and thus does not change the behavior of citizens.

In general, new rules should be made for those vehicles that are based on fuels that have a percentage considered to the size of fuel that is used or consumed and likewise for new hybrid vehicles that enter the country, taking into account that with these variants it will be proven that the scrapping of vehicles will decrease in a proportional way.

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