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How does the pricing policy affect clean fuels consumption (GPL/C) in Algeria? A DYNAMIC MODEL APPROACH (ARDL)

كيف تؤثر سياسة التسعير على استهلاك الوقود النظيف (GPL / C) في الجزائر؟

استعمال النموذج الديناميكي (ARDL)

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Abstract

The transportation sector is essential in Algeria's national assessment of energy consumption. Because it is an important vehicle for economic and social development and a source of greenhouse gas emissions, this sector unquestionably requires serious attention. Furthermore, its importance has prompted the Algerian public authorities to adopt tariff policies with the aim of directing demand towards relatively clean energy products in accordance with commitments to the various international protocols.

This study aims to evaluate the short- and long-term impacts of this policy on Algeria's fossil fuel consumption (LPG/C). To determine this dynamic, we used the ARDL model from 1995 to 2020.

The findings show that, in the short term, consumption of LPG/C depends positively on its past value, average oil prices, and GDP and negatively influenced by gasoline prices. However, there is always a positive relationship between LPG/C consumption and the average gasoline price in the long term; despite the variables, diesel fuel and gasoline prices have a negative impact on LPG/C consumption.

Keywords:pricing policy, fuel consumption, ARDL model, road transport, Algeria

Jel classification : Q41, Q42, C3

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ملخص

يحتل قطاع النقل في الجزائر مكانة مهمة في الميزانية العمومية. يتطلب هذا القطاع اهتمامًا خاصًا بسبب دوره كموجه للتنمية الاقتصادية والاجتماعية، ولكنه أيضًا مصدر لانبعاثات غازات الاحتباس الحراري. وقد دفعت أهميتها السلطات العامة الجزائرية إلى تبني سياسات بهدف توجيه الطلب نحو منتجات الطاقة النظيفة نسبيًا وفقًا للالتزامات الواردة في مختلف البروتوكولات الدولية.

تهدف دراستنا الى تحليل تأثير هذه السياسة على توجيه الطلب الوطني نحو الطاقات النظيفة مثل/GPLC على المدى القصير والطويل. لتحديد هذه الديناميكية، استخدمنا تقديم نموذجARDL للفترة 1995−2020.

تظهر النتائج التي تحصلنا عليها ان استهلاك ال GPL/C على المدى القصير يعتمد بشكل إيجابي على قيمته السابقة، متوسط سعر البنزين وال .PIB كما انه يرتبط بطريقة سلبية على سعر الديزل. على المدى البعيد، هناك علاقة إيجابية بين استهلاك C/GPL وسعر البنزين بينما هذه العلاقة سلبية مع سعر الديزل وعدد سيارات التي تعتمد على البنزين.

الكلمات المفتاحية: سياسة التسعير ، النقل البري، ARDL

GP الجزائر وقود

1. INTRODUCTION

According to an analysis of the world's most energy-intensive economic sectors, the transportation sector consumes over 29% of global energy consumption and 60% of global petroleum consumption. As a result, it holds first place in terms of greenhouse gas emissions (BP Statistics review of world energy, June 2019).

Algeria is no exception in this regard. Indeed, the same conclusion has been reached about the impact of the national use of traditional fuels (oil and gasoline) on environmental degradation and pollution. The reforms implemented by public authorities in the 1990s, the most significant of which was the demonopolization of the transportation sector, which had previously been guaranteed only by public enterprises, resulted in the spectacular development of the national road transport park. Furthermore, the increased purchasing power of households and the democratization of access to bank credit for personal or utilitarian vehicle purchases (credit granted under the ANSEJ, ANDI) have contributed to the automotive fleet spectacular growth. Thus, from 1995 to 2019, the automotive fleet increased by 143.95%, reaching 6577188 vehicles in 2019 (ONS, 2019), and resulting in a high use of fossil fuels. Indeed, according to the Ministry of Energy and Mines, consumption in this sector increased in 2019 to over 15,4 million tonnes (ARH 2019), accounting for over 30.55% of total energy consumption. This increase has unquestionably had a direct influence on the demand for energy products and, as a result, on environmental degradation.

In addition to the environmental and health risks posed by the energy sector, the public sector is under pressure to reduce import costs by shifting our consumption habits toward less polluting and more readily available products. Ultimately, the goal is to reserve petroleum products for export, a source of revenue for the national economy.

In this regard, the present research seeks to answer the following question: How does the rise of fuel prices in road transport sector affect Algerian LPG/C consumption in both short and long term? Alternatively, can the government's varied increases in fuel costs persuade motorists to opt for relatively clean energy (LPGC)?

To respond the current problematic, we propose the following hypothesis:

Hypothesis 1: Every change in the price of fossil fuels (gasoline, diesel fuel) has a short- and long-term impact on LPGC consumption.

Hypothesis 2: Since essence engines convert to LPGC fuel, any change in the diesel fuel automotive fleet will affect LPGC consumption.

To assess the study hypotheses and further our research, we used the following procedure:

At first, we conducted a review of related literature as well as a review of the factors influencing Algerian energy policy, including the evolution of fuel prices and consumption in the transportation sector, as well as the evolution of the automotive fleet (BP Statistical Review of World Energy, June 2019).

Secondly, we applied the ARDL model's economic modelling to a data set compiled by several organizations (Ministry of Energy, ONS, and NAFTAL) spanning 1985 to 2020.The estimation results are subject to interpretation and debate.

2. Literature Review

Several studies on price fluctuations in energy products have been conducted. However, these studies are more concerned with the influence of this diversity on economic growth. In this domain, there are two approaches to consider:

Several studies have found a link between energy consumption and economic growth, including the Kraft (1978) study, Ozturk (2010), Akinlo (2008), Sakiru (2011), Abaidoo (2011), and Shahbaz (2011). (2011). According to the authors who conducted these studies, an increase in energy consumption will inevitably result in economic growth. Algerian authors who have returned to this subject to conduct studies on the Algerian case, such as LAHOUAL and TAOUCH (2020) and MAACHI (2021) have obtained the same results. Other authors (Sarkar et al., 2010) have shown that this causal relationship does not exist and that energy consumption is rather neutral.

However, whereas the causal relationship between economic growth and changes in energy prices has been well studied, the role of fuel price fluctuations in influencing demand has received little attention.

Studies conducted by Blain and Feijiang (1996) on the short- and long-term effects of changes in fuel prices on consumer consumption are relevant in this regard. Similarly, see Hamdani's (2009) research on the links between diesel fuel prices and fuel consumption (diesel fuel, petrol, and LPG).

Our study aims to fill this gap by addressing an issue that we believe relevant to our field of study, namely the impact of the pricing policy implemented by Algerian public authorities to direct demand for fuels toward relatively clean and readily available products.

It is part of Algeria's efforts to respect its commitments to the climate change agreements and to replace domestic demand for petroleum products with the LPGC.

3. Pricing policy of energetic products in Algeria

The post-independence period's low pricing policy was an economic development axis. However, negative effects on the national economy, particularly waste and overuse of energy, as well as on the environment because of their "greenhouse effect" gas emissions, have been observed.

In this context, a new pricing policy has been implemented with the following objectives:

- maximizing state revenue from hydrocarbons and distributing it according to the country's economic and social choices;
- improved use of Algeria's various energy sources;
- increased operator revenue;
- combating overconsumption;
- The gradual elimination of implicit subsidies and their replacement with direct subsidies to benefit activities or groups in need of assist.

Since the 1990s, energy product pricing has been oriented toward price transparency.

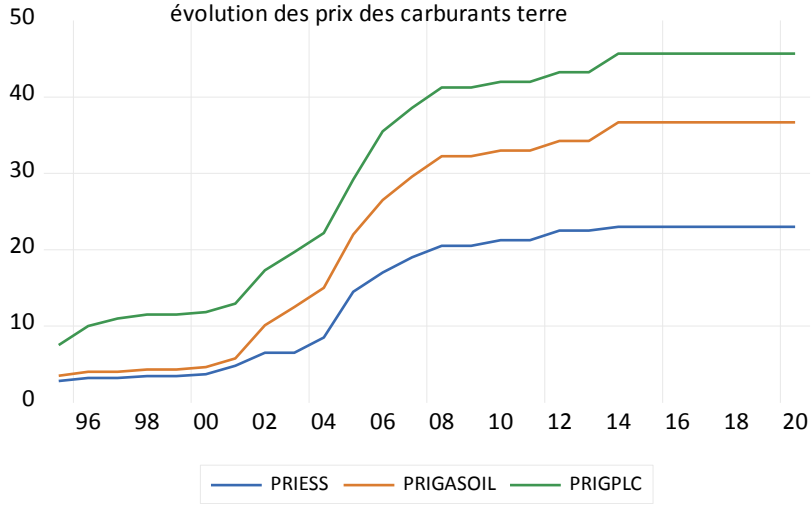
This strategy is based on getting the prices right, recouping petroleum revenue, and encouraging rational energy consumption.

Taking long-term trends in the national supply of various forms of energy (crude petroleum, condensate, refined products, natural gas, and LPG) into account, pricing policy seeks to adapt gradually the national economy to the cost and price conditions practised on the international market. The goal is to ensure a sufficient level of investment to increase supply capacity to meet national demand. Furthermore, the practice of price transparency as a long-term goal aims to combat consumption waste of some low-value-added products.

This policy is consistent with the goals of national energy policy, which seeks to rationalise the use of various available resources, particularly petroleum products, as primary sources of the country's currency and to shift consumption toward more environmentally friendly products.

This policy has resulted in successive price increases for the most polluting fuels (petrols, diesel fuel) to reduce consumption and shift demand toward renewable or less polluting energy sources such as LPGC/CGN, as seen in the graph below:

Fig.1. Annual average fuel prices from 1995 through 2020.



Source: *By authors according to Naftal data.*

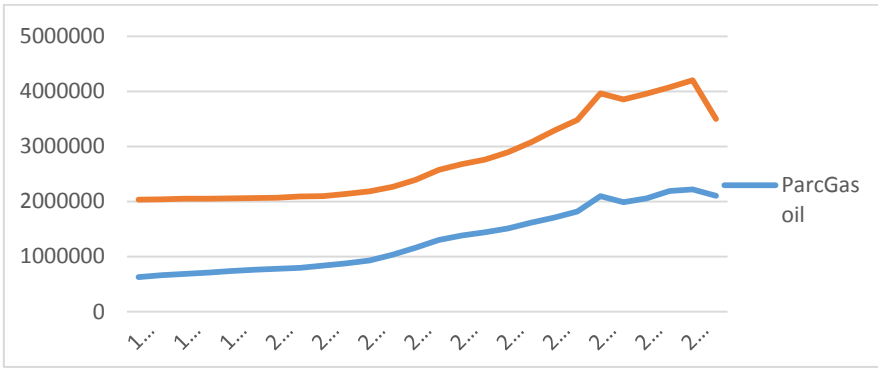
Indeed, as shown in the previous figure, fuel prices fluctuated significantly during the first phase (1985-1998). Diesel prices increased from 7.5 DA at the pump in 1995 to 11.75 DA in 1998. The same is true for petrol, which increased from 16.13 DA in 1995 to 17.83 DA and 20.83 DA in 1998.

However, the most important increase in terms of margin is recorded by the LPGC, which rose from 4 DA in 1995 to 7.2 DA in 1998.This rise can be explained by the fact that the environment was not yet a major concern at the time. During the second period (1999-2005), we see continued growth, albeit at a slower rate than in the previous period, with the LPGC price remaining unchanged. With the rise in oil prices during the third period (2005-2015), the government chose fuel price stability because of the subsidypolicy. However, the intention to lower demand for polluting fuels (petrol, diesel) and redirect it to LPGC drove governmental authorities to raise their prices beginning in 2016.

4.National automotive fleet evolution by energy source

The liberalization of the transportation sector, which followed the public sector's reforms of the road transportation sector in the 1990s and resulted in the liberalization and demonopolization of passenger and merchant transportation activities. As well as the ease of access to consumer credit granted to households in recent years for the purchase of personal vehicles, are all factors that have contributed to the decline.Because of this reform, the number of tourist vehicles has increased significantly in recent years, as seen in the Figure below:

Fig.2. Evolution of the automotive fleet by energy type(1995 to 2020



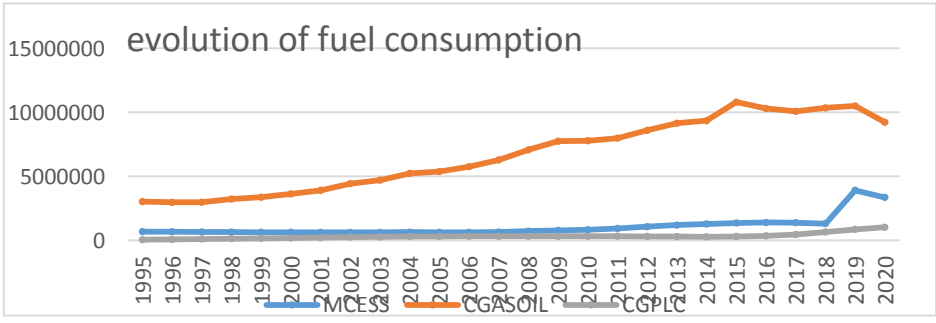
Source: *By authors according to Naftal data.*

The analysis of the evolution of the national automotive fleet by energy source reveals a strong dominance of petrol and diesel vehicles. Indeed, vehicles with petrol engines account for 61% of the national automotive fleet, whereas vehicles with diesel engines account for 39% in 2019, implying a significant increase in the use of final energy products, mostly petroleum products.

5. Evolution of fossil fuel consumption

The examination of the evolution of fossil fuel consumption has revealed the dominance of petrol and diesel (see graph 03)

Fig.3. Evolution of NAFTAL consumption by product line (MU: MT)



Source: *By authors according to Ministry of Energy and Mines,1995-2020.*

Indeed, the Algerian market for fossil fuels is characterized by the consumption of petrol (normal petrol, premium petrol, and unleaded petrol), diesel, and, to a lesser extent, LPG fuel.The graph shows that diesel consumption (normal, premium, and unleaded) increased from 204,935 MT in 1995 to 3.9 MT in 2019, i.e., an increase of 90.30%.

This increase is explained by the sustained growth in economic activity, particularly in the industrial and transport sectors, and the improvement in household incomes, which has led to an increase in the number of cars on the road and low fuel prices.

However, beginning in 2016, we see a "-4%" decrease in petrol consumption, with consumption falling from 4.1 million tons in 2016 to 3.93 million tons in 2018. The price of pump petrol has risen from 23 DA to 30.29 DA, causing this decrease.

The graph shows that diesel consumption increased positively between 2010 and 2018, despite an increase in diesel pump prices in 2016, which increased from 13.7 DA in 2010 to 20,42 DA in 2016. Despite its technical and economic advantages, LPG fuel consumption remains minor, accounting for only 2.4% of the fuel mix in 2016, despite its high availability in comparison to other fuels.Between 2015 and 2020, LPG consumption increased significantly, rising from 350 000 tons in 2016 to 1.2 million tons in 2020[1] , representing a 36% average annual growth rate. This growth is attributable to the stability of the LPG price, which is accompanied by an increase in the prices of other products, as well as a public awareness campaign about the use of less polluting energy sources and the expansion of LPG sales points.

6. Econometric study:

In this part of study, we will provide the econometric method we used to answer the issue posed (the impact of pricing policy on LPGC use over the short and long term), as well as different data sources.

Nevertheless, the study's database is an amalgam of annual chronologies derived from various sources and originating from several energy-related organizations, including Naftal, the Ministry of Energy, and ARH. **We have endogenous variables:** (average gasoline price, diesel price, gasoline automotive fleet, GDP). The endogenous variable: GPLC consumption.

6.1. Justification of chosen model

In our study, we chose the ARDL (Autoregressive Distributed Lag) model developed by Pesaran and Shin (1999) and expanded by Pesaran, Shin, and Smith (2001). This choice is justified by the fact that it allows for the treatment of both the short-term effect and the long-term dynamics of series integrated into different orders I(0) and I(1) (Emeka Nkoro1 and Aham Kelvin Uko2, 2016), but not in order 2. However, we obtained better estimates from small samples. Furthermore, the ARDL estimation model does not necessitate the inclusion of several explanatory variables in the model because delayed dependent variables might serve in lieu of omitted variables in some cases. As a result, this approach can be used even if the independent variable does not cause an instantaneous fluctuation in the dependent variable, as predicted by the theoretical model.

To recap, ARDL models are a combination of autoregressive models (AR) $Y_t = f(X_t, Y_{t-p})$ and models with echeloned or distributed delays (lag) in the form $Y_t = f(X_t, Y_{t-q})$

The combination of the two models results in the general form of the ARDL model shown below (Kuma, 2018):

$Y_t = f(X_t, Y_{t-P}, X_{t-P})$, with the explicit form written as follows:

$$Y_t = \varphi + \sum_{i=1}^{p} a_i Y_{t-i} + \sum_{J=0}^{q} b_j X_{J-t} + \varepsilon_t$$

With $\varepsilon_t \sim (0, \sigma)$: error term; «$b_0$ » reflects the short-run effect of X_t on Y_t If we consider the following long-run or equilibrium relationship «$Yt=k+\emptyset Xt+u$ », we can calculate the long-run effect of X_t on Y_t (i.e. «$\emptyset$») as follows: (Kuma, 2018)

$$\phi = \sum_{j}^{q} b_j \Big/ \left(1 - \sum_{i=1i}^{p} a_i\right)$$

To determine the optimal offset (p, q), the information criteria (AIC, SIC and HQ) must be used, choosing the minimum of these criteria when estimating the dynamic model.Their values are calculated as follows:

AIC $(p)=log|\Sigma| +2Tn2p$

$A(p)=log|\Sigma| +LogTTn2p$

$(p)=log|\Sigma| +2LogTTn2p$

With:

Σ = variance-covariance matrix of the estimated residuals ; T = number of observations ; p = lag of the estimated model ; and n = number of repressors.

6.2. The study analysis model

In this paper, we attempts to elucidate the impact of pricing policy on GPLC consumption (variable dependent), and for that purpose, we propose estimating the ARDL model:

$$CGPLC = (PRIXMOESS, PRIXGAZ, PARCES,, PIB)$$

The ARDL model's form might well be written as follows:

$$\Delta LCGPLC = a_0 + \sum_{i=1}^{P} a_{1i}\Delta LCGPLC_{t-1} + \sum_{i=0}^{q} a_{2i}\Delta LPRIXMOESS_{t-1} + \sum_{i=0}^{q} a_{3i}\Delta LPRIXGAZ_{t-i} +$$

$$\sum_{i=0}^{q} a_{4i} LPARCES_{t-i} + + \sum_{i=0}^{q} a_{5i}\Delta LPIB + b_1 LCGPLC_{t-1} + b_2 LPRIXMOESS_{t-1} + b_3 LPRIXGAZ_{t-1} +$$

$$+ b_4 LPARCES_{t-1} + + b_5 LPIB_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots (1)$$

With

LPRIXMOESS : Logarithm average price of petrol, (normal, super and unleaded petrol in DA)

LPRIXGAZ : Logarithm price of diesel in DA,

LPARCES : Logarithm of Gasoline Park,

LPIB : Logarithm of gross national product per capita,

LCGPLC : Logarithm of GPLC consumption in MT.

6.3. Results and discussion

For a better application of the ARDL model, we process as follows:

1- Performing the Unit Root Test for time series stationarity;
2- Determination of the optimal number of lags;
3- Perform the Bound Test to establish the long-term relationship;
4- Estimate the long-term and short-run coefficients;
5- Test the stability of the model through residual analysis and the CUSUM and CUSUMSQ techniques. (Brown, Durbin, & Evans, 1975)

- ***stationary test :***

To test the stationarity of the variables, we used the Augmented Dickey Fuller test (ADF). The results are shown in the following table:

Table 1: Stationarity test of series

	level			**1 st Difference**			**report**
	Critical value 5%	ADF Statistic	probability	Critical value 5%	ADF statistic	Probability	
Lcgplc	-1.95	-2.70	0.009	-	-	-	**I(0)**
Lparcess	-3.01	-4.35	0.0029	-	-	-	**I(0)**
Lprimess	-3.001	-3.75	0.01	-	-	-	**I(0)**
Lpib	-2.991	-2.35	0.16	-2.998	-4.61	0.001	**I(1)**
Lprixgaz	-1.956	0.90	0.89	-1.958	-4.39	0.001	**I(1)**

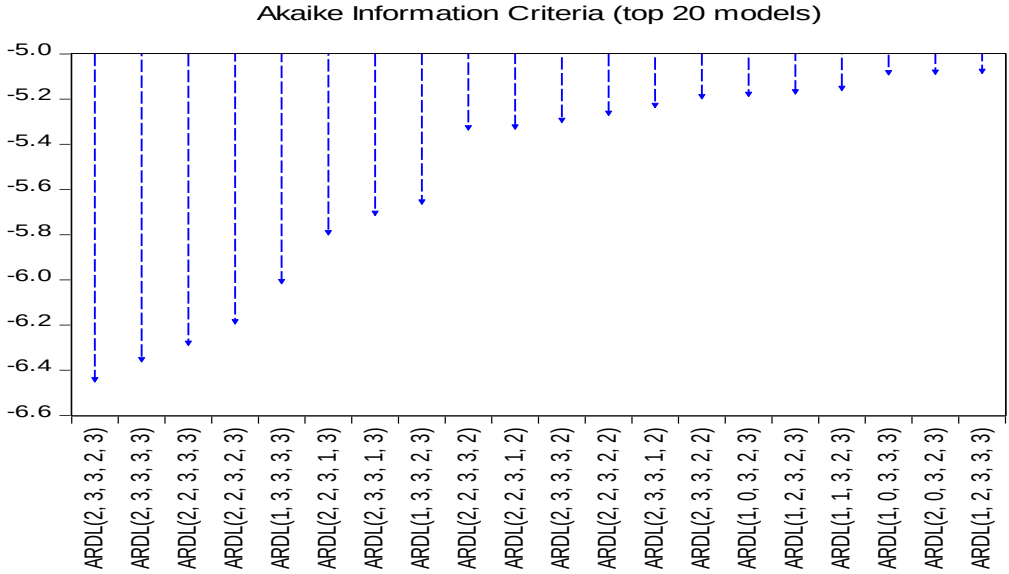
***Source**: by authors from eviews 12*

According to the above table (1), the results of the ADF test at the 5% level indicate that the variables in our study do not have the same order of integration. Three variables (lcgplc, lparcess, and lprimess) are stationary at the level, and two series (lpib, lprigasoil) are stationary at the first difference. All of the series are integrated in the order I(0) and I(1), and none are integrated in the order 2 (I(2)), which meets the requirements of the ARDL model's application.

- ***Determination of the optimal number of lags:***

The information criteria Akaike (AIC) and Schwarz (SCH) allow us to visualize graphically the Akaike values of the 20 optimal ARDL models estimated by the software Eviews, as shown in the graph below

Fig.4.Optimal lags



Source: *by authors from Eviews 12*

According to this graph, the optimal model selected among the 20 presented is 0.490157 according to Akaike (AIC) and Schwarz (SCH). It is the ARDL model (2 ,3, 3 ,2,3) which corresponds to the smallest value of SIC.

- ***Test Bound (Cointegration of Pearson and all)***

According to the results of the test bound obtained in the table (N°2) below, the Fisher statistic (25.15374) is significantly greater than the Fisher critical value of the upper bound at all levels of significance. As a result, we accept the hypothesis of the presence of a short-term and long-term relationship between the explicative factors and the variable to explain.

Table 2. Cointegration test bound

F- Bound test		**Null Hypothesis: No levels relationship**		
Test statist	Value	Signifi	**I(0)**	**I(1)**
F-Statistic	25.15374	10%	1.9	3.01
K	4	5%	2.26	3.48
		1%	3.07	4.44

***Source**: by authors from Eviews 12*

- ***Estimation of the short-term relationship***

According to the results of the short-term estimation (table n°3), the coefficient of error correction CointEq (-1) is significant (0,0001) and negative (--0.490157), confirming the existence of an error correction mechanism and, as a result, the existence of a long-term Cointegration relationship between the variables considered. This means that long-term imbalance correction is possible (0.490157).

Furthermore, the short-term results show that LPGC consumption is positively affected by its past value and that the average price of petrol has a favorable influence on LPGC consumption. A 1% increase in the average price of petrol would result in a 76% increase in LPGC consumption. In addition, we find that average diesel fuel prices in year (t-1) have a

significant negative impact and in year (t-2) have a significant positive impact on liquefied petroleum gas consumption in year (t).
The coefficients of the lagged variables GDP and gas prices are significant with the expected signs for all variables.

Table 3. Results of the short-term estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(CGPLC(-1))	0.761831	0.004133	184.3375	0.0000
DLOG(PRIMESS)	0.824033	0.010604	77.70629	0.0002
DLOG(PRIMESS(-1))	-2.043046	0.022902	-89.20803	0.0001
DLOG(PARCESS)	1.270084	0.015181	83.66420	0.0001
DLOG(PARCESS(-1))	-1.551511	0.035502	-43.70148	0.0005
DLOG(PARCESS(-2))	4.333426	0.038306	113.1266	0.0001
DLOG(PRIXGAZ)	-0.710923	0.010298	-69.03835	0.0002
DLOG(PRIXGAZ(-1))	0.542003	0.011065	48.98310	0.0004
DLOG(PRIXGAZ(-2))	0.055979	0.005846	9.575286	0.0107
DLOG(PIB)	0.075258	0.003619	20.79419	0.0023
DLOG(PIB(-1))	0.352674	0.004305	81.92521	0.0001
DLOG(PIB(-2))	0.048579	0.003659	13.27712	0.0056
CointEq(-1)*	-0.490157	0.004798	-102.1529	0.0001

***Source**: by authors from Eviews 12*

- ***Estimation of long- termRelationship***

The estimation of the long-term relationship, shown in Table (4), reveals that the signs of the obtained results are significant in the same way that those of the short-term relationship, with the exception of the variable (parcessen). The factors (PRIMESS, LGDP) have a significant positive effect on LPGC consumption. However, the factors (parcess, pricegaz) have

a significant negative impact on LPGC consumption.The increase in (PRIMESS, GDP) of one unit results in a change in LPGC consumption of 6.02 and 0.32, respectively.Furthermore, increasing the fraction of a unit reduces LPGC consumption by 3.

The only variable in the model that has a significant negative effect is the petrol automotive fleet (parcess); this variable has a long-term influence but has a negative sign in contrast to its positive sign in the short run.

Table 4. Results of long-term estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(PRIMESS)	6.027045	0.199932	30.14553	0.0011
LOG(PARCESS)	-1.096753	0.076654	-14.30777	0.0048
LOG(PRIXGAZ)	-3.009065	0.162819	-18.48099	0.0029
LOG(PIB)	0.325234	0.050758	6.407588	0.0235
C	13.25742	1.251026	10.59724	0.0088

EC = LOG(CGPLC) - (6.0270*LOG(PRIMESS) - 1.0968*LOG(PARCESS)
-3.0091*LOG(PRIXGAZ) + 0.3252*LOG(PIB) + 13.2574)

***Source**: by authors from Eviews 12*

- ***Test on the residuals of the ARDL model***

We used several tests to determine the robustness of our ARDL model (see Table N°5). The results show that their probabilities are greater than 0,05, allowing us to accept the H0 hypothesis for each test. This means that the errors in our ARDL model (2,3,3,2,3) are not auto-correlated, are normally distributed, and have a constant variance, indicating that our model is well specified.

Table 5. Test of robustness of the model

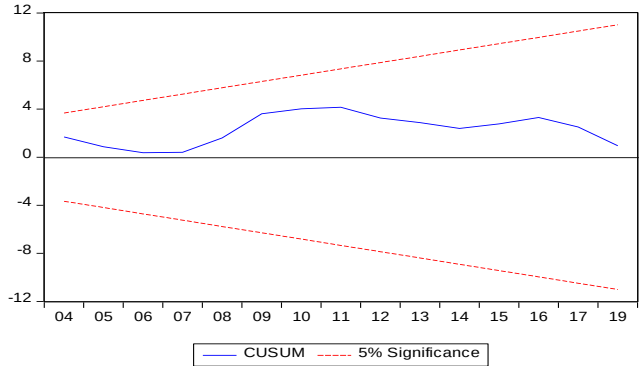
Hypothesis	Test applied	Results (probabilities)
Autocorrelation	Breusch-Godfrey	1.156771 (0.5610)
Normality	Jaque –Bera	1.156771 (0.5610)
Heteroscedasticity	ARCH	4.010785 (0.0614)
Specification	RamseyRest	0.232721 (0.7139)

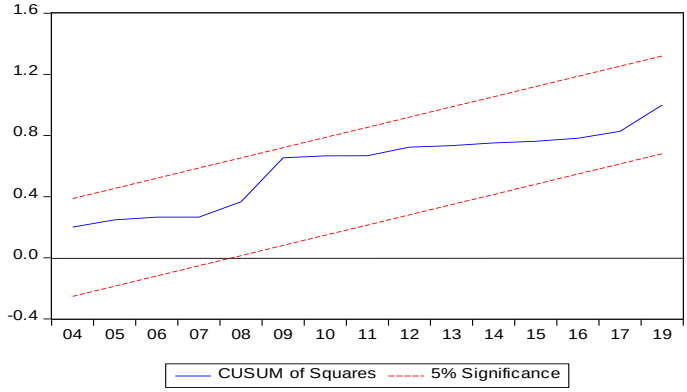
Source: By authors from Eviews 12

6.4. Stability tests CUSUM and CISUMQ

We conclude that, based on the statistics graphs of CUSUM and CUSUMQ%, that the ARDL parameters are stable since the two diagrams are within the critical limits of 5%.

Fig 5. Stability tests CUSUM and CISUMQ





Source: By authors from Eviews 12

7. CONCLUSION

Since a few years, Algeria has increased its efforts to achieve an energy transition, particularly in the transportation sector, with the goal of directing demand for fuels toward the most pure and readily available products, in this case GPLC. This will allow for the commercialization of petroleum, which is more valuable on the global market and remains our country's primary source of currency.

To that end, the public authorities have used pricing policy as a means of regulation. Our study consists on estimating the effect of variables that may have an impact on consumer preference for the GPL using the ARDL model.

The analysis of the results of this approach's estimation allowed us to conclude that there is a price effect on GPLC consumption in the short and long term, with a consumption record of 1.2 million in 2020. The domestic price variance of other fuels (gasoline, diesel) has had a positive influence on LPGC consumption.

However, the development of the gasoline automotive park as a factor has had a largely negative impact on GPLC consumption. This can be explained by the reluctance of motorists to convert their engines to LPGC due to a lack of conversion stations and a reluctance due to some technical problems encountered by converted engines, as the nature of motorization technology is frequently designed for a single type of fuel. Converting a diesel engine to a gas engine is a difficult and time-consuming process that

needs specialized knowledge. Aside from this difficulty, the current distribution station network does not promote the development of GPLC engines since the stations are not all equipped. Thus, it is necessary to invest in new stations in order to increase the number of sites of distribution.

To summarize, we believe that it is critical for Algeria to continue its energy policy focused on encouraging people to consume the most abundant and least polluting energy sources, such as natural gas. However, in order to achieve the policy's objectives, efforts must be made to develop a manufacturing industry for the equipment required for engine conversion, to develop the CNG network, and to raise environmental awareness among motorists, as well as to think about developing renewable energies that will eventually be able to replace fossil fuels.

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