Determinants of Petroleum Products Export from Niger

DAN BOUGA Boukari
Head of Niger Customs Data Analysis and Reform Unit

Abstract:- This paper aims to define the main determinants of petroleum products export from Niger in the light of the specificity of the country, in order to make recommendations to policy-makers for improving oil revenues.

To carry out this work, we started by interviewing stakeholders in the Niger trade using an interview guide. This was followed by a literature review and exploration of previous empirical work on various studies devoted to the determinants of exports. Finally, statistical data from a number of sources were processed.

The main results, derived from the estimation of the OLS gravity model, show that the factors that strongly influence Niger's exports are transport distance and its economic weight when put in relation to that of trading partners.

The main recommendations towards policy-makers arising from our research are: the creation of a new refinery close to Burkina Faso and Mali, increased oil production and the ongoing improvement of road transport infrastructure.

Keywords:- Determinants Of Export, Niger, Distance, Free-Trade, Gravity Model And Petroleum Products.

I. INTRODUCTION

In this paper, petroleum products are defined as hydrocarbons produced by oil refining in Niger. They include diesel, super fuel and domestic gas. These energy goods have been present in Niger's foreign trade since 2011, particularly with West African countries.

Beyond a region, oil is a product that dominates world trade, despite the many difficulties affecting its production, export and transport. In 2023, trade in petroleum products accounted for 10.68% of world trade (OPEC, 2023). This ever-increasing share is explained by strong demand, estimated by the International Energy Agency (IEA) at 102.3 million barrels per day, leading to global production of 4.75 billion tons (IEA, 2023).

In Niger, oil production reached 6.6 million barrels in 2019, worth 166 billion FCFA. For the time being, only refined products are exported, namely diesel, super fuel and gas. The refinery's production capacity is 20,000 barrels/day, whereas national consumption is 7,000 barrels/day. This leaves an export surplus of 13,000 barrels (EITI, 2020).

Domestic gas production is 44,000 tons per year, whereas the national need is around 3,500 tons. Here too, there is potential for export. Overall, refined oil ranks 2nd in total exports, with a share of 19.46% (EITI, 2020).

The exportable potential of Niger's petroleum products is subject to enormous barriers to exit to other markets. Among these obstacles, some relate to the specific dimensions of oil (political, strategic and geopolitical dimensions) Nayberg R. (1997a), Copinschi (2010) and De Cédric & al (2005) and others to socio-political instability in the sense of Gupta (1991). In addition, commercial costs are also important determinants for the sale of petroleum products in importing countries. For example, an empirical study (Ackah et al, 2013) shows that trade costs in the countries of the Economic Community of West African States (ECOWAS) range from an average tariff equivalent rate of 138.5% to 202.6%. For Niger, this cost is 141.1% tariff equivalent.

While the country hopes to generate additional budgetary resources, other predispositions reduce the contributory capacity of petroleum products in the Niger economy; these are its economic situation, which must be analyzed in terms of GDP, its geographical position, which must be seen in the sense of the country's landlocked status, and its membership of a Regional Economic Community (REC).

This paper aims therefore to identify the main factors encouraging the export of Niger's petroleum products. This will enable us to make recommendations to policy-makers on how to most capitalize on the trade relations between Niger and its partners.

Thus, aware of the pressing need for financial resources to implement the country's development program, we ask the following main question: what are the factors influencing the export trade of Niger's petroleum products?

This question is accompanied by the following hypothesis: the determinants of exports have a significant impact on the volume of Nigerien petroleum products sold for export.

II. LITERATURE REVIEW

With regard specifically to studies of the determinants of trade between states or even within a government entity, several authors have distinguished themselves on the subject matter. Jan Tinbergen (1962), inspired by Isaac Newton's law of gravitation of 1686, succeeded in modeling the factors that justify bilateral trade, such as the economic weight of countries, the distance separating them and historical or cultural ties, i.e. language or membership of a political community. Since then, his model has been widely used to explain bilateral and even multilateral trade.

There is a great range of literature on the factors encouraging trade. The international product life cycle, developed by Vernon (1966), has also contributed to understanding the behavior of firms in the production system and in the conquest of foreign markets. I. Keita (2000), in his analysis of the determinants of Côte d'Ivoire's exports using the basic (gravitational) model, relied on external demand, relative prices and production capacity. J. Lachance (2020), in his research, studied the determinants of wine exports to Canada, highlighting company size, research and development (R&D) and collaborations.

In addition, it is worth noting the work of F. Vaillancourt (1974) on Quebec-Ontario interprovincial trade and the very recent research work of Z. Lynda Safia and H. Souad Akila (2022) on the determinants of Algeria's non-hydrocarbon trade flows. These authors have also used variables traditionally employed to demonstrate the value of bilateral trade, such as GDP, geographical proximity, political, cultural and even historical ties between partner countries.

The analysis of determinants of trade in various sectors is widespread in economic research. The basic principles of this analysis are applicable to all types of products within different entities, since the explanatory variables are virtually the same as long as we rely on the gravity model. Vramah G. (2013), studied the explanatory factors of international trade in environmental goods with GDP, free trade, population size and environmental legislation as variables. His research reinforces the state of knowledge we have just reviewed, which shows a concentration of work on the gravity model.

III. METHODOLOGICAL APPROACH

We have defined variables according to the general objective of the research. However, these variables are inspired by the literature review that enabled us to see the practices of trade evaluation between states.

The empirical model we have chosen is the gravity model of international trade, which is also widely used to model factors that can influence trade.

A. Variables of the Model

The factors that encourage trade between states are not strictly limited to a given list. It's the relevance of these factors that must be taken into account, depending on the purpose of the research. For our purposes, we have selected the following explanatory variables:

➤ *The Economic Weight of Exporting Countries*

Gross Domestic Product (GDP) is an indicator of a country's wealth over a given period. It is most significant in terms of purchasing power when expressed on a per capita basis. External demand for goods is therefore a function of a country's level of economic growth.

➤ *Transportation Distance*

Gravity, expressed in terms of distance in international trade, is a determining factor in foreign trade, particularly for a landlocked country like Niger. Niger's borders are 760 km from the nearest seaport.

Other barriers or stimuli to trade that run parallel to transport, such as the quality of road infrastructure and border-crossing taxes, are not included in the model.

➤ *Free Trade*

Niger is a member of a free-trade zone. This is the Economic Community of West African States (ECOWAS). By virtue of its membership of this set-up, all its products can circulate between member states without payment of customs duties. This variable therefore plays a decisive role in the choice of export countries.

➤ *Belonging to a Linguistic Community*

As much as the distance between countries, language is a vector of trade. Indeed, the international logistics chain is taken over by a multitude of players with distinct interests (government agencies and private agents). Trade being a combination of the movement of people and goods, the language of communication becomes a factor encouraging exchange between these trade actors. Thus, according to (Jean Marcel et al, 2004), through language, identity is established between economic space and linguistic space.

Indeed, communities that speak the same language tend to trust each other. In this way, cultural proximity, particularly linguistic proximity, becomes a determinant of the level of trust that can exist between peoples (Carrère and Masood, 2015).

B. Econometric Model

To define the determinants of Niger's exports, the variables are included in the analytical gravity model, whose regression confirmed the interest of the research.

➤ *Gravity Equation in International Trade*

We have modified the gravity model to include other variables that are likely to influence trade between two countries, such as language and free trade.

➢ *The Equation is Rewritten as Follows:*

$\text{Log}(X_{ij}) = \beta_0 + \beta_1 \log(\text{PIB}PA_i * \text{PIB}PA_j) + \beta_2 \log(\text{distance}_{ij}) +$

$\beta_3(\text{language}) + \beta_4(\text{Free\_trade}) + \xi_{ij}$

Where,
X_{ij} = Total Value of M and X onion between Niger (*i country*) and *j* country;
$\text{PIB}PA_i$ ($\text{PIB}PA_j$) = Gross Domestic Product per capita of i country (j) ;
Distance_{ij} = Distance between Niger (*i* country) and *j* country;
Language = Common language between *i* and *j* countries (dummy variable);

Free-trade = No customs tariffs between Niger (*i* country) and *j* country (dummy variable) ;
ξ_{ij} = term of error.

➢ *Analysis Data*

The data comes from the customs clearance system (ASYCUDA World), for imports and exports. There are also World Bank statistics on GDP and *Comtrade* statistics on international merchandise trade. These are processed using Excel and Stata software for regression.

IV. DESCRIPTIVE STATISTICS

The table below illustrates the export destinations of Niger's petroleum products. Its purpose is to confirm the hypothesis, or not, prior to the estimation results.

Table 1: Main Destinations for Niger Hydrocarbons, from 2018 to 2022 (all HS Codes Combined)

DESTINATION_ COUNTRY	T_HYDROC_EXPORT	VALUE IN CFA FRANCS
Mali	684 465∗	262 945 490 996
Nigeria	434 916∗	157 441 900 175
Burkina Faso	374 445∗	119 350 879 904
Benin	158	5 182 577
Côte d'Ivoire (Ivory Coast)	21	6 693 555
Ghana	9	3 457 458
Chad	3∗∗	956 222
Senegal	2∗∗	768 324

Source: Directorate General of Niger Customs

All the statistical observations in this table show that the choice of export countries is strongly influenced by proximity, tariff preferences, language of communication and purchasing power in the said countries.

We can see that Mali, Nigeria and Burkina Faso (∗) are the preferred destinations for oil from Niger. Not only are they border countries, but Nigerien products are not subject to customs duties when they enter. On the other hand, Chad

and Senegal (∗∗), which are the furthest from Niger, are not well served, which supports our hypothesis.

V. MODEL REGRESSION

The data processed to estimate the model are shown in the table below. The same data also provide primary indications of the determinants of Niger's petroleum products exports.

Table 2: Regression Input Elements

T_HYDROC_EXPORT	LN(Xij)	Dest._Country	Niger _GDP	GDP/Cap._US dollar	LN(PIBi*PIBj)	Distance_km	LN(dist.)	Com_Lang	Free_Trade
374 445	13	Burkina Faso	488.85	680.44688	12.71481	41	4	1	1
158	5	Benin	488.85	1 110.41	13.20454	328	6	1	1
434 916	13	Nigeria	488.85	2 232.94	13.90313	19	3	0	1
9	2	Ghana	488.85	1 647.00	13.59877	1 134	7	0	1
2	1	Senegal	488.85	1 636.89	13.59261	2 240	8	1	1
484 465	13	Mali	488.85	873.79	12.9649	42	4	1	1
3	1	Chad	488.85	754	12.81745	1 159	7	1	0
21	3	Côte d'Ivoire	488.85	1 867.57	13.72445	1 141	7	1	1

Table 3 : Model Regressions Results

Source	SS	df	MS			
				Number of obs	=	8
				F(4, 3)	=	59.12
Model	218.09978	4	54.524945	Prob > F	=	0.0035
Residual	2.76700904	3	.922336347	R-squared	=	0.9875
				Adj R-squared	=	0.9708
Total	220.866789	7	31.5523985	Root MSE	=	.96038

LNXij	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
LNPIBiPIBj	-.8561816	1.339893	-0.64	0.568	-5.120319	3.407956
LNdistance	-2.814123	.2489154	-11.31	0.001	-3.606283	-2.021963
1.LANGUE_COM	.6360076	1.120296	0.57	0.610	-2.929275	4.201291
1.LIBRE_ECHANGE	2.111773	1.338705	1.58	0.213	-2.148584	6.37213
_cons	31.29118	17.04494	1.84	0.164	-22.95343	85.5358

The above table shows the model's OLS estimates based on average data from 2018 to 2022. The estimation results reflect the level of influence of the various explanatory variables on the variable being explained, i.e. export volumes.

It should be noted that the adequation of the model is good. Indeed, we find that Prob > F is equal to 0.0035 and if Prob > F is less than 0.05 the model is good overall.

The R^2 (0.9875) shows the proportion to which the variation in the explanatory variables accounts for the variation in the explained variable. In our case, 98.75% of variation in the explained variable is due to variation in the explanatory variables. The difference of 1.25% is explained by other factors not included in the model.

The coefficients and P-values of the variables allow us to confirm or refute the hypothesis based on the relationships shown by the regression between the explanatory variables and the explained variable.

VI. DISCUSSION OF RESULTS AND RELATIONSHIPS BETWEEN VARIABLES

The model reveals that **GDP** (coefficient -0.85) has a positive but insignificant impact on exports of targeted products, since the P-value (0.56) > 0.05. As this value is close to 1, the null hypothesis cannot be rejected. We can therefore say that GDP/CAP. is a variable that does not interact with exports of petroleum products from Niger. It tends to be ignored. In this case, the hypothesis is not verified.

As for the **variable distance**, it has a coefficient of variation with a highly significant negative sign of -2.81 and a highly significant P-value of 0.001 < 0.05, enabling us to reject the null hypothesis. The negative coefficient of -2.81 means that exports of petroleum products from Niger will decrease by 2.82% by increasing the distance by 1%, keeping all other variables constant. In this case, the hypothesis is verified.

The **variable language** has a coefficient of variation of 0.63 and a P-value of 0.06>0.05, indicating that it does not interact with the variable being explained. As the null hypothesis cannot be rejected, the variable can be ignored. In this case, the hypothesis is not verified.

For the **variable free-trade**, we note a coefficient of 2.11 and a P value equal to 0.21>0.05. The impact is therefore not significant. As the P value is close to 1, the null hypothesis cannot be rejected. For these products, the hypothesis is not verified.

VII. CONCLUSION

The research revealed that exports of petroleum products from Niger are largely influenced by geographical distance and, to a lesser extent, by economic weight. In view of these findings, four important recommendations are made to policymakers.

First, oil production must be increased, not only to improve GDP in relation to exporting countries, but also to better supply nearby countries. Increasing production also means looking for opportunities to export crude oil.

Second, the construction of a new refinery close to the borders of the main export countries, Mali and Burkina Faso, to further reduce transport distances. The current refinery is over 900 kilometers from these countries.

Third, well-adapted infrastructures and means of transport to mitigate the external costs of production. As we have seen, geographical distance plays a major role in trade. The effect of a long distance can be mitigated if the quality of the road infrastructure is good. It is therefore advisable for public authorities to maintain the main export corridors in good condition. Similarly, investors should be given the opportunity to renew their domestic vehicle fleets.

Fourth and last, it is necessary to design an export support mechanism. In addition to the tools offered by commercial banks and insurance companies, many countries have set up mechanisms to support exporting companies. Although they are similar to export subsidies, contrary to WTO rules and subject to retaliation, these mechanisms are becoming more widespread.

As for the shortcomings of this research, there is the unavailability of data to explore other significant variables such as terrorism in the Sahel, tax surcharges and export licenses that affect trade volumes.

The non-accomplished taste of this research is also the lack of evaluation of the interest in trade (gains or losses in monetary value) when acting or not on the variables.

REFERENCES

[1]. Ackah, C., Turkson, F. E., & Opoku, K. (2013). Measuring trade costs in ECOWAS. *Modern Economy*, 4, 56–65. doi:10.4236/me.2013.41007

[2]. Banque Mondiale, *Base de données du programme international de comparaison de la Banque mondiale*, 1990-2021. Récupéré de https://donnees.banquemondiale.org/indicator

[3]. Carrère, C. & Masood, M. (2015). *Poids économique de la francophonie : impact via l'ouverture commerciale*. Revue d'économie du développement, 23, 5-30. https://doi.org/10.3917/edd.292.0005

[4]. Copinschi, P. (2010). Chapitre 2. Le pétrole, un bien commercial soumis aux logiques de marché. *Le pétrole, quel avenir : Analyse géopolitique et économique* (pp. 31-63). Louvain-la-Neuve: De Boeck Supérieur. Récupéré sur https://www.cairn.info/le-petrole-quel-avenir--9782804113148-page-31.htm

[5]. De Cédric de L., Christophe-Alexandre P., Pierre Z. (2005). *Géopolitique du pétrole: un nouveau marché, de nouveaux risques, des nouveaux mondes*, Technip, Paris, 206 Récupéré sur : https://www.google.ne/books/edition/G%C3%A9opo litique_du_p%C3%A9trole/ex9r0Kr-LDcC?hl=fr&gbpv=1&dq=g%C3%A9opolitique+du +p%C3%A9trole+De+C%C3%A9dric+de+Lestrange ,+Christophe-Alexandre+Paillard,+Pierre+Zelenko&printsec=front cover

[6]. Dispositif National de Mise en œuvre de l'Initiative pour la Transparence des Industries Extractives au Niger, (DN/ITIE-Niger), *Rapport 2019*, Novembre 2021, pp. 17, pp. 89

[7]. Gupta, D. K. (1991). *On the Methodology of Constructing a Composite Indicator for Political Instability: A Cross-National Study*. In R. Frantz, H. Singh, & J. Gerber (Eds.), Handbook of Behavioral Economics (Vol. 2A, pp. 151-178). JAI Press Inc

[8]. Ibrahima K. (2000), *Les déterminants des exportations : analyse du cas de Côte d'Ivoire*, Institut Africain de Développement et de la Planification, Dakar, pp 51-68

[9]. International Energy Agency (2023), *CO2 Emissions in 2023 : A new record high, but is there light at the end of the tunnel*? Paris : AIE, février 2024, 24 p

[10]. Jean-Marcel L., Frédéric G., Teresa De S., Marie P., et Michel M. (2004). *Le développement international des entreprises : quelle langue pour quels échanges* ? Presses universitaires de Rennes. Récupéré de https://books.openedition.org/pur/31797?lang=fr#text

[11]. Nayberg, R. (1997a), « *Qu'est-ce qu'un produit stratégique ? L'exemple du pétrole* », Défense nationale, n°2, février, pp. 77-86, Paris. Récupéré sur https://www.defnat.com/e-RDN/vue-article.php?carticle=7095&cidrevue=584

[12]. Organization of the Petroleum Exporting Countries (2023). *OPEC monthly oil market report: December*, Vienna, Autria, pp 72

[13]. Tinbergen J. (1962), *Shaping the World Economy: Suggestions for an International Economy Policy*, The Twentieth Century Fund, New York. Récupéré de https://onlinelibrary.wiley.com/doi/abs/

[14]. Vramah G. (2013). *Analyse des facteurs explicatifs du commerce international des biens environnementaux : utilisation de modèles de gravité*, Université Laval, Québec, pp 7-13

[15]. Zemirline L. et Hamadouche A. (2022) *Étude des déterminants des flux commerciaux et estimation du potentiel d'exportation par le modèle gravitationnel. Application : Exportations hors-hydrocarbures de l'Algérie*, École Nationale Polytechnique, El-Harrach, pp 26-43