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A CGE ANALYSIS OF THE ECONOMIC IMPACT OF OIL PRICE SHOCKS ON THE ALGERIAN ECONOMY

التأثير الاقتصادي لصدمات أسعار النفط على الاقتصاد الجزائري

تحليل باستخدام نموذج التوازن العام القابل للحساب

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Abstract:
The main objective of this study is to show the nature and extent of the impact of oil prices on the Algerian economy. It also tries to find out what the economic position would be, should the oil prices be decrease or increase. In this study, different types of external price shocks are also considered in order to test the response of the economy. Model results indicate that export price shocks in petroleum sectors chow a fall in domestic output and consequently a fall in value added and total employment. Domestic terms of trade of exports

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deteriorate and exports fall. This also causes a fall in GDP, private consumption and total absorption. The government revenue declines and budget deficits worsen.

Keywords: Oil Price, Algerian Economy, CGEM,SAM.

الملخص:الهدف الرئيسي من هذه الدراسة هو إظهار طبيعة ومدى تأثير أسعار النفط على الاقتصاد الجزائري، كما تحاول معرفة ماهية الوضع الاقتصادي، بموجب الزيادة أو الانخفاض في أسعار النفط. في هذه الدراسة، يتم أيضًا الأخذ بعين الاعتبار مختلف أنواع صدمات الأسعار الخارجية من أجل اختبار استجابة الاقتصاد. وتشير نتائج النموذج إلى أن صدمات أسعار الصادرات في قطاع النفط تسهم في انخفاض الناتج المحلي وبالتالي انخفاض القيمة المضافة وإجمالي العمالة، كما تتدهور شروط التجارة الداخلية للصادرات وبالتالي تنخفض الصادرات، ما يسبب أيضا انخفاض في الناتج المحلي الإجمالي والاستهلاك الخاص والاستيعاب الكلي وكذا انخفاض عائدات الحكومة وتفاقم العجز في الميزانية.

الكلمات المفتاحية: أسعار النفط، الاقتصاد الجزائري، نموذج التوازن العام المحاسبي، مصفوفة المحاسبة الاجتماعية.

1- Introduction:

The collapse of global oil and natural gas prices has battered the Algerian economy at a time of degenerating security conditions in Northern Africa, raising concerns about the ability of the OPEC nation to weather theresulting economic, political, and security shocks, and inviting comparisons between the current situation and the catastrophic events experienced by the country during the 1986–1988 oil price collapse and in its aftermath. Algeria’s security and energy future are of critical importance: it holds a strategic position in the Western Mediterranean and was one of two North African countries that remained stable during the Arab Spring and the subsequent years. It is also the largest natural gas producer in Africa and a major LNG exporter. It is the number-two exporter of natural gas to Europe and a key supplier of oil to its Mediterranean countries.

The collapse of oil prices that began in mid-2014 has clearly had a major and sometimes destabilizing impact on nations heavily reliant on oil and natural gas export revenue. Algeria is no exception, and its ability to withstand the economic blow could have major implications for the world and especially Europe, the nation's largest trading partner, the top consumer of its oil and gas exports, and its neighbor in the Mediterranean.

The Algerian economy is in a far better situation today to weather the oil price collapse than in the mid-1980s and 1990s. However, while the current economic difficulties have slightly shifted the balance of power infavor of the reformers, the ability of the government to withstand the crisis over the near term encourages only modest political and economic reforms, such as passing a restrictive and moderately reformist budget, and somechanges to the Algerian economic model. More expansive reforms, especially in the energy sector, are needed for the longer-term benefit of the country.

Since early 1980s, a massive amount of work has been done using this modeling technique with the help of sophisticated computer softwares, such as GAMS, and General Algebraic Modelling Package (GAMPACK) etc. Area of application of this modeling technique has been expending and the application of it in explaining environmental issues is more frequent now. For example, (THIELE and Wiebelt, 1993, pp502-531) have used CGE model in explaining the causes of over exploitation and depletion of rain forests in Cameroon. (Wiebelt, 1994) has explained the role of macro-economic, sectoral, and regional policies to protect the rain forests in Brazil with the help of a CGE model.San, (Lofgren and Robinson, 2000) have also used a CGE model to analyse the impact of tax policy on the forestation in Sumatra regional economy, Indonesia. Some of the studies similar to the model developed for this study purpose are presented here briefly. (Lofgran, 2001b) has developed a model for the study of trade policy issues in Malawi. (Wobst, 2001) has developed a model for Tanzania to analyse the impact of structural adjustment policies on overall economic growth, sectoral performance, welfare, and income distribution, in this study, trade and exchange rate policy simulations were carried out with special emphasis on agriculture. (Sapkota and Sharma, 1999) have presented a CGE model for Nepal where impact of trade policy liberalization on different household groups in analyzed. (Siddiqui and Iqbal, 1999) have developed a similar type of CGE model to analyze the impacts of tariff reduction on the income distribution on different household groups.

CGE models are a class of economy wide models that are widely used for policy analysis in developing countries. This paper provides a detailed documentation of an applied Computable General Equilibrium (CGE) model of Algeria. The purpose of this paper is to serve as a source of background information for analysts using the model in the context of the current project and in the future.

Like most other CGE models, the Algerian CGE model is solved in a comparative static mode. It provides a simulation laboratory for doing controlled experiments, changing policies and other exogenous conditions, and measuring the impact of these changes. Each solution provides a full set of economic indicators, including household incomes; prices, supplies, and demands for factors and commodities (including foreign trade for the latter); and macroeconomic data.

The model is structured in the tradition of CGE models of developing countries described in (Dervis, de Melo, and Robinson, 1982). It is a further development of the stylized CGE model found in (Löfgren, 2000). To make it appropriate for applied policy analysis, more advanced features have been added, drawing on recent research at IFPRI (see Harris et al. 2000). Most importantly, the model has an explicit treatment of trade inputs, which are demanded whenever a commodity is distributed domestically as part of international trade (to or from the border) or as part of domestic trade (from domestic supplier to domestic demander). This feature is particularly important in many African settings where an underdeveloped transport network leads to high transportation costs (cf. Ahmed and Rustagi 1993). In addition, the model can handle non-produced imports, i.e., commodities for which the total supply stems from imports. Compared to the stylized CGE model, the current model also has more advanced functional forms for production and consumption to enable it to better capture observed real-world behavior.

The applied Algerian model can be used for analyses in a relatively wide range of areas, including agricultural, trade, and tax and subsidy policies. It is characterized by a detailed treatment of the labor market and households, permitting model simulations to generate information about the disaggregated impact of policies on household welfare.

As part of the project research activities, the model will be used to analyze The Economic Impact of Oil Prices Shocks on the Algerian Economy. The model is built around a 2013 SAM for Algeria. Most of the model parameters are set endogenously in a manner that assures that the base solution to the model exactly reproduces the values in the SAM – the model is "calibrated" to the SAM. (The remaining parameters, a set of elasticities, are set exogenously.) However, as opposed to the SAM, which is a data framework that records payments, the model contains the behavioral and technical relationships that underlie these payments (Thorbecke, 1985).

2-Literatures review:

Many researchers spent a great deal of their time looking into trade and trade related problems. It was only recently during the 1973 oil embargo by Arab countries that some researchers came to realize the effect of differences in oil exports in the light of activities of oil producing economies. The main aim of this paper is to review the related literatures essential to the theme chosen for this research work to this research.

The analysis of the macroeconomic effects of oil price shocks has received considerable attention in the literature (for recent surveys see (Kilian 2008b, pp871–909) and (Hamilton, 2008). Most of it focuses on industrialized countries, particularly on the US. This bias is even more noticeable in cross-country studies (Cologni and Manera, 2008, pp856–888); (Kilian, 2008a, pp78–121); (Peersman and Van Robays, 2012, pp1532-1547) with some notable exceptions such as (Abeysinghe, 2001, pp147 – 153), (Cuñado and Pérez de Gracia, 2005, pp65–83) and (Cuñado et al. , 2015, pp867-879) who have looked at the impacts of oil price shocks in the Asian region.

Some studies focus on the effects of oil prices under the framework of market structures. The effects of oil price increase on output and real wages have been shown by (Rotemberg and Woodford, 1996, pp549-577) in an imperfectly competitive market scenario. In their study, it has been shown that 1 percent oil price increase contributes to 0.25 percent output and 0.09 percent real wage decline. Moreover, these results have been supported by (Finn, 2000, pp400-416). Finn studies oil price and macroeconomic relationship under perfect competition. According to the author, the adverse effect of oil price increase on economic activity is indifferent to the market structure. Regardless of the structure of the market, perfect or imperfect, oil price increase negatively affects economic activity.

(Guo and Kliesen, 2005, pp669-683) used a measure of realized volatility constructed from daily crude oil future prices traded on the Nymex, and find that, over the period 1984-2004, oil price volatility has a significant effect on various key US macroeconomic indicators, such as fixed investment, consumption, employment and the unemployment rate.

(Jin, 2008, pp98-111), in a comparative analysis, discovered that oil price increases exert a negative effect on economic growth in Japan and China and a positive effect on Russia. Specifically, a 10 per cent permanent increase in international oil prices is associated with a 5.16

per cent growth in Russian gdp and a 1.07 per cent decrease in Japanese gdp.

(Elmi and Jahadi, 2011, pp627-635) used var approach to analyze the effect of oil price shocks on economic growth fluctuations in selected opec and oecd countries for the period 1970-2008, and found that both opec and oecd countries are affected by oil price shock albeit at different degrees.

(Berument et al, 2010, 149-176) in a study on Middle East and North African countries found the asymmetric effects of world oil price shocks on the gdp of Algeria, Iraq, Jordan, Kuwait, Oman, Qatar, Syria, Tunisia, and UAE to be positive and statistically significant, while positive but insignificant results were reported for Bahrain, Egypt, Lebanon, Morocco and Yemen.

(Farzanegan and Markwardt, 2009, pp134-151) found a strong positive relationship between oil price changes and industrial output growth and real effective exchange rate for the Iranian economy. However, (Lorde et al, 2009, pp. 2708-2716) found that unanticipated shock to oil price volatility brings about random swings in the macroeconomy of Trinidad and Tobago. However, only government revenue and the price level exhibit significant responses, while magnitude of oil price volatility responses tend to yield smaller macroeconomic impacts. Also, Granger-causality tests indicate causality from oil prices to output and oil prices to government revenue. Similarly, (Bekhet and Yusop, 2009) reveal evidence of a stable longrun relationship and substantial short run interactions between the oil price and employment, economic growth and growth rate of energy consumption in Malaysia.

(Chuku et al, 2011, pp. 119-139) studied the linear and asymmetric impacts of oil price shocks on the Nigerian economy for the period 1970Q1-2008Q4 using var model and Granger causality test approach; and found that oil price shocks are not a major determinant of macroeconomic activity in Nigeria in the linear model; while Granger causality results indicate that world oil prices do not influence macroeconomic activity and that non-linear specification results show that the impact of world oil price shocks on the Nigerian economy are asymmetric.

(Lescaroux and Mignon, 2008, pp. 343-380) considered the effect of oil price changes on gdp, cpi, unemployment rate and bond price in opec member countries and some oil importing countries. In two cases, Iran and Saudi Arabia, causality is birectional. For Brazil and Oman causality runs from gdp to oil price. For other cases, oil price change causes gdp change.

(Farzanegan and Markwardt, 2008) analyzed the impact of oil price shocks on Iran’s economy. The study estimated a VAR to analyze the dynamic relationship between oil price shocks and major macroeconomic variables. The study also pointed out the asymmetric effects of oil price shocks. The quarterly data included measures of industrial GDP per capita, government expenditures, inflation, imports, and exchange rate over the period Q2, 1975 to Q4, 2006. The results revealed that positive and negative oil price shocks significantly affect the inflation and the real exchange rate, but have a marginal impact on government expenditures. The results also suggested that positive oil price shocks increase industrial output by decreasing the price of imported inputs and negative oil price shocks reduce industrial output due to the higher price of imported inputs.

(Aye et al, 2014, pp41–47) examined the effect of oil price shocks on the manufacturing production of South Africa by utilizing monthly data on oil prices and manufacturing production over the period February 1974 to December 2012. For this purpose, a modified bivariate VAR, GARCH-in-Mean VAR, and maximum likelihood tests were applied. The results indicated that oil prices negatively affected South African manufacturing production and the response of manufacturing production towards the positive and negative oil price shocks were asymmetric.

(Hamdi and Sbia, 2013, pp118–125) study the dynamics among oil revenues, government spending, and growth in Bahrain. The authors find that oil revenues remain the principal source for growth and the main channel through which government spending is financed. (Dizaji, 2014, pp299–313) examines the effects of oil shocks on government expenditures and government revenues in Iran. The author finds that causality runs from oil revenues to government total expenditures. Their results also reveal that the contribution of oil revenue shocks in explaining the government expenditures is stronger than the contribution of oil price shocks. (Akanbi and Sbia, 2017, pp1–20) find empirical evidence of the effects of fiscal policy on the current accounts of oil exporting countries. (Medina, 2016, pp502–525) study the impacts of commodity price shocks on fiscal policy indicators in Latin American and find that fiscal aggregates rise in response to positive shocks to commodity prices.

3- Structure of the Model

This study is fanatical to estimate impacts (i.e. baseline estimation and simulation
target) of external price shocks on the Algerian economy and quantifies the linkages between recession and economic instability**.** The Algerian computable general equilibrium model is presented in this section, which is a set of non-linear simultaneous equations followed by Lofgren, et al (2002), where the number of equation is equal to the number of endogenous variables. This section introduces the framework of the CGE model and algorithm for solving the objectives. The equations are classified in six different blocks, system constraints block as follows.

3-1. Price Block

The price system of the model is rich, primarily because of the assumed quality differences among commodities of different origins and destinations (exports, imports, and domestic outputs used domestically). The price block consists of equations in which endogenous model prices are linked to other prices (endogenous or exogenous) and to non-price model variables.

Import Price

$$PM_c = pwm_c(1 + tm_c) \cdot EXR \quad (1)$$

Where $PM_c$is import price in LCU (local-currency units) including transaction costs,tm_c is the import tariff rate,pwm_c is the import price in FCU (foreign-currency units),$EXR$is the exchange rate (LCU per FCU).

The import price in LCU (local-currency units) is the price paid by domestic users for imported commodities (exclusive of the sales tax). Equation (1) states that it is a transformation of the world price of these imports, considering the exchange rate and import tariffs plus transaction costs (the cost of trade inputs needed to move the commodity from the border to the demander) per unit of the import.

Export Price

$$PE_c = pwe_c(1 + te_c) \cdot EXR \quad (2)$$

Where $PE_c$the export price (LCU) is,te_c is the export tax rate,$pwe_c$is the export price (FCU).The export price in LCU is the price received by domestic producers when they sell their output in export markets. This equation is similar in structure to the import price definition. The main difference is that the tax and the cost of trade inputs reduce the price received by the domestic producers of exports (instead of adding to the price paid by domestic demanders of imports).

Absorption

The absorptionPQ_cQQ_c by the domestic demanders is the function of quantity supplied to the domestic market can be expressed as:

$$PQ_cQQ_c = [PD_cQD_c + PM_cQM_c](1 + tq_c) \quad (3)$$

Where: PQ_c=composite commodity price, QQ_c= quantity supplied to domestic market,PD_c= domestic price of domestic output, QD_c= quantity of domestic output sold domestically and tq_c= sales tax rate.

Similarly, the domestic output value, activity price and value added can be expressed as:

$$PX_c \cdot QX_c = PD_c QD_c + PE_c QE_c \tag{4}$$

Activityprice

$$PA_a = \sum_{c \in C} PX_{ac}\, \theta_{ac} \tag{5}$$

Value addedprice

$$PVA_a = PA_a - \sum_{c \in C} PQ_c\, ica_{ca} \tag{6}$$

Where: PX_c= producer price, QX_c= quantity of domestic output, PVA_a= value added price,PA_a= activity price, θ_{ac}= yield of commodity c per unit of activity a, and$c \in C$ where C is commodities.

3-2.Production and trade block

The production and trade block covers four categories: domestic production and input use; the allocation of domestic output to home consumption, the domestic market, and exports; the aggregation of supply to the domestic market (from imports and domestic output sold domestically); and the definition of the demand for trade inputs that is generated by the distribution process. Production is carried out by activities that are assumed to maximize Profits subject to their technology, taking prices (for their outputs, intermediate inputs, and factors) as given. In other words, it acts in a perfectly competitive setting. This block defines production technology and demand for factors as well as CET (constant elasticity of transformation) functions combining exports and domestic sales, export supply functions and import demand and CES (constant elasticity of substitution) aggregation functions. This block contains several functions and equations for the production side of the economy as follows:

Activity production function

$$QA_c = ad_a \prod_{f \in F} QF_{fa}^{\alpha_{fa}} \tag{7}$$

Factor demand

$$\mathrm{WF_f WFDIST_{fa}} = \frac{\mathrm{a_{fa} PVA_a QA_a}}{\mathrm{QF_{fa}}} \tag{8}$$

Intermediatedemand

$$\mathrm{QINT_{ca}} = \mathrm{ica_a QA_a} \tag{9}$$

Output function

$$\mathrm{QX_c} = \sum_{\mathrm{a \epsilon A}} \theta_{\mathrm{ac}}\, \mathrm{QA_a} \tag{10}$$

Composite supply (Armington) functions

$$\mathrm{QQ_c} = \mathrm{aq_c} \left(\delta_c^q \mathrm{QM_c}^{-p_c^q} + (1 - \delta_c^q) \mathrm{QD_c}^{-p_c^q} \right)^{\frac{-1}{p_c^q}} \tag{11}$$

Import-domesticdemand ratio

$$\frac{\mathrm{QM_c}}{\mathrm{QD_c}} = \left(\frac{\mathrm{PD_c}}{\mathrm{PM_c}} \frac{\delta_c^q}{(1 - \delta_c^q)} \right)^{\frac{1}{1 + p_c^q}} - 1 < p_c^q < \infty \tag{12}$$

Composite supply for non-imported commodities

$$\mathrm{QQ_c} = \mathrm{QD_c} \tag{13}$$

Output transformation function

$$QX_c = at_c \left(\delta_c^t QE_c^{p_c^t} + (1 - \delta_c^t) QD_c^{p_c^t} \right)^{\frac{1}{p_c^t}} \tag{14}$$

Export-domesticdemand ratio

$$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PD_c} \frac{(1 - \delta_c^t)}{\delta_c^t} \right)^{\frac{1}{p_c^t - 1}} - 1 < p_c^t < \infty \tag{15}$$

Output transformation for non-exportedcommodities

$$QX_c = QD_c \tag{16}$$

Where: QA_c= activity level, $QF_{fa}^{\alpha_{fa}}$= quantity demanded of factor f by activity a,$WFDIST_{fa}$= wage distortion factor for f in a,$QINT_c$= quantity of c used in activity a, WF_f= average wage (rental rate) of factor f,ad_a= production function efficiency parameter,ica_a= *quantity of c as intermediate input per unit of activity a,*qg_c *= government commodity demand,*δ_c^q*= share parameter for composite supply (Armington)function,*δ_c^t*= share parameter for output transformation (CET) function,*p_c^q*= exponent for composite supply (Armington)function,*at_c*= shift parameter for output transformation (CET) function, ,*p_c^t*=exponent for output transformation (CET) function* and$f \in F$ is the fictional from where F is factors with f being labor or capital.

3-3.Institution block

This block consists of equations that map the flow of income from value added to institutions and ultimately to households. These equations fill out the inter-institutional entries in the SAM (Social Accounting Matrix of Algeria. This block contains several functions and equations for the institution side of the economy as follows:

Factor income

$$YF_{hf} = shry_{hf} \sum_{a \in A} WF_f WFDIST_{fa} QF_{fa} \quad (17)$$

Non-governmentdomestic institution

$$YH_h = \sum_{f \in F} YF_{hf} + tr_{h,gov} + EXR \cdot tr_{h,row} \quad (18)$$

Household consumption demand

$$QH_{ch} = \frac{\beta_{ch}(1 - mps_h)(1 - ty_h)YH_h}{PQ_c} \quad (19)$$

Investmentdemand

$$QINV_c = qinv_c \cdot IADJ \quad (20)$$

Government revenue

$$YG = \sum_{h\in H} ty_h \cdot YH_h + EXR \cdot tr_{gov,row} + \sum_{c\in C} tq_c \left(PD_c QD_c + PM_c QM_c\right) + \sum_{c\in CM} tm_c EXR \cdot pwmc_c \cdot QM_c + \sum_{c\in CE} te_c\, EXR \cdot pwe_c \cdot QE_c + ygi \qquad (21)$$

Governmentexpenditures

$$EG = \sum_{h\in H} tr_{h,gov} + \sum_{c\in CE} PQ_c \cdot qg_c \quad (22)$$

Where : YF_{hf}= transfer of income to h from f,WF_f= average wage (rental rate) of factor f,، $WFDIST_{fa}$= wage distortion factor for f in a,QF_{fa}= quantity demanded of factor f by activity a, YH_h= income of h, $tr_{h,gov}$= government transfer from household,QH_{ch} = quantity of consumption of commodity c by h, $QINV_c$= quantity of investmentdemand, $IADJ$= investment adjustment factor, YG= government revenue, $shry_{hf}$= share of the income from factor f in h,mps_h= share of disposable income to savings,ty_h= rate of income tax for h,$qinv_c$= base-year investment demand,$tr_{gov,row}$= government transfer to rest of the world and qg_c= government commodity demand.

3-4.System constraints block

This block defines the constraints that are must be satisfied by the economy as a whole. The model's micro constraints apply to individual factor and commodity markets. The system constrains in an economy as follows:

Factor markets

$$\sum_{\propto\in A} QF_{fa} = QFS_f \qquad (23)$$

Composite commoditymarkets

$$QQ_c = \sum_{\propto\in A} QINT_{ca} + \sum_{h\in H} QH_{ch} + qg_c + QINV_c \qquad (24)$$

Current account balance for ROW

$$\sum_{c\in CE} pwe_c \cdot QE_c + \sum_{i\in I} tr_{i.row} + TASV = \sum_{c\in CM} pwm_c \cdot QM_c + irepat + yfrepat_f \qquad (25)$$

Savings-Investment balance

$$\sum_{h\in H} mps_h \cdot (1 - ty_h)YH_h + (YG - EG) + EXR \cdot FSAV = ygi + EXR \cdot irepat + \sum_{c\in C} PQ_c \cdot QINV_c + WALRAS \qquad (26)$$

Price normalization

$$\sum_{c\in C} PQ_c \cdot cwts_c = cpi \qquad (27)$$

Where: QFS_f*= supply of factor f,*$QINT_{ca}$*= quantity of c used in activity a,*$FSAV$*= foreign savings,*$irepat$*= investment surplus to ROW,*$yfrepat_f$*= factor income to ROW, EG= government expenditure,walras= dummy variable,* $tr_{i.row}$*= transfer to institution to ROW,cpi= consumer price index,*$cwts_c$= commodity weight in CPI.

The basic model of my study consists 14 sectors, 4 institutional agents, two primary factors production, and the rest of the world (ROW). The 14 sectors where aggregated from the 2013 Algerian Input-Output table that initially comprised of 22 sectors. The benchmark model representing the baseline economy is constructed using the social accounting matrix of Algeria 2013 as shown in Table 1. For the sectors, each sector is assumed to produce a single composite commodity for the domestic market and for ROW. There are four domestic final demand sectors. They are household, enterprise, government and an agent that allocate saving over investment demand from all production sectors. These institutions obtain products from both domestic production sectors and ROW (imports).

All producers are assumed to maximize profits and each faces a two-level nested Leontief and Cobb-Douglas production function (Lofgren, et al, 2002). Each commodity is produced by Leontief technology using intermediate input from various production sectors and primary inputs (labour and capital). The primary inputs are determined by Cobb-Douglas production function. To capture features of intra-industry trade for a particular sector, domestic products and products from ROW within the sector are assumed to be imperfect substitutes and their allocations are determined according to Armington CES (constant elasticity of substitution) function. On the supply side, output allocation between the domestic market and ROW are according to constant elasticity of transformation (CEF) function. On the demand side, a single household is assumed. The household is assumed to maximize utility according to Cobb-Douglas utility function subject to income constraint. Consumption demand for a sector's product is also a CES function of the domestically produced and imported product. Government expenditure is specified as exogenously determined. Sectorial capital investments are assumed to be allocated in fixed proportions among various sectors. In terms of macroeconomic closure, investment is saving-driven and capital is assumed mobile across activities and fully employed. Labor is also fully mobile at fixed wage. Both factors are available in fixed supplies. Factor incomes are distributed to household and enterprise on the basis of fixed shares (derived from base-year data). Outputs are demanded by the final demand agents at market-cleaning prices and exchange rate is assumed flexible.

4- Simulation design and model results

4-1. Description of the simulation

This section presents the results obtained from different policy simulations carried out using the CGE model developed for this study purpose. The simulations carried out are mostly based on the realistic situation of the economy and tried to fit with the trend of the economy.

The Scenario 1 is accordingly designed to analyse sector specific export price shocks for petroleum, which has special policy implication for the economic sectors performance. Given the importance of the hydrocarbon sector in the Algerian economy. We used the model to shock in the export price of oil, by making two types of simulation; the former is the rise of price by 15 percent, while the second simulation relates to decline prices of oil by 45 percent.

Table 1: scenario codes and definition of the simulation

Scenario codes	**Simulation specifications**
Scenario 1	Petroleum price shock in the international market
Scen 1a	Increasing the world price of Oil (hydrocarbons sector) by 15 percent.
Scen 1b	Decreasing the world price of Oil (hydrocarbons sector) by 45 percent.

4-2. Model results and discussion

A CGE model is used to analyse Algerian's economic situation if the Oil Prices system is change and how the economy could react with different external shocks. The principal database for the model is the input output table of Algeria for 2013 (table 01 in the annex), from which 38x38 social accounting matrix is construction using other data.

Model results (see the annex) indicate that by the increase in the world price of oil by 15 percent, led to increased production in most sectors, where the total increase was estimated at 2.3 percent, as well as an increase in total imports increased by 13.4 percent, while total exports known deficiency causing a deficit in the trade balance was estimated at 7.25 percent, while the impact on most economic variables are positive, where it knew an increase and improvement, such as, government income, private consumption and total investment that increased by 3.69, 8.71 and 9.35 percents respectively. While the drop in oil prices by 45 percent, resulting a decline in production in all sectors , total decrease with about 4.58 percent, an increase in exports by 2.98 percent and a decrease in total imports by 28.94 percent, which reflected negatively on all economic variables.

In the end, we conclude that the economic crisis caused by the decline in the global price of oil, Adversely affect the most sensitive economic sectors,, such as the hydrocarbon sector, construction and public works sector, Despite the relative improvement in some sectors such as the agricultural sector, in addition to the deterioration of the indicators that reflect the welfare such as income, consumption and also The high proportion of unemployment.

Fall in remittance work through fall in household’s consumption and results in a fall in demand. Fall in demand brings the prices down and consequently, the production and employment down. Fall in remittances causes a fall in output both aggregate agriculture and aggregate service but the production in aggregate industry increases. Because the fall in output is greater than the increase, the net effect is the fall in aggregate output. Again, aggregate employment also fall as the wage rate and wage proportionality factors are both fixed in the model.

5- Conclusion

Economic performance in Algeria is still highly dependent on hydrocarbure production and productivity growth in agriculture has a highly positive impact on the whole of the economy. This way, the policies that increase investment in agriculture are particularly recommended.

Although reduction of government expenditure is suggested in the structural adjustment
programme, strong government supports for basic agricultural infrastructure is necessary for sustainable agriculture development.

Again, Algeria is a special case in the Arabic countries for its highly densed population and human capital development is one of the few options left for the country for future economic development.

In addition, public expenditure should be increased in order to increase the administrative efficiency. So, government expenditure should be categorized carefully to avoid non-productive expenditure to fit with the changing revenue condition.

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Appendices:

Table 01: Sectoral Aggregation of Algerian Social Accounting Matrix (SAM) for year 2013(DZD millions)

	A	C	F	H	E	Gov	ROW	S-I	Total
Activities		18424125							18424125
Commodities	5615266			5675936	75521	647505	5528757	7168182	24711167
Factors	11567908								11567908
Household			6523080		161431	4227762	125335		11037608
Enterprises			5044828	174538			311503		5842632
Government	1240951	1235901		1694226	2623124	311763	182053		6976255
Rest of the World		5051141		3731	596812	65140			5716824
Saving-Investment				3489177	2385744	1724085	-430824		7168182
Total	18424125	24711167	11567908	11037608	5842632	6976255	5716824	7168182	

Source: Authorscalculations by using IOT (TES) and EOT (TEE) for the year 2013.

Table 02: Effects of a 15% increase in the price of oil on economic variables - Unit (%) -

	Scen 1a
Householdincome	3.716228
Gross domesticproduct	8.553603
Governmentincome	3.69012
Governmentsavings	3.831
Privateconsumption	8.716228
The actualtrade balance	-13.6677
Total employmentrequest	1.35
Total investment	9.3555

Source: Among author's calculations, using simulation results from GAMS software.

Table 03: The effects of a 15% increase in the price of oil on Total of production, imports and exports

- Unit (%) –

	Scen 1a
Production	2.303244
Imports	13.4003
Exports	-2.7281

Source: Author's calculations, using simulation results from GAMS software.

Table 04: Effects of a 45% drop in oil prices on economic variables

- Unit (%) -

	Scen 1b
Householdincome	-12.6754
Gross domesticproduct	-1.8564
Governmentincome	-6.6374
Governmentsavings	-59.8973
Privateconsumption	-1.8675
Total employmentrequest	-0.2536
Total investment	-20.0675

Source: Author's calculations, using simulation results from GAMS software.

Table 05: The effects of a 45% Decrease in oil prices on Total of production, imports and exports
- Unit (%) –

	Scen 1b
Production	-4.5788
Imports	-28.936
Exports	2.9863

Source: Author's calculations, using simulation results from GAMS software.