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The multidimensional impacts of external price shocks on the Algerian economy by using of CGEM

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Abstract
The global economy has gone through the past ten years a severe recession triggered by the financial catastrophe and the collapse of the commercial and industrial activity in the world. This slowdown has weighed its effects on the growth of economies around the world. Algeria, which is not fully integrated into the international economy, knowledge and know likely in the near future indirect effects of the crisis, but in a less severe than in Europe. Algeria has all the potential human and material to be a pivotal country in development at the Euro-Mediterranean and Arab Africa. This requires a development based on a coherence and visibility in the economic policy of the State. We propose in this paper an analysis of the multidimensional impacts of external price shocks on the Algerian economy with particular focus of hydrocarbon revenue. An applied computable general equilibrium model (CGEM) is utilized in my study to simulate the Algerian economic impact by three scenarios. First is food import price increase by 25 percent (scenario1), second is the oil price decrease by 30 percent (scenario2) and the finally scenario that combines scenario 1 and 2simultanneously (scenario 3).The results depict the multidimensional impacts on major macroeconomic indicators from recession to economic instability. My results indicate that the price catastrophe either in scenario 1 or 2 or in scenario 3, depress overall Algerian domestic output and exports. Reduced output also reduces employment thus causing a fall in household's income and consumers can afford less quantity of both domestic and imported goods, in the scenario 1, overall imports decreased by 0.3 percent. But in the scenario 2 and 3 increased by 2.05 and 3.21 percent respectively. Finally results were concerned highlight the structural weaknesses of the Algerian economy remains extroverted and strongly oriented towards the exploitation of unprocessed raw materials.
Keywords: External Shocks, Algerian Economy, Computable General Equilibrium Model

Introduction

The world is in the grip the most severe economic crisis that has seen since the thirties that paralyzed the international financial system. Poly-sectoral crisis: the industries have returned at half-mast, exports of goods and services are in decline, the trade machine is jammed. The market economy is in a dismal state capitalism is broken, the outlook for the least disturbing.

The global food and energy crisis, which peaked in jun-july of 2008, has triggered social unrest in many parts of the world; and in many instances, especially in poorer countries, have rise to political and economic instability (World Bank, 2008). At its peak, oil price had reached as high as US$147 per barrel before declining to about US$110 per barrel in September 2008 (Brahmbhatt and Christiaensen,2008).while price increased rapidly over a short period of time, prices of food commodities, had increase much earlier in 2009. Following the food and energy external shocks, developed and developing countries went into different degrees of recessions that still linger in many countries until today. Some quarters fear that this crisis might recur in the future thus negating any recovery and bringing the world economy into another round of recession.

Impacts of this external price shocks on macroeconomic variables and the relationship of the external shock and financial crisis in the year 2008 and 2009 have been well documented in literatures such as Edwards (2004), Roubini and Setser (2004),Shiller(2008), Posner (2009),Gabraith(2009), Reinhart and Rogoff(2009) and Acharya and Richardson(2010). Some analysts had attributed the cause of the crisis to the large budget deficit in the United State (Acharya and Richardson (2010)). Reinhart and Rogoff (2009),felt that U.S deficit of more than five per cent was a single of a potential crisis and creating a high likelihood of global economic crisis unless these imbalances were reduced. Other causes cited included interest rates, global imbalances for economy wide price spirals, perceptions of risks and regulation of the financial system (Posner, R.A.2009).
The catastrophic depression in many countries though the effectiveness of policies has varied depending on the magnitude of the the response and vulnerabilities of the domestic economy (Shiller, 2008; Posner,2009; Galbraith,2009; Reinhart and Rogoff, 2009; and Acharya and Richardson,2010). The magnitude of the response and vulnerabilities of the domestic economy is subject to appropriate research. I have experienced that the global external price shocks on foods and oil exert worldwide impacts on production, expenditure pattern, trade, and ultimate impacts diverted to global recession, Algeria is not exception. Centering the world's prices catastrophe, this study investigates Algerian experiences from recession to economy instability.

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Due to globalization, the crisis does not spare anyone. It affects rich and poor countries. Algeria has recorded a growth of 2.4% in 2008, seems able to bear the consequences of the global financial crisis. Payment of the debt in advance and the establishment of a reserve fund, the price boom hydrocarbons, while it allows the country to be in a good position to absorb short-term effects of the crisis.

However, Algeria collects nearly 98% of its export revenue from the sale of hydrocarbons, can not be save eternally effects of the crisis, especially if this last remains. Indeed, the country may be affect by the crisis through various factors that are related to hydrocarbon exports. The decline of exports, the result of slowdown in global energy demand, will establish over floors, the depreciation of the dollar. The threatens value of exports are large uncertain in the international market price of oil, and are elements that increase the risk of the economy severely and indirectly affected by the consequences of the financial crisis in the long term.

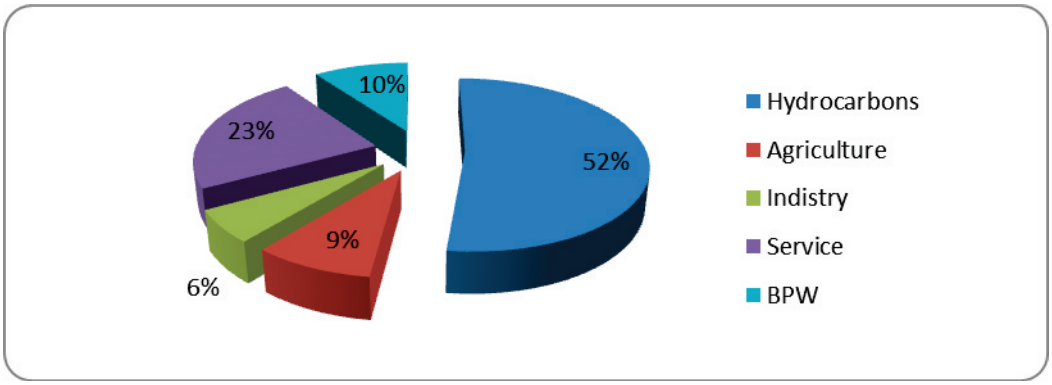
Primary economic resource of Algeria, hydrocarbon accounts for over 50% of the GDP and 98% of Algerian exports. Soaring oil prices between 2006 and 2008 has allowed Algeria to garner input on major currencies. This windfall has helped the reduction of external debt and launches a comprehensive economic development program valued at more than 150 billion U.S. Dollars. With the economic downturn caused by the financial crisis, oil prices, like the prices of other commodities that have suffered from the effects of the downturn through a sharp fall in international markets.

We propose in this study an analysis the multidimensional impacts of external price shocks on the Algerian economy with particular focus on hydrocarbon revenue. This interest the evaluation of the impact of external price shocks on the Algerian economy, I utilized a computable general equilibrium model (CGEM) in my study to simulate the Algerian economic impact by three scenarios. First is food import price increase by 25 percent (scenario1), second is the oil price increase by 30 percent (scenario2) and the finally scenario that combines scenario 1 and 2simultanneously (scenario 3).

1-hydrocarbons in the Algerian economy

The Algerian economy is mainly based on the exploitation of hydrocarbons. The petroleum is the resource almost unique of the country. It is the main source of income (98% of Algeria's total exports). During the last decade, hydrocarbon revenues have funded various stimulus programs and significantly reduce the country's external debt. And gross domestic product (GDP) remains strongly influenced by the behavior of the production in the hydrocarbon sector, given the importance of this sector in the GDP.

Figure 1: The contribution of the Hydrocarbons to GDP in 2007



Also, the hydrocarbons revenues contribute significantly to the state budget through the oil taxes. Thus, during the last decade when oil prices showed significant increases (97 dollars on average in 2008), the contribution of oil taxes to the state budget is around 60% (see Fig 2).

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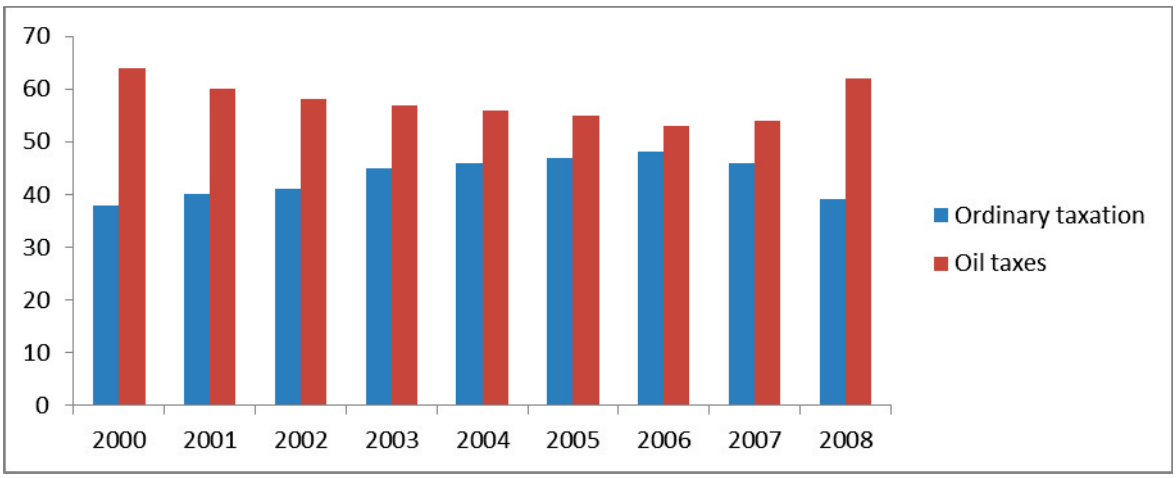
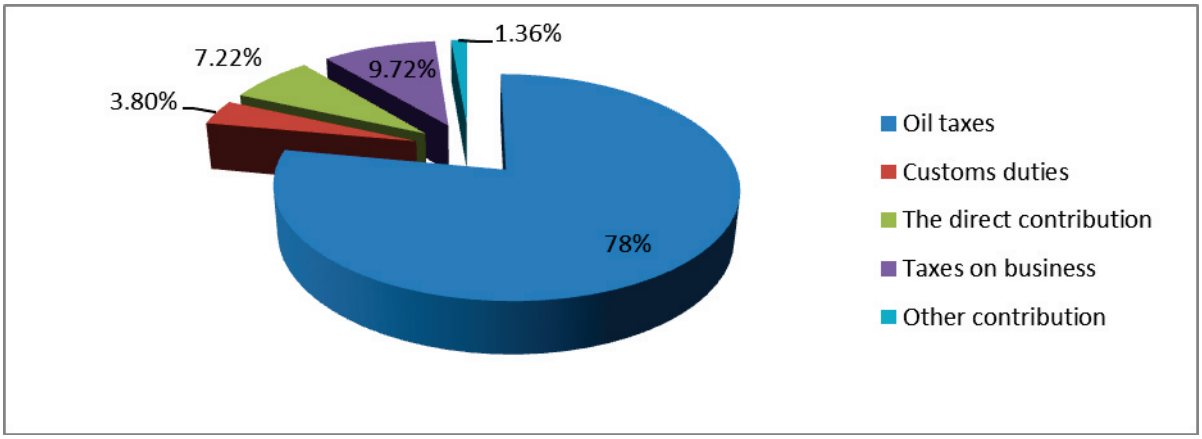
Figure 2: The contribution of oil taxes to the state budget



A careful examination of the contribution of oil taxes during 2007 and taking into account the hydrocarbons revenues paid to the revenue regulation fund, we note that the oil taxes is the main resource of the state revenue compared to other fiscal resources (see fig 3). This shows the fragility of public finances to a sharp fall in oil prices.

Figure 3: The contribution of hydrocarbons to the total revenue of the State in 2007.



2-second approach: the computable general equilibrium modeling

In this approach, we build a computable general equilibrium model to simulate the impact of a 50% drop in oil prices on the Algerian economy.

Structure of the Model

This study is fanatical to estimate impacts (i.e. baseline estimation and simulation target) of external price shocks on 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.

A-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 nonprice model
variables.

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Import Price

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

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

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

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

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

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:

$$PX_c \cdot QX_c = PD_cQD_c + PE_cQE_c \ (4)$$

Activity price

$$PA_a = \sum_{c \in C} PX_{ac}\theta_{ac} \ (5)$$

Value added price

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

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.

B-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:

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Activity production function

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

Factor demand

$$WF_f WFDIST_{fa} = \frac{a_{fa} PVA_a QA_a}{QF_{fa}} \quad (8)$$

Intermediate demand

$$QINT_{ca} = ica_a QA_a \quad (9)$$

Output function

$$QX_c = \sum_{a \epsilon A} \theta_{ac} QA_a \quad (10)$$

Composite supply (Armington) functions

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

Import-domestic demand ratio

$$\frac{QM_c}{QD_c} = \left(\frac{PD_c}{PM_c} \frac{\delta_c^q}{(1 - \delta_c^q)} \right)^{\frac{1}{1+p_c^q}} \quad -1 < p_c^q < \infty \quad (11)$$

Composite supply for non-imported commodities

$$QQ_c = QD_c \quad (12)$$

Output transformation function

$$QX_c = at_c \left(\delta_c^t QE_c^{p_c^t} + (1 - \delta_c^t) QD_c^{p_c^t} \right)^{\frac{1}{p_c^t}} \quad (13)$$

Export-domestic demand ratio

$$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PD_c} \frac{(1 - \delta_c^t)}{\delta_c^t} \right)^{\frac{1}{p_c^t - 1}} \quad -1 < p_c^t < \infty \quad (14)$$

Output transformation for non-exported commodities

$$QX_c = QD_c \quad (15)$$

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.

C-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

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

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Non-government domestic institution

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

Household consumption demand

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

Investment demand

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

Government revenue

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

Government expenditures

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

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 investment demand, $IADJ$= 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.

D-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

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

Composite commodity markets

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

Current account balance for ROW

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

Savings-Investment balance

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

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Price normalization

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

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, four institutional agents, two primary factors production, and the rest of the world (ROW). The 14 sectors where aggregated from the 2009 Algerian Input-Output table that initially comprised of 22 sectors. The benchmark model representing the baseline economy is constructed using the social accounting matrix as shown in Table 2.Sectoral characteristics of the Algerian economy are presented in table 3. 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. Sectoral 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. Appendix a presents full notation of equations of my model.

Analysis of results

Three external shocks experiment were conducted to show impacts on macroeconomic variables. Our investigation experiences from recession to economic instability. The results are summarized in Table 3 through 4. The results are discussed in terms of macro variables and domestic output (Table 3), trade and prices (Table 4).

Simulation 1

Overall the impact of 25 percent increase in world price of food on macro variables (consumption, investment, trade and GDP) is minimal. As shown in Table 4, while these entire variables decline (except export), the decrease are less than three percent. The largest decrease is on investment which recorded a figure of almost three percent. Overall welfare, as measured by GDP and household income, both decline by 2.36 and 1.79 percent respectively .

The 25 percent higher import price result in about 3.1 percent lower in agricultural sector and translates to about 4.31 percent increase in agricultural composite commodity price. The higher price stimulates domestic agricultural output by 0.86 percent. Due to inter-linkages of sectors, price of other composite commodities also increased, except the hydrocarbons sector, resulting in overall domestic output to decline by 0.88 percent, thus lowering household income, direct indication of economic recession. In this scenario, only the service sector is not negatively affected by the food price increase. However, mines and quarries and various industries suffer 2.66 and 3.60 respectively.

Simulation 2

The impact of 30 percent increase in world petroleum price on macro variables is more positives than the impact of food price shock. However, the overall impact can be considered goods. Expect for exportation, all other macro variables rise. Increase in investment and importation are quite significant, i.e, by 17.87 and 6.56 percent respectively. Overall welfare in terms of GDP and household income rise by 7.2 and 5.33 percent respectively.

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The higher petroleum price result in about 20 percent raise Chemical, Rubber and Plastic import and translates to about 7.30 percent increase in its price, inducing domestic output to expend by almost 4.23 percent, the prices of the other composite commodities also all increased. Sectors that are also significantly affected by higher petroleum price are mines and quarries (-3.91percent), industries food (-2.92 percent), various industries (-2.12 percent) and services (-2.08 percent).

Simulation 3

As expected, the impact of simultaneous increase in price of food and petroleum by 25 and 30 percent respectively result in significant positive impact. Except for exportation, all other macro variables raised. As in scenario 2, the increase in investment and import are quite significant, i.e, by 9.18 and 5.05 percent respectively.GDP and household income rise by 4.12 (DZD billion) and 3.10 percent (DZD billion) respectively, implying considerable rise in welfare.

Building materials and chemical, robber and plastic increased by 12.78 and 18.23 percent respectively and corresponding prices increased by 6.95 and 7.43 percent. While the higher price induce expanded production in the services and public works oil and textiles, apparel sector, the same is not true for the agriculture sector. This sector contracted 0.1 percent. Other sectors that are also significantly affected by higher petroleum and food prices are the same as in simulation 2. They are mines and quarries (-3.29), the various industries (-2.64) and the steel industries, mechanical, metallurgical and electrical sector (-1.93); all being major consumers of oil. Overall, domestic output declined by 1.2 percent. Results of all three scenarios indicate that the food and oil price external shocks, as expected, negatively affect economic in scenario 1, welfare, with food price shock generating adverse effect on the contrary that of oil price increase, give positively effect for welfare in the scenarios 2 and 3 and this is because Algeria is heavily dependent on oil revenues in order to revive the economy. Generally, the price shocks, either occurring singularly as in scenario 1 and scenario 2, or simultaneously as in scenario 3, would increase domestic price, depress overall domestic output (respectively by 0.6 percent, 0.9 percent and 1.2 percent) and reduced exports (by 0.4 percent, 1.8 percent and 2.3 percent). Reduced output also reduces employment thus causing a fall in household's income and consumers can afford less quantity of both domestic and imported goods, in the scenario 1, overall imports decreased by 0.3 percent. But in the scenario 2 and 3 increased by 2.05 and 3.21 percent respectively.

Conclusion

In this study 14 sectors static computable general equilibrium model of Algeria is used to analyze the economy wide impact of external shocks. The analysis is based on social accounting matrix of the Algerian economy for the year of 2009. The external shocks are considered in terms of higher world oil and food price. Three simulations were executed empirically. The first two examine the impact of the shocks singularly. The third simulation examines the economy wide impacts of price shocks simultaneously and economic instability. A worrisome outcome in each of the experiment is the large dependent of Algerian economy to the change in the oil price that considered the main resource for the government income. Therefore the effect on the nation welfare. As we have noted in the simulation 2 and 3 the investment have a large raised, Therefore, in this case, reverse any decline in oil prices will have negativity consequences, because this potentially may lead to further reduction in output and income in future time periods. Finally the overall exports also decreased by 0.4 percent, 1.8 percent and 2.3 percent respectively in all scenarios; is the indication of recession and economic instability.

This study is the empirical guideline to show the factual economy wide impacts followed by international recession conditions. Algerian government must reorganize now about the possible alternatives to recover the recession and how external shocks can substitute by effective alternative measures. Therefore, efforts should be made to use the substitute of exported petroleum in agriculture, industry and utility sectors, which could efficiently insulate the economy from the dependence to petroleum sector and to the international price shock in this sector. On the other hand, the adjustment of tariff and export duty could further improve macroeconomic impacts. However, liberalization policy should be carefully implemented with the international market condition or on the basis of effects on internal balance of payment. To mitigate consumer's welfare loss, direct cash payment should be made out to low income consumers as they are the most affected by any food or energy price change.

And finally, measures should be taken to avoid the economy from plunging to a stagflation should be implemented Also; these results could highlight the structural weaknesses of the Algerian economy remains extroverted and strongly oriented towards the exploitation of unprocessed raw materials.

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Table 1: Sectoral aggregation of Algerian social accounting matrix (SAM) for year 2009(DZD thousand)

	A	C	L	C	H	E	G	S-I	Ytax	Stax	Tariff	ROW	TOTAL
Activities		13759741,91											13759741,91
Commodities	4403061,035				3922963,25		1862704,32	4545845,95				3427170,82	18161745,38
Labour	8273639,99												8273640
Capital													
Household				5286439,16	7052,86	29228,06	1102359,17					25387,17	6450466,44
Enterprise				2986615,57		5277,42	542227,60					14000,38	3548120,97
Government	1083040,87				797552,87		701887,72		1984716,8	542063,18	169055,05	598871,74	5877188,24
Saving-Investment					1514413,96	1601408,91	1430023,08						4545845,95
Income tax					205540,09	1779176,70							1984716,8
Seles tax		542063,17											542063,18
Tariff		169055,05											169055,05
ROW		3690885,24	585,26		2943,39	133029,86	237986,34						4065430,11
TOTAL	13759741,90	18161745,38		8273640	6450466,44	3548120,97	5877188,24	4545845,95	1984716,8	542063,18	169055,05	4065430,11	

Source: Author

Table 2: Sectoral characteristics of Algerian economy

Sector	Composition of Output (%)	Per unit value added (%)	Export/domestic Output (%)	Import/ Absorption (%)
01- griculture	9.53	0.78	03	17.34
02- water, energy, building and public works	16.83	0.46	0.0	0.0
03- hydrocarbons	35.08	0.75	79.4	0.58
04- Services and Public Works oil	3.55	0.30	0.0	0.0
05- Mines and Quarries	1.24	0.56	27.4	48.25
06- steel industries, mechanical, metallurgical and electrical	3.18	0.31	5.4	87.38
07- Building Materials	1.93	0.59	2.5	21.56
08- Chemical, Rubber and Plastic	2.07	0.44	0.3	0.18
9- Industries food	5.64	0.37	33.8	70.81
10- Textiles, Apparel	1.36	0.33	0.5	25.82
11- Leather and Shoes	1.05	0.40	0.4	40.78
12-Wood, cork and paper	1.30	0.46	14.3	57.68
13-Various industries	1.48	0.74	2.0	72.77
14- Services	15.76	0.79	0.0	24.68
Total/Average*	100	0.53	27.7	19.1

*Which ever applies.

Source: Author

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Table 3: Simulation results: negative impacts of domestic production and economic recession

Variables	Baseline (DZD thousand)	Simulation 1 Percent change	Simulation 2 Percent change	Simulation 3 Percent change
Private consumption	3922963,25	-1.67	6.89	4.63
Government consumption	1862704,32	-0.75	5.58	3.47
Investment	4545845,95	-2.45	17.87	9.18
Export	3427170,82	0	-5.35	-4.03
Import	3690885,24	-0.3	6.56	5.05
GDP	10067799,1	-2.36	7.2	4.12
Household income	6450466,44	-1.79	*5.33*	3.10
Sectoral domestic production	Baseline (DZA thousand)	Simulation 1 Percent change	Simulation 2 Percent change	Simulation 3 Percent change
01- griculture	1151011,77	0.86	*-0.56*	-0.1
02- water, energy, building and public works	2033166,34	0.00	*0.49*	0.34
03- hydrocarbons	4116948,28	0.00	*0.00*	0.00
04- Services and Public Works oil	307754,559	2.56	*3.63*	3.47
05- Mines and Quarries	28491,1116	-2.66	*-3.91*	-3.29
06- steel industries, mechanical, metallurgical and electrical	263383,697	-0.34	*-1.27*	-1.93
07- Building Materials	112685,895	0.67	*1.12*	1.61
08- Chemical, Rubber and Plastic	129057,256	2.37	*4.23*	4.05
9- Industries food	681425,532	0.98	*-2.92*	-1.81
10- Textiles, Apparel	43940,1791	-0.85	*-0.07*	-0.46
11- Leather and Shoes	6236,34321	0.68	*0.19*	0.77
12-Wood, cork and paper	35938,8739	-0.25	*-0.13*	-0.13
13-Various industries	58365,0766	-3.60	*-2.12*	-2.64
14- Services	4791337,03	1.09	*-2.08*	-2.17
Total	13759741,9	-0.6	-0.9	-1.2

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Table 4: Simulation results: Sectoral export and import

Sectoral export	Baseline (DZA thousand)	Simulation 1 Percent change	Simulation 2 Percent change	Simulation 3 Percent change
01- griculture	2908,28	*4.42*	*-6.72*	-7.63
02- water, energy, building and public works	962,39	*3.30*	*-9.38*	-9.89
03- hydrocarbons	3255221,97	*-0.88*	*-1.98*	-2.14
04- Services and Public Works oil	0	*0*	*0*	0
05- Mines and Quarries	7783,45	*-6.52*	*-11.62*	-10.34
06- steel industries, mechanical, metallurgical and electrical	14192,305	*-3.65*	*-7.15*	-7.56
07- Building Materials	2553,128	*-4.77*	*-9.73*	-9.39
08- Chemical, Rubber and Plastic	43516,74	*0*	*0*	0
9- Industries food	5829,679	*2.91*	*-6.81*	-6.83
10- Textiles, Apparel	154,746	*-2.73*	*-7.03*	-7.91
11- Leather and Shoes	886,45	*-1.46*	*-6.76*	-6.32
12-Wood, cork and paper	698,58	*-3.84*	*-7.54*	-7.04
13-Various industries	27,715	*-2.72*	*-8.92*	-8.14
14- Services	189665,2	*1.57*	*-9.17*	-9.02
Total	3524401	-0.4	-1.8	-2.3
Sectoral Import	**Baseline (DZD thousand)**	**Simulation 1 Percent change**	**Simulation 2 Percent change**	**Simulation 3 Percent change**
01- griculture	248270,5	-3.1	*6.05*	5.67
02- water, energy, building and public works	28086,15	0	*0*	0
03- hydrocarbons	5	0	*0*	0
04- Services and Public Works oil	0	0	*0*	0
05- Mines and Quarries	25966,89	-0.1	*7.43*	7.23
06- steel industries, mechanical, metallurgical and electrical	1900839,33	-2.7	*7.90*	7.06
07- Building Materials	30018,527	-0.8	*13.29*	12.78
08- Chemical, Rubber and Plastic	320356,91	-0.5	*20.00*	18.23
9- Industries food	242644,28	-2.8	*4.73*	3.89
10- Textiles, Apparel	32475,27	-1.2	*7.45*	6.86
11- Leather and Shoes	8777,327	-0.7	*7.72*	7.04
12-Wood, cork and paper	98258,41	-0.4	*8.08*	7.98
13-Various industries	21276,11	-0.6	*5.57*	5.26
14- Services	626797,375	0.3	*5.82*	6.37
Total	3583772	-0.3	2.05	3.21

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Sectoral prices	Baseline	Simulation 1 Percent change	Simulation 2 Percent change	Simulation 3 Percent change
01- griculture	1.00	4.31	*3.25*	4.2
02- water, energy, building and public works	1.00	2.63	*5.30*	4.65
03- hydrocarbons	1.00	-0.3	*6.27*	5.7
04- Services and Public Works oil	1.00	0.5	*6.52*	6.1
05- Mines and Quarries	1.00	1.2	*4.27*	4.8
06- steel industries, mechanical, metallurgical and electrical	1.00	0.8	*3.12*	3.18
07- Building Materials	1.00	1.6	*5.84*	6.95
08- Chemical, Rubber and Plastic	1.00	2.8	*7.30*	7.43
9- Industries food	1.00	1.04	*2.07*	2.2
10- Textiles, Apparel	1.00	0.9	*3.68*	3.77
11- Leather and Shoes	1.00	1.2	*3.66*	3.81
12-Wood, cork and paper	1.00	1.6	*3.93*	3.90
13-Various industries	1.00	1.8	*3.67*	3.87
14- Services	1.00	0.8	*3.83*	3.95

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