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Simulate the effect of tariff customs on the Algerian economy in the light of trade openness using the computable general equilibrium model

محاكاة تأثير التعريفة الجمركية على الاقتصاد الجزائري في ظل الانفتاح التجاري باستخدام نموذج التوازن العام القابل للحساب

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Abstract:

To assess the potential effects of economic policies, such as trade liberalization, quantitative economists rely on statistical modeling and data analysis.

The purpose of this paper is to describe the effect of tariff customs reduction and elimination on some variables of the Algerian economy such as trade (importation , exportation) and domestic production, family consumption, in the light of trade openness using the Computable General Equilibrium Model technique.

The basic data for the model is the table of inputs and outputs of Algeria in 2013, which was identified using the social accounting matrix created using national accounts data.

We have therefore tried to determine how the tariff customs affects the Algerian economy open to trade liberalization shocks, where we used a simulation of foreign policy, tariff reduction / elimination.

The results of the study show an increase in production, exports and imports in most sectors, but government revenues have fallen sharply as a result of trade liberalization,

This deficit resulting from total trade liberalization (trade openness) has been adjusted by raising taxes on income and institutions.

After the adjustment process, the results showed that output and employment were not affected, but private consumption fell relative to its pre-adjustment level.

Key words : Trade openness, Algeria, Tariff customs, Simulation, Computable General Equilibrium Model.

JEL Classification Codes: XN1, XN2

الملخص :

لتقييم الآثار المحتملة للسياسات الاقتصادية ، مثل التحرير التجاري يعتمد الاقتصاديون الكميون على النمذجة الإحصائية و تحليل البيانات.

تهدف ورقة العمل هذه إلى وصف تأثير تخفيض و ازالة التعريفة الجمركية على بعض المتغيرات في الإقتصاد الجزائري كالتجارة (الواردات ، الصادرات) و الانتاج المحلي ، استهلاك العائلات، في ظل الانفتاح التجاري باستخدام تقنية نموذج التوازن العام القابل للحساب (CGEM).

البيانات الأساسية للنموذج هي جدول المدخلات والمخرجات للجزائر لسنة 2013 ، والتي تم تحديدها من خلال مصفوفة المحاسبة الاجتماعية التي تم إنشاؤها باستخدام معطيات المحاسبة الوطنية.

هكذا حاولنا تحديد كيفية تأثير التعريفة الجمركية على الاقتصاد الجزائري المفتوح لصدمات تحرير التجارة ،حيث استخدمنا محاكاة للسياسة الخارجية ، وهي تخفيض / إلغاء التعريفة الجمركية.

تظهر نتائج الدراسة زيادة في الإنتاج والصادرات والواردات في معظم القطاعات ، لكن الإيرادات العامة انخفضت بشكل حاد بسبب تحرير التجارة ، تم تعديل هذا العجز الناتج عن التحرير الكلي للتجارة (الانفتاح التجاري) من خلال زيادة الضرائب على الدخل والمؤسسات.

بعد عملية التعديل ، أظهرت النتائج أن الإنتاج والعمالة لم يتضررا ، ولكن الاستهلاك الخاص انخفض مقارنة بمستواه قبل عملية التعديل.

الكلمات المفتاحية : الانفتاح التجاري ، الجزائر ، التعريفة الجمركية ، المحاكاة ، نموذج التوازن العام القابل للحساب .

تصنيف **JEL :** XN1, XN2

Introduction:

The importance of trade openness for a country has been mentioned by David Ricardo (1817) in his theory of comparative advantages.

The author has shown that international exchange allows a differentiation of the relative costs of production, a reorientation of scarce resources towards the most efficient sectors and an improvement of the well-being of the population.

This theory was later extended by Heckscher and Olin (1933), these authors came to confirm these gains by adding those related to the remuneration of factors of production.

When assessing the effects of trade openness on an economy, Computable General Equilibrium Models (CGEC) are often used. Indeed, they remain the most

appropriate for studying the impact on an economy of macroeconomic policies such as trade policies.

In particular, they make it possible to take into account the interactions between the different sectors of an economy, which is particularly useful when it comes to analyzing the impacts of openness to trade on an economy. They are also more satisfying than partial equilibrium analyzes because they give an overview of the channels through which the implementation of a policy takes place. It seems reasonable to expect that the liberalization process will have positive repercussions on some sectors or some actors of the economy and negative on others.

Most of the Computable General Equilibrium Model (CGEC) used to assess the impacts of trade liberalization policies rely on neoclassical modeling such as that presented in Dervis and all (1982), Lofgren and all (2002), on the model of the International Food Policy Research Institute (IFPRI), or on the EXTER model of Decaluwe (2001). The GTAP model (Global Trade Analysis Project) is also widely used to analyze the impacts of trade liberalization policies, but still relatively little in the Caribbean and Pacific countries of Africa because of its multi-regional structure and the difficulty of recent and reliable data for the countries in this area.

The general equilibrium model is a complex system of mathematical equations illustrating and visualizing the nature and functioning of an economy based on the neoclassical economic theory of general equilibrium, a detailed description of production techniques, consumer behavior and preferences, available resources and needs. Describe the optimal behavior of economic decision-making units or economic units (usually families, businesses, governments and the outside world).

The numerical solution of the model is obtained by using data from the social accounting matrix, an accounting table based on the double input system known in the national accounts for the representation of an economy in a given period of time.

This makes the model computable, and the model system is solved from simultaneous equations in real time using software with clear and easy-to-use language. The computable general equilibrium model is therefore applied to the theory of general equilibrium on the data of the social accounting matrix.

Among these models, the Johansen Leif model in 1960 for the study of economic growth in Norway and the Harberger model in 1962 to study the impact of tax policy on corporate profits in the United States, this approach is used as an analytical tool to study the effects of the implementation of long-term economic policies such as the liberalization of foreign trade, the introduction of a new type of taxation in the tax system and other economic policies.

Since the early 1980s, a great deal of work has been done using this modeling technique using advanced computer programs such as the Comprehensive Modeling System and the General Algebraic Modeling Process (GAMS). Even the small type of general equilibrium models can be calculated, it can also be solved in a framework-based spreadsheet, such as Microsoft Excel.

2 - Social Accounting Matrix:

The social accounting matrix is a complete accounting system to represent a particular economy in a given period, It is an analytical tool in national accounting to measure, present, analyze and interpret the benefits and costs in the economy of a given society, in order to evaluate its performance and determine its contribution to the well-being of society .

As indicated in the United Nations System of National Accounts (SNA 1993), the matrix covers six main types of accounts: factors of production, economic units, economic sectors, products, capital accumulation and the outside world.

It is in the form of a table or square matrix, which gives a complete and numerical picture of the most important macroeconomic aspects of a given economy in a given period of time.

The social accounting matrix belongs to the family of economic tables, such as the table of inputs and outputs, the general economic table, On the one hand, it provides a clear overview of the various transactions and exchanges that take place in a particular economy, while on the other hand, decision makers are provided with an accounting framework for economic policy analysis and easy choice of policy.

Matrix data come from national income accounts, various economic tables such as the table of inputs and outputs, census data, household surveys, public finance and foreign trade statistics, such as the balance of payments.

The United Nations System of National Accounts includes guidelines for building the social accounting matrix.

It is not easy to give a specific concept to the social accounting matrix, but it is a very important accounting framework, because they allow the development of all economic accounts by clarifying the production flows for all industries, factors of production as well as income and expenditure calculations for different economic units.

This is represented by a dual entry system each row of the matrix is represented by row and column, where the row represents the income and the column represents the expenses The total flows of the row must equal the total of the flows in the column.

Although the matrix has a common form and structure, it can be disaggregated and subdivided into sub-accounts or by adding new accounts, depending on the nature of the economy studied and the problem identified, as well as the availability of data and information.

The Social Accounting Matrix was first conceived in the 1960s, a research team from Cambridge University has completed an English economic matrix whose data were used to solve early growth models and used for academic purposes.

The first practical applications of the social accounting matrix date back to the mid-1970s, when a research team from the International Labor Office created a matrix for the Sri Lankan economy under the supervision of economists Richard Stone and Geery Pyatt.

3 - The theoretical structure of the social accounting matrix:

The social accounting matrix is a square table with two entries for a given year , the different accounting flows are recorded from the income and expenditure of the economy studied. Revenues are given in lines denoted by i, Expenses in columns are indicated by j

The internal compatibility of the accounting nature of the social accounting matrix is guaranteed for each account general revenues are identical to overheads.

$$\sum_j t_{ij} = \sum_i t_{ki}$$

Total revenue = Total expenditure

3 – 1 The account of the factors of production: The production factor

account consists of labor and capital and can be divided into sub-accounts. For example, the labor can be divided into skilled and unskilled labor, depending on the requirements of the study and the availability of data.

3- 2 The Account of economic units (economic agents) : This account includes activities for families, Institutions, government and the outside world.

3 – 3 The activity account: Activity account includes revenues from sales of goods and services in domestic and foreign markets, These revenues are spent on the purchase of intermediate goods, raw materials and factors of production, as well as for the payment of taxes.

3 – 4 Account of (goods and services) : The product account represents a department store that buys goods and services from local and foreign production activities and sells them to families, government, institutions and the outside world.

3 – 5 capital accumulation account (investment / savings): The capital account includes the savings of families, corporations, the state and the outside world, expenditures are capital expenditures by gross capital accumulation, inventory changes and funds transferred abroad.

3 – 6 Account of the outside world: Its income includes income from the goods and services account (imports) and transfers by economic units, expenditures include exports and transfers to various economic units .

Thus, the social accounting matrix is an analysis of all the accounting processes that take place during a given period and usually a year.

The information provided by the analysis makes it possible to analyze the impact of economic policies and make the choice easy of policies by decision-makers.

4 - Closing the social accounting matrix:

Different statistical approaches used in creating branch accounts , the institutional sectors translate into a difference between the balances of the different accounts.

The preparation of the various accounts is accompanied by a systematic review of the overall coherence of the system. It is about balancing the supply and use of accounts by balancing the product accounts to reach the final overall balance of the social accounting matrix.

5 - Reconciliation and balancing of the social accounting matrix:

The next step in developing or constructing a social accounting matrix is to balance all the matrix entries generated by the expenditure and revenue calculations, that is, to balance all the total values of the columns and lines.

However, before constructing the exact social accounting matrix that can be considered as the appropriate data set for the computable general equilibrium model, some adjustments have to be made.

In order to align the matrix with the computable general equilibrium model, the aggregate social accounting matrix of an economy is considered an important element before preparing the ground for the discussion of the equations of the basic computable general equilibrium model.

6 - The importance of the social accounting matrix in defining activity multiples:

6 – 1 The Leontief multiplier :

Multipliers measure the impact of additional demand tests and Leonetief multiples that take into account tribal and distant productive links, which are required exclusively for intermediate consumption, It is recognized that each sectoral production requires fixed-rate intermediate consumption noted a_{ij} If we have :

$$X_{ij} = a_{ij} + X_j$$

Or Xij represent production in the sector i sold to the sector j as intermediate consumption and Xj Total production of the sector j.

In this case, we assume that the economy is closed and that final and intermediate demand is satisfied by their local production needs.

The balance between supply and demand in each sector is written as follows:

$$X_i = \sum_{j=1}^{n} a_{ij} X_j F_i$$

Where F is the beam of demand

$$X = AX + F$$

$$(I - A) X = F$$

$$X = (I - A)^{-1} F$$

Where: $(I - A)^{-1}$ is a matrix of Leontief multipliers

7 - The social accounting matrix of the Algerian economy for 2013:

In this section, we will present the social accounting matrix for the Algerian economy in 2013, this year's selection as a reference year is explained on the basis of the availability of data from the input and output tables published by the national statistics office for the year 2013.

7 – 1 Data sources used:

The sources used to construct the social accounting matrix are firstly an input-output table for 2013 which is originally a table representing a balance of resources for the use of goods and services and various data on intermediate consumption and value-added analysis to compensate for wages. This table includes 19 activity sectors according to the functional classification established by the system of Algerian economic accounts as well as a table for the production account and the accounts (operation of the insurance companies - operation of the banks - real estate - public administration).

The second data source used is the 2013 General Economic Table, this table includes four accounts: the production account, the operating account, the income and expenditure account and the investment account according to the Algerian system of economic calculations,

The general economic table for 2013 includes five clients: companies and similar companies, households and individual institutions, public administrations, financial institutions and the rest of the world.

In addition to these two important sources of data in the creation of the social accounting matrix in general, we have also used other publications of the National Office of Statistics as well as reports on the economic situation published by the National Economic and Social Council.

7 – 2 Accounts of the social accounting matrix for the year 2013:

The matrix we built includes fourteen sectoral activities resulting from the 19 activity groups for the 2013 Input-Output Table these sectors are: agriculture, forestry, fishing (01), Petroleum sector (03) As well as the petroleum services and public works Branch (04) .

The industrial sector is composed of a group of industrial branches for the input-output table for the year 2013 means the industries of steel, mechanical, metallurgical and electrical (06), Building materials industry (07) , Industrial Chemical, Plastic and Rubber (09) , Food Industry (10), Industry of Textile,

clothing and socks (11), Leather and footwear industry (12), Manufacture of wood, paper and cork (13), Various industries (14) , Mining and quarrying (05)

Services sector includes transportation and communications (15) , Trade (16) , Hotels, Cafes, Restaurants (17) , Institutional Services (18) , Family Services (19), The last section in the Social Accounting Matrix relates to the sector that combines the Water-Energy Branch (02), Buildings, public works (08).

We explain the selection of this group to the nature of the problem studied, and the nature of the model used, which requires at least ten sectors as well as the nature of the characteristics of the national economy.

The other accounts in the social accounting matrix are the 14 composite products approved for the 14 sectors mentioned above.

The rest of the accounts belong to two accounts: the VAT account, the customs duties on imports, the calculation of the income tax and the remaining accounts for the agents of production: hand, money and capital, and finally a special savings-investment account.

8 - Computable general equilibrium models applied to international trade:

Generally, in terms of international trade, there are two approaches to construct computable general equilibrium models :

The construction of a multi-state model in which each member of the integration structure is modeled in detail and interconnected by trade flows, for example the example of the Bayat and Raownd model in 1984 for Malaysia and the construction of the famous model by Hicks in 1988 in Australia. Kimble and Harrison in 1984 and Morgan in 1989 used multiregional models to analyze tax effects.

Jonas and Halley (1989) also presented a computable general equilibrium model for Canadian provinces geared to the impact assessment of government policies.

Derradov and Starn (1981) also constructed a trade valuation model, the best-known model for the analysis of trade liberalization problems, composed of 34 industrialized countries and other developing countries and has been used to assess the effects of reducing tariff barriers and non-tariff barriers.

Finally, we mention the Mirage model, which was built in 2002 to evaluate the European Union's trade policy with its environment.

Mirage is a multisectoral and multiregional balancing model that includes elements of incomplete competition, product differentiation and foreign direct investment.

It's about building a model for the state where only the most involved partner is modeled, this model can only know the effects of integration by measuring the trade policy of this country towards its partners to include it in the model.

In this section of the models includes the Boadway and Tridenic model (1978) for Canada. and the famous model of Devris, Milo and Robinson (1982) of Turkey.

9 - The structure of the computable general equilibrium model:

The computational general equilibrium model includes four economic units: families, businesses, governments (the state), and the outside world.

Economic units are defined as a group of economic agents who follow identical or similar economic behavior in the exercise of their economic functions.

9 – 1 families: The family is the cornerstone of this sector and consists of a group of people living in a single dwelling: individual institutions are included in this sector, such as small traders, artisans, doctors, lawyers, its main function is the consumption and production of goods and services.

Families seek to maximize their utility, which is a growing function of consumption: the more we consume, the more we benefit, but at higher consumption levels, it becomes more difficult to increase profit by increasing consumption.

The value of income is determined by the value of the work provided by these families, the interest rate,

A typical family is considered to express the rest of all families, or a group of them is taken when they are distinguished in terms of categories in terms of level of education, level of income, nature of work and other standards.

9 – 2 Companies:

Companies are defined as units whose main activity is the production of goods and services (the distinction is made between companies and similar financial and non-financial corporations in accounting systems).

The goal of companies is to maximize their profits, as is the case in global standard models: production functions are used to express the techniques used and to link the inputs of the production process to the factors of production limited to most models of work and capital.

In some models, land, raw materials and other factors are added, when the model is created, these factors are selected according to the desired uses and according to the nature of the economy studied.

9 – 3 Public Administration (Government or State):

Public administrations represent the state or the government, their main role is to provide non-commercial services, free or semi-free and redistribute income through taxes, fees and assistance.

In computable general equilibrium models as in global econometric models, the role of the state is viewed externally from the model, which does not mean that the state does not play a role in the economy, but it has the role of government spending.

9 – 4 The outside world:

The outside world includes a group of non-resident economic units that have relationships with resident units: families, companies, governments, and other organizations.

Most calculable general equilibrium models are based on the theory he proposed Paul Armington in 1969 he felt that the goods produced by the country and the imported goods were replaceable,

Consumers prefer to choose between domestic and imported goods based on relative prices, with exports being imported from other countries and affected by the competitiveness of exported goods.

In the case of the assumption that capital circulates freely, the interest rate is determined in the world economy, it is considered externally in the model, what distinguishes the model from its theoretical framework since one of the prices of the studied economy is determined externally.

10 - The use of the social accounting matrix in the computable general equilibrium model:

The numerical solution of the model is obtained by using matrix data of social accounting, an accounting table based on the double input system known in the national accounts for the representation of an economy in a certain period of time.

This makes the model computable, and the model system is solved from simultaneous equations in real time using software with clear and user-friendly language, thus, the computable general equilibrium model is applied numerically to the theory of the general equilibrium of social accounting matrix data.

Most of the equations in the model are derived from partial economic theory, particularly from the neoclassical theory of general equilibrium, which determines how the quantities of goods and services offered are affected by price changes in all problematic markets of the world. economy studied.

On the other hand, the analysis of the behavior of the economic units is part of the macroeconomic analysis, and thus the general equilibrium model derives from the means of analysis and the basis of the microeconomic theory to analyze the phenomena and macroeconomic variables.

The general equilibrium model is often designed to study a specific subject, depending on the nature of the subject, the type, the form and the degree of detail of the model.

The one-sector model and the multisectoral model, and between the single-economy model and the multi-economy model.

Since the general equilibrium models can be computed according to Walrasian equilibrium theory, it is possible to make changes in the models according to the specificity of the studied economy,

Developing hypotheses about the behavior of economic units or productive activities in the economy and knowing the impact of changes resulting from economic policies, crises and shocks on the economy studied through the results obtained from the model.

11 - The computable general equilibrium model proposed for the Algerian economy:

11 – 1 Choice of model:

We have proposed a computable general equilibrium model of the Algerian economy, which is a set of nonlinear real-time equations submitted by Lofgren and All 2002 which like most other computable general equilibrium models, belong to the classical general equilibrium models, centered on trade liberalization or trade openness in developing countries, described by Dervis de Melo and Robinson in 1982.

It is a modular static model, which allows the implementation of a set of policy simulations to modify policies and other external conditions, and measure the impact of these changes.

The computable general equilibrium model was used to analyze the state of the Algerian economy in the direction of further liberalization of the trading system and how it interacted with various external shocks. The basic data for the model was the table of Inputs and Outputs for the year 2013.

11 – 2 Mathematical formula of the model:

The computable general equilibrium model for the case of Algeria presented in this section is mathematically a set of nonlinear real-time equations, used by Lofgren and Al 2002.

For convenience, the equations are classified into four blocks or groups: prices, output, goods, institutions, and system constraints which are:

11 – 2 – 1 Price Mass: This mass contains price equations with internal variables that describe the demand and supply side of the model as follows:

Import price: It is represented by equation (1) as follows:

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

Export price: it is presented by equation (2) as follows:

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

Compound price (consumer): it is presented by equation (3) as follows:

$$PQ_cQQ_c = [PD_cQD_c + PMcQMc1 + tqc \quad (3)$$

Value of local production (production) marketed: it is present by equation (4) as follows:

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

Price of the activity: it is presented by equation (5) as follows:

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

Value-added price: it is presented by equation (6) as follows:

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

11 – 2 – 2 Mass of Production and Trade: The mass of production and trade includs four categories: national production and use of inputs, allocation of domestic product for domestic consumption, domestic market, exports, compile supply on the local market (from imports and domestic production sold locally), and define the demand for the commercial inputs created by the distribution process.

Activity production function: it is present by equation (7) as follows:

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

Demand (agent) factors: it is present by equation (8) as follows:

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

Intermediate request: it is present by equation (9) as follows:

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

Function of the outputs: it is present by equation (10) as follows:

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

Compound offer function (Armington): it is present by equation (11) as follows:

$$QQ_c = aq_c \left(\delta_c^q QM_c^{-p_c^q} + \right.$$
$$1-\delta cqQDc-pcq-1pcq$$
$$(11)$$

Local import demand rate: It is presented by equation (12) as follows:

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

Combined supply of non-imported goods: it is presented by equation (13) as follows:

$$QQ_c = QD_c \quad (13)$$

Production conversion function (fixed conversion flexibility): it is presented by equation (14) as follows:

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

Demand rate for domestic exports: it is presented by Equation (15) as follows:

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

Conversion of production into non-exported goods: it is presented by Equation (16) as follows:

$$QX_c = QD_c \quad (16)$$

11 – 2 – 3 Foundation Mass: This group consists of equations that determine the flow of income from the value added of firms, and finally households, these equations fill the entries between institutions in the social accounting matrix of Algeria, and this cluster contains several functions. and equations for the aspect of the institution of the economy as follows:

Income factor : it is presented by equation (17) as follows:

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

Local income - Non-governmental organizations: The total income of any local non-governmental organization is the sum of the worker's income, government transfers and transfers from the rest of the world. It is presented by equation (18) as follows:

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

Household consumption demand: The demand for household consumption is expressed in equation (19):

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

Investment application: it is presented by equation (20) as follows:

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

Government Income: It is presented by Equation (21) as follows:

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

Government Expenditures: it is presented by equation (22) as follows:

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

11 – 2 – 4 The mass of the restriction of the system: it consists of:

Factor markets: they are presented by Equation (23) as follows:

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

Markets for composite raw materials: they are presented by Equation (24) as follows:

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

Current account balance for the rest of the world in foreign currencies: it is presented by Equation (25) as follows:

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

Savings and investment: it is presented by equation (26) as follows:

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

Price adjustment: it is presented by equation (27) as follows:

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

The basic model of this study includes 14 sectoral activities, four institutional agents, two main factors of production, savings-investment, value added tax, customs duties. The 14 sectors of the table of entries and exits of Algeria for the year 2013 were regrouped as follows:

Agriculture Sector (01), Water Sector - Energy and Buildings, Public Works (02), Fuels Sector (03), Petroleum Services and Work Sector (04) and Mining and Quarrying Sector (05), Iron and steel industry, Mechanical engineering, Metallurgy and electricity (06), Construction materials industry (07), Industrial chemistry, Plastics and rubber (08), Food industry (09), Textiles, clothing and stockings (10), Manufacturing industry leather and footwear (11) Wood, paper and cork industry (12), Miscellaneous industries (13), Services sector (14).

The quantitative model representing the basic economy was constructed using the social accounting matrix of the year 2013.

12 - The model execution and the consistency test:

This model is solved in the General Program of the Linear Modeling System (GAMS), The coherence of the model is tested simultaneously. By solving this model, the program (GAMS) is used to find a range of prices, wages and exchange rates that respond to the complex set of nonlinear equations (Lofgren and al 2002).

13 - Simulation design and description:

In this section we will present the different policy simulations that we would like to implement using a computable general equilibrium model developed for this purpose of the study.

The simulations that will be conducted primarily based on the realistic state of the economy have been tested to match the direction of the economy.

14 - Reduction / elimination of tariff customs:

They are implemented as the main driving force for economic policy reform and still have to be carried out. This simulation was carried out in four steps. Scenarios a1 and b1 are to reduce import tariff rights by 50 percent and 70 percent, respectively, while Scenario c1 represents full liberalization or full trade openness, it means removing tariff barriers in all importing sectors.

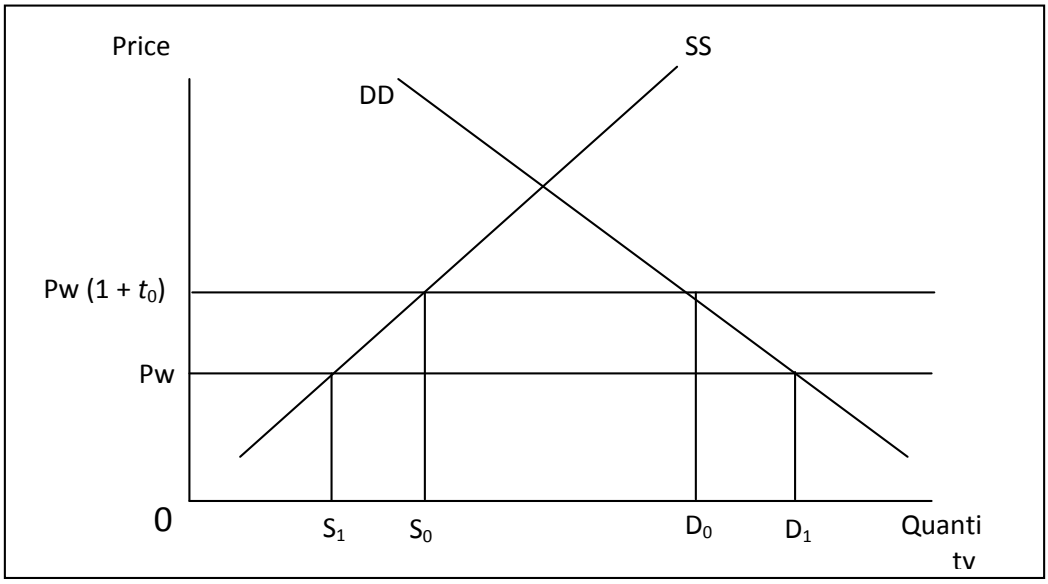
In this simulation, the tariffs are adjusted in three small steps to differentiate between the intensity of the effects and finally in step 4 Scenario d1 The loss of income is adjusted because to tariff removal in order to maintain the neutrality of government incomes. Customs tariff by increasing the corporate tax rate and income tax in the economic model.

14 – 1 Effects of tariff reduction/elimination on domestic production and trade:

Tariff reduction generally involves lowering the prices of imported products that lead to increased import demand And could lead to a reduction in GDP as shown in the **figure A** When the country is considered small and assumes that the tariff is imposed on a single product, The DD and SS curves are specific to the supply and demand of the country for a product, P_w is the world market price, The country faces unlimited flexibility in the rest of the world export supply curve expressed in ES_w, The tariff for the imported product is P_w $(1 + t_0)$ Where Supply and Demand for countries are respectively S_0 and D_0 And t_0 is the tariff rate imposed.

Tariff reduction / elimination will reduce the domestic price of imported goods, Domestic supply of the country will decrease with increasing imports of foreign goods. As shown in the **figure A** the elimination of customs duties t_0 has increased the value of imports of S_0D_0 to S_1D_1 causing the decline in the supply of S_0 to S_1, this can reduce government revenues and increase consumer welfare by increasing consumption, But the final effect of eliminating tariffs is related to different factors such as the nature of imported goods, Share of imported inputs in total imports And elasticities of supply and demand.

Figure (A): Effect of tariff in a small imported country



Source: Soderstern and Reed, 1994

The logical relationship presented in Figure A Take into account only trade in finished products, But taking into account the trade in finished products and intermediate goods, the impact on local production and consumption

will be different such as intermediate input trade brings change within the limits of production potential, availability of intermediate inputs by trade with the stability of other factors, labor transformation from intermediate goods industries to finished goods industries so the increase in production is a change beyond the limits of production potential.

Table N° 1 : Effect of tariff reduction / elimination on domestic production

Domestic production	Scen a1	Scenb1	Scen c1	Scen d1
TOT	0.004099	0.128068	0.22037	0.160959
SEC1-C	0.007838	0.244904	0.421415	-0.30946
SEC2-C	-0.03644	-1.13862	-1.95924	-0.90286
SEC3-C	-0.02040	-0.03779	-0.09747	0.319141
SEC4-C	0.02693	0.841452	1.44791	0.960085
SEC5-C	0.022475	0.702275	1.208464	0.674688
SEC6-C	0.034794	1.087188	1.87077	0.813477
SEC7-C	0.027344	0.854395	1.470184	0.526552
SEC8-C	0.029029	0.907086	1.560873	0.546071
SEC9-C	0.017202	0.537511	0.924915	-0.12188
SEC10-C	0.00308	0.09608	0.16533	-1.09428
SEC11-C	0.02783	0.86965	1.49644	-2.39465
SEC12-C	0.015496	0.484231	0.833242	0.095946
SEC13-C	0.006342	0.198166	0.340993	-0.58788
SEC14-C	0.006083	0.190088	0.327097	-0.31153

Source: The researcher's calculations using GAMS software simulation results.

In this case, model results show the impact of tariff reduction on domestic production as the reduction / elimination of tariffs leads to domestic production of the increase from the base level in almost all sectors excluding the hydrocarbons sector, the water and energy sector, buildings and public works, tariff reduction makes imported goods cheaper on the domestic market, leading to increased imports, In the reference year, about 30% of imported goods were used as inputs, since the increase in the use of intermediate inputs stimulates production in the Scen a1 and Scen b1 scenarios, Total production increased by 0.004099 and 0.1280680 percent, respectively.

In the total liberalization of trade Scen c1 total production increased by 0.22037 percent, this increase in total production is attributable to the contribution of increased production or production in the steel sector, mechanical, mineral and electrical 1.87077 percent, chemicals, plastics and rubber accounted for 1.560873%, Sector of textiles, clothing

and socks with 1.49644 percent. In the case of agriculture, production increased by 0.421415 per cent.

The decline in production in the water and energy sector, Buildings and public works can be attributed to the decline in total investment because the total investment demand consists mainly of a demand for construction and public works materials.

In the Scend1 scenario, the decline in government revenue caused by the removal of tariff barriers was adjusted, resulting in an increase of about 0.160959% in total output. This adjustment has pushed domestic production towards an increase because it makes the flow of funds a public investment in the economic model However, the overall increase in production in scenario c1 remains the largest compared to the increase in the scenario d1.

14 – 2 Impact of tariff reduction / elimination on import:

The direct effect of the tariff reduction is the decline in the relative prices of imports in the domestic market and the increase in imports, as shown in Table 2 so imports increased in all sectors.

Table N° 2 : Impact of tariff reduction / elimination on importation

Importation	Scen a1	Scenb1	Scen c1	Scen d1
TOT	0.02138	0.477412	1.365624	0.524387
SEC1-C	0.00789	0.246503	0.724145	0.611711
SEC2-C	0.03648	1.140133	1.361814	0.900688
SEC3-C	0	0	0	0
SEC4-C	0	0	0	0
SEC5-C	0.022563	0.705027	1.213144	0.670746
SEC6-C	0.034836	1.088467	1.832941	0.811636
SEC7-C	0.027395	0.855977	1.472873	0.524285
SEC8-C	0.029088	0.598883	0. 94697	-0.054395
SEC9-C	0.017268	0.539544	0.928379	0.012476
SEC10-C	0.003046	0.095193	0.163815	1.095516
SEC11-C	0.027787	0.868242	1.484019	2.396575
SEC12-C	0.015537	0.885457	1.535331	0.620942
SEC13-C	0.026389	0.199614	0.343465	0.589919
SEC14-C	0.006162	0.192529	0.331268	0.314972

Source: The researcher's calculations using GAMS software simulation results

In the total liberalization of trade, in the scenario Scenc1,imports in the steel, machinery, minerals and electricity sectors increased by 1.832941 per cent, textiles, clothing and socks sector by 1.484019 per cent, The leather and footwear sector increased by 1.535331% compared to

the base level, thus in the case of total liberalization, total imports increased by 1.365624% from baseline.

14 – 3 Impact of tariff reduction / elimination on exports:

In the area of exports, the reduction or elimination of tariffs has led to an increase in exports in most sectors, which would justify the liberalization of trade policy, trade liberalization modifies the local PE_c / PD_c traders index in favour of exports, as a result, more exported goods are produced and exported.

The hydrocarbons sector is the main export sector of the Algerian economy and the results obtained showed the sector's response to the increase in the volume of exports, as shown in the table N° 3.

Table N° 3 : Impact of tariff reduction / elimination on exports

Exportation	Scen a1	Scenb1	Scen c1	Scen d1
TOT	0.019899	0.42175	1.26987	0.587038
SEC1-C	0.007573	0.238456	0.41047	-0.60042
SEC2-C	0.036278	1.132499	1.94894	0.911677
SEC3-C	0.021476	0.67103	1.15466	0.365979
SEC4-C	0	0	0	0
SEC5-C	0.022277	0.695681	1.19724	0.684103
SEC6-C	0.034649	1.082673	1.86431	0.819974
SEC7-C	0.027092	0.848266	1.45973	0.535503
SEC8-C	0.028861	0.90201	1.55224	0.553351
SEC9-C	0.016938	0.529446	0.91118	0.110430
SEC10-C	-0.00333	-0.09985	-0.17174	-1.08899
SEC11-C	-0.02794	-0.87374	-1.5034	-2.38908
SEC12-C	0.015548	0.479687	0.82548	0.102502
SEC13-C	0.009751	0.195027	0.33154	-0.58508
SEC14-C	0.005801	0.181356	0.31217	0.29921

Source: The researcher's calculations using GAMS software simulation results

Despite the increase in exports in other sectors, they are very small and do not represent anything relative to the hydrocarbon sector.

The elimination of import duties has led to an increase in total exports of 1.26987 per cent, the largest increase in exports in the water and energy sectors, buildings

and public works, oil and gas. steel, mechanics, metallurgy, electricity and hydrocarbons. Respectively compared to the basic values.

The increase in domestic production has also led to an increase in the demand for labor in the economic model and an increase in overall employment, which has led to an increase in total value added, the operation being the main component of value added.

14 – 4 Effect of tariff reduction / elimination of value added:

Table N° 4 : Effect of tariff reduction / elimination on value added

Value Added	Scen a1	Scenb1	Scen c1	Scen d1
TOT	0.02167	0.677095	1.165103	0.894559
SEC1-C	0.014384	0.449434	0.773358	0.718995
SEC2-C	0.06694	-2.09159	-2.59904	1.659238
SEC3-C	-0.03752	-1.17234	-2.01729	0.58714
SEC4-C	0.049464	1.545587	2.659541	1.764404
SEC5-C	0.041296	1.28992	2.219631	1.240049
SEC6-C	0.06392	1.997121	3.436533	1.49497
SEC7-C	0.050224	1.569339	2.700421	0.96794
SEC8-C	0.053326	1.666156	2.86706	1.003788
SEC9-C	0.03159	0.987055	1.698461	-0.22323
SEC10-C	0.005664	0.176799	0.304231	-1.01005
SEC11-C	0.051106	1.598093	2.749869	-1.39907
SEC12-C	0.028456	0.889368	1.530401	-0.17666
SEC13-C	0.011628	0.363547	0.625577	1.079327
SEC14-C	0.011166	0.348908	0.600389	0.571882

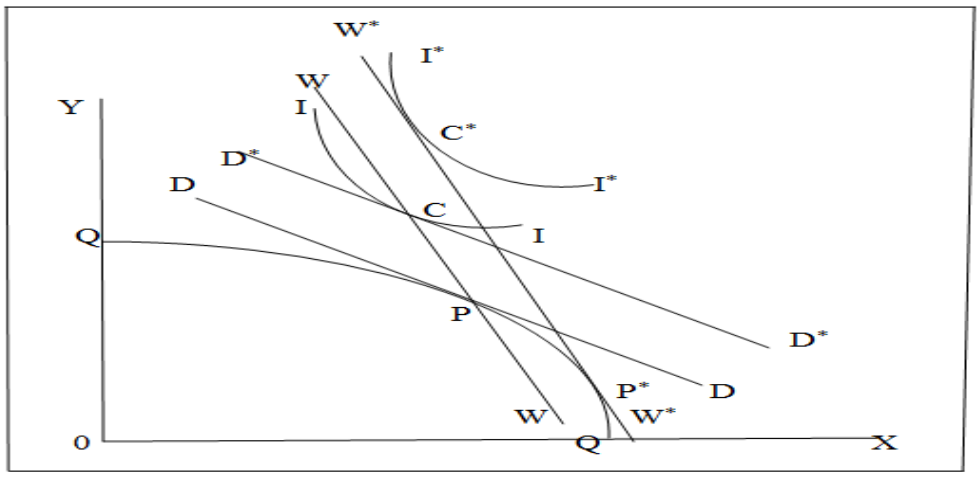
Source: The researcher's calculations using GAMS software simulation results

In the case of Scen c1 , value added in the steel, mechanical, metallurgy and electricity industries increased by 3.436533% In the chemicals, plastics and rubber products sectors, the textiles, clothing and socks sector gained 2.8686%, while the agricultural sector gained 0.773358%, the total increase in value added total being estimated at 1.165103% compared to the reference level for the reference year.

14 – 5 Impact of tariff reduction / elimination on household consumption:

The effect of the general imbalance of tariffs on the welfare of consumers is shown in Figure B.

Figure (B): Reducing import tariffs increases the welfare of small states



المصدر: Soderstern and Reed 1994

Source: Soderstern and Reed, 1994

For simplicity, we assume that only two of the products X and Y are produced, consumed, exchanged, and we assume that the duty rate of t is imposed on the commodity Y, the imposition of the tariff and the ratio of this domestic price will determine the level of production and consumption.

The points of production and consumption after tariff increases are respectively p and c, where line DD shows the slope of the domestic price ratio which corresponds to the production potential curve in p, the marginal inclination of WW shows the price ratio of international free trade.

In the event that the tariff is abolished, the product will be cheaper and the domestic producers will adjust these changes in relative prices in the domestic market, the output of competing industries for imports will decline,

More exportable goods will be produced and the new point of production will be in p^*, and the new consumption point will be in c^*, where the upper indifference curve I^* is tangent to the regression slope of the WW^*

Thus, removing tariffs will increase consumer welfare in the short and long term as consumption moves towards the higher indifference curve.

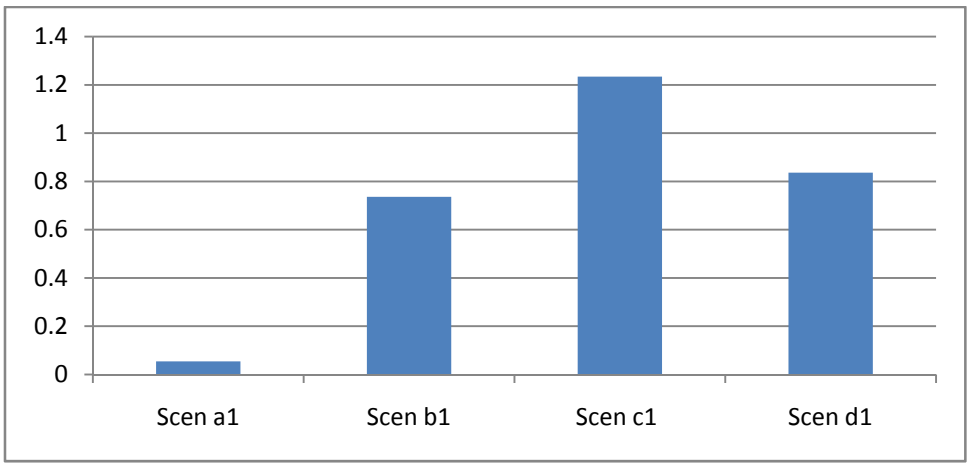
In this study, model results are consistent with theory, where household income and consumption have shown an upward trend with trade liberalization.

Scenario Scen a1 increased the consumption by 0.054353%, while tariff suppression resulted in an increase of 1.234068% from baseline. 1 increased

the consumption by 0.054353%, while the suppression of tariffs resulted in an increase of 1.234068% compared to the base level.

In the fourth scenario, the government's budget deficit due to the elimination of tariffs was adjusted by the increase in corporate and income tax rates, This has resulted in a decline in household consumption relative to the consumption level of trade liberalization, as the increase in the wage tax rate has led to a decline in consumer incomes, as shown in the figure C.

Figure C: Impact of tariff reduction / elimination on household consumption



Source: The researcher's calculations using GAMS software simulation results

14 – 5 Impact of tariff reduction / elimination on macroeconomic variables:

At the macro level, tariff reductions have reduced the value of the real exchange rate, increased exports and imports, and reduced both government income and savings.

In general, the collection of import tariff revenues and the reduction of import tariffs will result in a significant reduction of government revenues and savings.

Table N°5 : Impact of tariff reduction / elimination on macroeconomic variables

	Scen a1	Scenb1	Scen c1	Scen d1
Real exchange rate	1.051	1.253	1.513	2.053
Gross domestic product	0.016927	0.527689	0.907956	1.02667
Government revenue	-0.04091	-1.27843	-2.19985	-
Government savings	-4.05435	-6.73603	-9.23407	-
Private consumption	0.054353	0.736028	1.234068	0.836161
The real trade balance	-0.07254	-0.56995	-1.03627	-0.24352
Total employment request	0.005036	0.158209	0.27469	0.176529
Total investment	-0.04191	-1.3095	-2.25331	-1.1637

Source: The researcher's calculations using GAMS software simulation results

Eliminating tariff customs has reduced government income and savings by -2.19985% and -9.23407% respectively from the baseline level.

In terms of private or family consumption, it increased by 1.234068% in the event of total liberalization and by 0.054353% in the event of release. The openness against the basic ratio and GDP increased by 0.907956 per cent in the case of full liberalization.

In scenario Scend1, after adjusting the revenue shortfall by raising taxes on institutions and incomes, this led to a decrease in private consumption compared to the state of total liberalization (openness)

Because the fall in the public deficit increases total savings, which is equal to the total investment in the economic model.

Increasing investment affects production upwards and thus increases the demand for labor, the increase in employment with a fixed wage rate pushes household income upwards,

The household sector is the sole beneficiary of labor income and the increase in incomes increases its consumption relatively, but the increase in consumption after the amendment of the adjustment is lower than the increase before the amendment because the

increase in tax affects its level of consumption,

When private consumption is the largest component of total absorption or local absorption, the increase in private consumption also increases gross inland absorption.

15 - Conclusion:

In the scenario reduce / eliminate the tariff customs :

Showed an increase in production, exports and imports in most sectors, but public revenues have been sharply reduced by global trade liberalization this is the result of the elimination of the customs tariff, which necessarily leads to a reduction in the value of customs duties of indirect taxes, which are considered as a source of public revenue.

This shortfall due to the total liberalization (openness) of trade has been modified by the increase in taxes on income and institutions,

After the adjustment process, the results showed that production and employment did not suffer but that private consumption fell from its level before the adjustment process.

Bibliography List :

1- Books :

- Adam KLUG, 2006**,** Théory of International Trade, Routledge, New York
- Burkhard. HEER, Alfred.MAUBNER, 2009**,** Dynamic Equilibrium Modeling Computational Methods and Applications, Springer verlag Berlin Heidelberg, Second Edition.
- David COLANDER, 2006**,** Post Walrasian Macro Economics Beyond The Dynamic Stochastic General Equilibrium Model, Cambridge University Press, New York, USA,
- De Melo, J. and D. Tarr, 1992, A General Equilibrium Analysis of US Foreign Trade Policy, (Boston: MIT Press)
- Dennis R. APPLEYARD , Alfred .J, Field .JR, 2014, International Economics, Eighth Edition, Mc Graw-Hill/Irwin, New York, USA
- Donald .BROWN, Felix. KUBLER, 2008**,** Computational Aspects of General Equilibrium Theory, Springer verlag Berlin Heidelberg, German
- Douglas.GALE, 2000, Strategic Foundations of General Equilibrium Dynamic Matching and Bargaining Games, Cambridge University Press, United Kingdom.
- Giancarlo GANDOLFO, 2014, International Trade Theory and Policy, Second Edition, Springer heidelberg, New york Dordrecht, London

- Harrison G. W., S. E. H. Jensen, L. H. Pedersen and T. F. Rutherford, 2000 (eds),Using Dynamic General Equilibrium Models for Policy Analysis (Amsterdam, Oxford and New York: Elsevier)

- Kehoe, T.J, 1998 Social Accounting Matrices and Applied General Equilibrium Models, in I. Begg and S.G.B. Henry (eds.), Applied Economics and Public Policy, Cambridge: Cambridge University Press

- Labidi Mourad, 1979 , «Cours de comptabilité nationale», OPU, Alger

- Labidi Mourad, 1987, « Manuel de comptabilité nationale », OPU, Alger

- Lisa.L MARTIN, 2015 The Oxford Handbook of the political Economy of International Trade , Oxford University Press, New York, USA,

- Mary E. Burfisher, 2011**,** Introduction to Computable General Equilibrium Models. Cambridge University Press, New York

-

2 - Journal article :

- ALVAREZ, F., AND R. J. LUCAS, 2007**,** "General Equilibrium Analysis of the Eaton- Kortum Model of International Trade," Journal of Monetary Economics, 54(6), pp1726 – 1768,

- Arndt, Channing, Sherman Robinson, and Finn Tarp, 2002**,** Parameter Estimation for a Computable General Equilibrium Model: A Maximum Entropy Approach. Economic Modeling, Vol. 19, pp. 375 – 398

- Aruoba, S. Boragan, Jesus Fernandez-Villaverde, and Juan F. Rubio- Ramırez, 2006**,** Comparing Solution Methods for Dynamic Equilibrium Economies. Journal of Economic Dynamics and Control. Vol. 30. pp. 2477 – 2508

- Boehringer, C., T.F. Rutherford and W. Wiegard, 2003, Computable General Equilibrium Analysis: Opening a Black Box, ZEW Discussion Paper No. 03-56, Mannheim, Germany

- CALIENDO, L., AND F. PARRO, 2015, "Estimates of the Trade and Welfare Effects of NAFTA," Review of Economic Studies, 82(1), pp. 1 – 44

- Ezequiel INSAURRIAGA MEGIATO, Angélica MASSUQUETTI, André Filipe ZAGO DE AZEVEDO, 2016, Impacts of integration of Brazil with the

European Union through a general equilibrium model, Economy A 17 , pp. 126 – 140

- Jacob W. Musila, Zelealem Yiheyis, 2015, The impact of trade openness on growth: The case of Kenya, Journal of Policy Modeling, volume 37, issue 2, , pp. 342 – 354

- Kim. S.H, Kose, M.A, 2014, Welfare implications of trade liberalization and fiscal reform: a quantitative experiment. J. Int. Econ. 92, pp. 198 – 209

- M. Waugh and B. Ravikumar, April 14, 2016, Comments on "Measuring Openness to Trade", Journal of Economic Dynamics and Control

Appendices:

1 - Equations and variables of the model:

Price Mass:

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

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

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

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

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

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

Mass of Production and Trade:

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

$$WF_fWFDIST_{fa} = \frac{a_{fa}PVA_aQA_a}{QF_{fa}} \quad (8)$$

$$QINT_{ca} = ica_aQA_a \quad (9)$$

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

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

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

$$QQ_c = QD_c \quad (13)$$

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

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

$$QX_c = QD_c \quad (16)$$

Foundation Mass:

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

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

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

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

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

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

The mass of the restriction of the system:

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

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

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

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

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

2 – Table of Inputs – Outputs for Algeria Year 2013

Code NSA	Intitulés des NSA	01	02	03	04	05	06	07	08	09	10	11	12
01	Agriculture, sylviculture, pêche	73617	0	0	3240	974	4405	68	3433	3374	557620	5	0
02	Eau et Energie	7602	33273	1687	1150	3077	28569	35215	4184	3781	10294	96	21
03	Hydrocarbures	6401	17992	772337	56300	610	1713	597	93696	1117	17602	21	0
04	Services et Trav. Pub.	0	0	39791	157062	0	0	0	0	0	0	0	0
05	Mines et carrières	398	0	60	1599	5	8099	2212	31203	747	779	1	0
06	ISMMEE	56513	6574	3838	5537	1853	71679	1585	327902	1446	6716	51	1
07	Matériaux de Construction	360	113	499	56392	12	1303	1079	715461	177	344	0	0
08	BTPH	2138	18234	0	13555	2892	12486	2212	1416	1443	633	103	2
09	Chimie, Plastiques, Caoutchouc	84850	13634	513	207	6264	32552	2748	136505	78122	730	751	49
10	Industries Agro-alimentaires	90179	0	90	15	0	5646	67	4006	13436	66014	48	87
11	Textiles, confection, bonnéterie	3570	2327	0	0	265	11173	592	2031	3248	142	27394	38
12	Cuirs et	609	19367	0	0	1501	17903	2088	8	632	13	2646	3578

	Chaussures												
13	Bois, Papiers et lièges	14076	3981	4401	23866	2280	19602	5289	80392	5777	1455	217	7
14	Industries diverses	2399	972	0	0	238	2773	279	695	225	296	13	0
15	Transport et communications	17445	2596	27223	7724	1459	13074	1305	3761	1236	2017	46	1
17	Hôtels cafés restaurants	2020	7750	21	348	231	2151	245	1772	304	476	9	0
18	Services fournis aux entreprises	30815	2198	58173	1931	46	651	99	7162	260	36536	9	0
19	Services fournis aux ménages	10864	0	0	0	0	0	0	1913	0	1	0	0
Consommations Intermédiaires		403856	129010	908632	328926	21707	233780	55680	1415541	115324	701670	31412	3782
Valeurs Ajoutées (VA)		1627762	125822	4968018	58134	22443	104022	80347	1562105	64941	285480	14331	2651
Rémunération des Salariés (RS)		168767	46283	138352	55586	8465	53928	25754	616762	24709	44522	6507	973
Impôts liés à la production (ILP)		7503	5360	947765	7577	1155	7809	4886	99912	3597	10324	1464	154
Excédents Bruts d'Exploitation		1451492	74179	3881902	-5029	12824	42285	49707	845431	36635	230635	6360	1524
Consommation de Fonds Fixes		3021	75836	352597	50492	4602	42299	13857	74637	12701	22072	1532	157
Excédents Nets d'Exploitation		1448471	-1656	3529306	-55521	8222	-13	35850	770795	23934	208563	4828	1367

Productions Brutes (PB)	2031618	254832	5876650	387060	44150	337802	136027	2977646	180265	987150	45743	6433
Importations biens et services	378205	0	357160	0	12565	2235674	89719	3087	570630	479196	75850	17301
Taxes sur la Valeur Ajoutée	17789	42846	40770		1865	286591	14948	197	57292	131107	14235	3471
Droits et taxes à l'importation	30373	0	79960	0	620	146730	10321	289	34367	56242	16020	5119
Marges commerciales	67659	0	54169	0	5708	870822	339972	0	307007	489877	27866	4404
Total des Ressources	2525645	297678	6408709	387060	64909	3877620	590987	2981219	1149561	2143572,40	179714	36727

Source : Office National des Statistiques