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# Some Effects of Gradual Trade Liberalization on the Saudi Arabian Economy

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**Abstract.** This paper adopts a Dynamic Computable General Equilibrium (CGE) model to examine the effects of gradual trade liberalization on the Saudi Arabian economy. In particular, the study aims to analyze the effects of trade liberalization on government revenue and nine productive sectors of the economy. The assumptions of this study encompass the standard neoclassical assumptions of small open economy in competitive markets. The oil sector, however, is characterized by the market power, which Saudi Arabia has. The main findings of this study are that trade liberalization will lower real government revenue, hence, real consumption will decline in the short run. In the long run, however, the effects of trade liberalization on government revenue will tend to vanish as the government compensates for the loss of tariff revenue by an increase in indirect tax and oil revenue.

## Introduction

Trade liberalization became a major issue in the 1990s for developing countries as well as developed countries. The World Trade Organization's (WTO) main objective was to liberalize trade among its members. The International Monetary Fund (IMF) has also been pursuing liberalizing trade for member-countries. In these circumstances, the effects of liberalizing trade on developing countries have been subject of many studies ranging from theoretical to practical and of case studies. Saudi Arabia's current efforts are focused on joining WTO, forming a customs union within the Gulf Cooperation Council's (GCC) countries, and advocating the large free trade area among Arab countries. All of these ambitious integration policies require a reduction of imports tariffs. In the case of Saudi Arabia, most of its tariffs, about 90 percent, are equal to 12 percent rate.

This paper presents a detailed analysis of some of the effects of trade liberalization on the Saudi economy. This includes the impact at the sectoral levels, and the impact on

resource allocation, budget deficits, and wages, as well as pressures on the real exchange rate. The most appropriate model for this type of study is a computable general equilibrium (CGE) model which this paper uses to show the effects of tariff reduction on the Saudi economy.

The aim of this paper is to examine the effects of a uniform tariff reduction, first of 50 percent, and then of 100 percent (i.e., from 12 percent to 6 percent, and then to zero percent) on the Saudi Arabian economy, including both government revenue and the welfare of the society. In particular, the paper adopts a Dynamic Computable General Equilibrium (CGE) model in order to assess the impact of tariff reduction on government revenue, resource allocation, growth rates, and sectoral output over a ten-year period (a sequence of three periods, 1990, 1995, and 2000). The paper is divided into six sections: the first is an introduction, and the second is a literature review, which concentrates mainly on the effects of trade liberalization on government revenue. The third section shows data requirements of the study; the fourth one is the model construction. The fifth presents analysis of the tariff reduction on government revenue and relative prices, trade and other sectors of the economy, and the last section contains the concluding remarks.

## Literature Review

Trade liberalization on the form of tariff cut would cause a decline in budget revenue, unless compensating procedures were taken to compensate for the loss of tariff revenue. In theory, tariff cut would make the economy more open to the rest of the world which would lead to an increase in the production of the export sectors as well as the level of imports. In reality, the effects of liberalizing trade, however, will be determined by many factors which encompass: a) the nature and degree of liberalization of tariffs and non-tariff barriers; b) changes in the foreign exchange regime and/or the exchange rate; c) changes in imports and exports; d) other structural characteristics of the economy, such as the level of development and the effectiveness of tax and customs administrations; e) the macroeconomic environment; f) the impact of trade liberalization on growth; and g) the nature of the domestic tax system [1]. Moreover, the direct impact of a liberalization policy depends not only on the change in the tariff rate, but also the price and income elasticities of the demand for imports, the elasticity of substitution between imports, the market structure of import trade, and the degree of exchange rate flexibility.

In a study [1], the IMF staff adopted three complementary approaches for studying the effects of trade liberalization on government revenue: case studies, a simple examination of trends in abroad range of countries, and econometric analysis. The main policy conclusion, which the study stated, is that trade liberalization would be greatly facilitated by mutually reinforcing combination of trade reforms, domestic tax reforms, and sound macroeconomic policies. However, it is worth noticing that the net impact of these reforms will differ from one country to another, depending on each country's

political, social, and economic characteristics. Thus, it is expected that a range of outcomes will result, depending upon the initial conditions, the components of the reform package, and economic structure.

Other studies using Computable General Equilibrium (CGE) models, [2,3], examined the effects of trade liberalization on government revenue as well as on other sectors of the economy. Feltenstein [3] showed negative revenue effects from tariff liberalization, and concluded that it might be necessary to raise domestic taxes to compensate for the tariff reduction. Tokarick [2] studied the economy of Trinidad and Tobago. His simulations highlight the importance of the price flexibility of non-traded goods in determining the ultimate effects of trade liberalization. If the price of non-traded goods is inflexible, many of the beneficial effects of trade liberalization will not be realized. In this case, there might be a role for nominal exchange rate depreciation, in connection with trade reform, to help facilitate the necessary adjustment in relative prices. In addition, a policy of trade liberalization would increase the central government's budget deficit, and further strain the government's ability to borrow. Tokarick's study showed that an increase in the value-added tax rate would be the most efficient means of replacing the revenue lost from a terms-of-trade deterioration.

In addition to the loss of tariff revenue, trade liberalization involves short and long-term costs. Blejer and Cheasty [4] stated that the short-run cost of adjustment to open trade could force the government to reverse the liberalization even if longer-term benefits could be realized. Long-run budget gains are more likely to occur when the tax and transfer systems are broad, neutral, and efficiently administered. Nevertheless, collecting taxes, by itself, is costly. Mihaljek [5] showed that, in the presence of collection costs modeled as an increasing function of the tax rate, the standard rules of optimal commodity taxation may no longer be valid; that tariffs may be a more efficient way to raise revenue than domestic consumption taxes; and that the optimal tax rates may be uniform rather than differentiated.

In a simple, small, open economy with rational expectations, Auernheimer and Mary [6] argued that gradualist policy introduces a distortion in consumption-accumulation decisions and generates welfare costs. If the gradual change is extended over a "too long" period, these costs may even exceed the long-run benefits of liberalization. This paper indicated that gradually tariffs introduces an intertemporal relative price distortion between consumption and asset accumulation for the duration of the policy. An immediate implication is that a third policy option - removing the tariff all at once at a future date, without a previous announcement - may be better than gradually removing the tariff starting at the present date. Such a policy would delay the benefits of the intertemporal production gains but avoid the intertemporal distortion of a gradualist policy. In some cases, the gains from avoiding these costs of intertemporal distortion would dominate the costs of delay.

Moreover, trade liberalization may aggravate overvaluation of the real exchange rate if the nominal exchange rate is fixed. This overvaluation will be costly to the economy, as it will exaggerate the real appreciation that will take place even in the best of circumstances, due to the necessarily gradual convergence between domestic and world inflation [7].[1] While the importance of fixing the nominal exchange rate to conquer inflation can be debated, the more relevant point is that when policy-makers choose this strategy, it leaves the nominal exchange rate unavailable for maintaining external competitiveness. This would not be of great consequence if nominal wages were fully flexible. In the absence of such flexibility, however, trade liberalization must be coupled with a devaluation to offset the negative impact on the trade balance and on employment. If a devaluation cannot be undertaken for fear of complicating stabilization policy, trade liberalization will simply result in real exchange rate appreciation.

If, however, the nominal exchange rate is fixed, a reduction in tariff rates will cause domestic demand to shift from import-competing industries toward imports as the price of imports start to fall. This shift in demand will result in some reduction in domestic production, as well as in unemployment in the previously protected industries, leading to an overall contraction in economic activity, since labor is not likely to be immediately absorbed into other industries. The rise in imports will cause deterioration in the trade balance.

The effects of changes in the real exchange rate on tariff revenues is that an appreciation of the real exchange rate would lead to a fall in the real value of imports, measured in domestic prices, and in turn, revenue would decline. By the same token, real exchange rate appreciation will have a negative effect on the revenue coming from the export taxes because export values are expressed in domestic currency. The impact of devaluation on the fiscal deficit, however, depends on a specific analysis of a country's situation, which can provide a reliable answer to the empirical question of whether its fiscal deficit will be reduced or increased by devaluation.

The effects of trade liberalization on wages and unemployment were studied by Agenor and Joshna [8]. Analysis shows that a reduction in tariffs, coupled with an adjustment in lump-sum taxes to balance the government budget, lowers wages in all production sectors in the short and medium run. Yet, it has an ambiguous effect on unemployment. Although employment and production of exportable goods expand in the medium run, the unemployment rate may rise or fall depending on whether the elasticity of wages in the export sector with respect to wages in the non-traded goods sector is lower or greater than unity.

[1] This effect takes place under the assumption that the nominal fixed exchange rate is at its equilibrium level before freeing trade.

## Data Requirements

The Social Accounting Matrix (SAM) is the cornerstone of the CGE model in the sense that it represents the "benchmark" equilibrium of the economy. This paper relies on the Social Accounting Matrix for Saudi Arabia for the year 1990[2], which was constructed by Haji [9]. It represents a snapshot of the incoming and outgoing accounts of the Saudi economy in a (15x15) matrix framework for the year of 1990. It portrays a convenient summary of the structure of the Saudi economy in 1990 and shows some linkages among the production sectors[3], factors of production, household, government, capital account, and the rest of the world. The columns represent expenditures, while rows represent receipts. The total of each column must equal the total of each respective row so that the matrix is in a state of equilibrium (see Table 1).

**Table 1. Schematic social accounting matrix for Saudi Arabian in 1990 (in billion of Saudi Riyals)**

| Expenditure → / Receipts ↓ | Activity (9 sectors) | Factors | Household | Government | Capital account | Rest of the world | Total expenditure |
|---|---|---|---|---|---|---|---|
| Activity (9 sectors) | INTM 124.399 | DEPR 43.613 | HC 114.634 | GC 82.803 | INVEST 100.616 | E 94.055 | 560.115 |
| Factors | WKRT 297.654 | | | SUBS 56.992 | | | 354.64 |
| Household | | YH 297.645 | | | | | 297.645 |
| Government | TX 36.646 | | HHTAX 4.036 | | BONDS 56.673 | IEAR 82.5 | 179.855 |
| Capital account | | | HHSAV 153.36 | GOVSAV 4.025 | | | 157.281 |
| Rest of the world | M 101.415 | ENTRPI 13.498 | HHDP 25.729 | GOVTR 36.023 | | | 176.546 |
| Total receipts | 560.114 | 354.64 | 297.645 | 179.843 | 157.281 | 176.546 | |

| | |
|---|---|
| BONDS | Return to government sales of bonds |
| DEPR | Depreciation (consumption of fixed capital) |
| E | Exports |
| ENTRPI | Entrepreneurial property income to the rest of the world |
| GC | Government consumption |
| GOVSAV | Government saving |
| GOVTR | Government transfers abroad |
| HC | Household consumption |
| HHDP | Household direct purchases from abroad |
| HHSAV | Household saving |
| HHTAX | Household tax |

[2] This is the latest, and probably, the only SAM that has been published for Saudi Arabia.

[3] There are nine production sectors: Agriculture, Mining, Manufacturing industry, Electricity, Construction, Commerce, Transport, Finance, and Services.

| | |
|---|---|
| IEAR | Interest earning on government oil revenue surplus invested abroad and repatriated |
| INTM | Intermediate inputs |
| INVEST | Investments and change in stock |
| M | Imports |
| SUBS | Subsidies |
| TX | Indirect tax and tariffs revenue |
| WKRT | Wages and return on capital |
| YH | Household income |

The transactions among the nine sectors are added together and form the intermediate activities of the second row and second column in the schematic SAM for Saudi Arabia (Table 1). The intermediate transactions are obtained directly from the 1990 input-output matrix of Saudi Arabia (see Table 2).[4] For the labor and capital data, SAM provides only wages and salaries for labor, and return to capital. The total wages and return to capital are posted in the third row and second column of Table 1. The physical labor[5] and capital are exogenously determined, and will be discussed further in the next section.

**Table 2. Input-output Table for Saudi Arabia (1990)**

| Sectors | Agri-culture | Mining | Manu-facture | Electricity | Construc-tion | Commerce | Transport-ation | Finance | Services |
|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 0.0589 | 0 | 0.0013 | 0 | 0 | 0.0225 | 0.0006 | 0 | 0.1059 |
| Mining | 0 | 0.0207 | 0.0757 | 0 | 0.0479 | 0.0001 | 0 | 0 | 0 |
| Manufacture | 0.0308 | 0.0032 | 0.0048 | 0.345 | 0.3573 | 0.0347 | 0.1042 | 0.0153 | 0.4144 |
| Electricity | 0.0006 | 0.0006 | 0.0001 | 0.0043 | 0.002 | 0.004 | 0.0007 | 0.0012 | 0.0057 |
| Construction | 0 | 0.011 | 0.0008 | 0.1043 | 0.0013 | 0.0091 | 0.0072 | 0.0098 | 0.0409 |
| Commerce | 0.0011 | 0.0001 | 0.0001 | 0.0115 | 0.0079 | 0.0018 | 0.002 | 0.0009 | 0.0101 |
| Transportation | 0.0002 | 0.0036 | 0.0008 | 0.0158 | 0.0063 | 0.0378 | 0.0251 | 0.0073 | 0.036 |
| Finance | 0 | 0.0003 | 0.0004 | 0.0003 | 0.0061 | 0.0194 | 0.0036 | 0.0542 | 0.0172 |
| Services | 0 | 0.0024 | 0.0003 | 0.0062 | 0.0314 | 0.0859 | 0.0216 | 0.0296 | 0.04 |

Source: J. Haji (1993). "The construction of the Social Accounting Matrix (SAM) for Saudi Arabia." *Margin*, v. 25(3).

The constant elasticity of substitution (CES) functions (production function, export function, and import function) employed in this model required exogenously determined elasticity values, which are based on other empirical studies. This study relies on elasticity values of SALTER model of the world economy (see Table 3).

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[4] For detail information and construction of SAM and Input-output Table for Saudi Arabia, see J. Haji [9].

[5] Since the focus of this study is on trade liberalization rather than labor issues, the paper does not distinguish between Saudi and Non-Saudi laborers. SAM does not distinguish between wages and salaries paid for Saudi and non-Saudis, yet the ENTRPI cell (Row 7 x Column 3) may contain partially the foreign labor transfer.

**Table 3. Sectoral elasticities**

| Sectors | $\sigma$ | $\rho^{I}$ | $\rho^{C}$ |
|---|---|---|---|
| Agriculture | 0.4 | 3.75 | 2.2 |
| Mining | 0.8 | 3.5 | 2.8 |
| Manufacture | 0.9 | 4.28 | 2.9 |
| Electricity | 0.9 | 3.9 | 2.8 |
| Construction | 1.2 | 2.3 | 1.9 |
| Commerce | 1.2 | 2.2 | 1.9 |
| Transportation | 0.9 | 2.2 | 2.9 |
| Finance | 0.9 | 2.2 | 1.9 |
| Services | 0.9 | 2.5 | 1.9 |

Source: Jomini, P., McDougall, R., Watts, G., and Dee, P.S. (1994). The SALTER model of the world economy: model structure, database and parameters, Industry Commission, Canberra, Australia.

$\sigma$ Elasticities of substitutions between labor and capital

$\rho^{I}$ Elasticities of substitutions between exports and domestic goods

$\rho^{C}$ Elasticities of substitutions between imports and domestic goods

Given estimates of elasticities and the exogenously determined value of inputs for each CES function, it is possible to calculate the production function parameters. In the CES production function (equation-1, next section), for example, the share parameters for capital and labor ( ) are given by:

$$\gamma_i = \frac{\left(\frac{K_i^{\frac{1}{\sigma_i}}}{L_i^{\frac{1}{\sigma_i}}}\right)}{\left[1+\frac{K_i^{\frac{1}{\sigma_i}}}{L_i^{\frac{1}{\sigma_i}}}\right]} \quad i = 1,2,\ldots.9 \qquad \text{(a)}$$

The values of the share parameters in each production function are then derived from the zero-profit conditions for each sector, given the unit definition for outputs. The parameters' values of the Armington functions of both imports and exports can be derived by the same method.

## The Model

This section outlines the structure of the model, including the main assumptions used. The model adopts the small country trade assumption in imports, as Saudi Arabia cannot affect the world price of imports. It has, however, some power in influencing the world price of oil exports. In other words, the Saudi economy faces a constant world

price of imports and a constant world price of exports of non-oil sectors, but a downward sloping demand curve in the oil export sector.[6] Additional significant assumptions for the export and import sectors are:

1) Domestically produced goods and imported goods are imperfect substitutes, which follows the Armington assumption of product differentiation.

2) A product differentiation assumption is also extended to the export sectors in the sense that the domestically produced goods sold on the domestic market are imperfect substitutes for goods sold on the export market.

**Equations**

The model has several functions dealing with production, exports, and imports. The production function disagregates the economy into nine sectors, agriculture, mining, manufacturing, electricity, construction, commerce, transport, finance, and services. This paper uses the subscript (*i, j*) to denote sectors, and (*s*) to indicate the type of labor skill.

$$X_i = A_i^d [\gamma_i K_i^{-\rho_i^x} + (1-\gamma_i)(\omega_s L_{is} + \omega_s L_{is} + \omega_s L_{is})^{-\rho_i^x}]^{-\frac{1}{\rho_i^x}} \qquad (1)$$
$$i=1,2,..,9 \qquad s=1,2,3.$$

The production function is in the form of constant elasticity of substitution (CES) production function with three-categories of labor ($L_{is}$)[7] (skill, semi-skill, and non-skill), and capital ($K_i$) as the only two inputs. $X_i$ is sectoral output, $A_i^d$ is a production function shift parameter, $\gamma_i$ is the production function share parameter, $\rho_i^x = \frac{1-\sigma_i}{\sigma_i}$, and is the elasticity of substitution between capital and labor, and $\omega_s$ is the weight-share for the labor category.

$$E_i = D_i \left[ \frac{P_i^e (1-\chi_i)}{P_i^d \chi_i} \right]^{\frac{1}{\rho_i^T}} \qquad (2)$$

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[6] The model used here is a neoclassical model. It is an appropriate model for Saudi Arabia as the Kingdom purses a free market economy and is small country in all economic sectors, except the oil sector. In the oil sector, the model assumes that Saudi Arabia is a large country that can affect oil prices. The neoclassical model is used in this study for its convenience. Consequently, the outcome results of the model will be consistent with the theoretical outcome of a small country model.

[7] Since the scope of this paper is trade policies rather than labor issues, we combine all labor and include both Saudis and non-Saudis.

Equation (2) represents the export supply of the non-oil sectors ( $E_i$ ) as a function of relative prices of the domestic price of exports ( $P_i^e$ ) to the domestic price of the domestic goods ( $P_i^d$ ). The domestic goods are represented by $D_i$, while $\chi_i$ represents the shares allocated for either exports or domestic supply.[8] The export of oil is represented in equation (3) below that shows the world export demand function in which Saudi Arabia has some market power.

$$E_i = \overline{E_0}\left(\frac{P_{iw}^e}{\Gamma_i^w}\right)^{-\varepsilon_i}\left(\frac{WY}{WY_0}\right)^{\nu} \tag{3}$$

Where $\overline{E_0}$ is the export demand shift parameter, $P_{iw}^e$ is the world price of exports, $\Gamma_i^w$ is the average world price of exports in U.S. dollars, $\varepsilon_i$ is the export demand price elasticity, $WY$ is the current nominal income level of the world, $WY_0$ is the world nominal income level in the base year, and $\nu$ is the elasticity of demand for oil by the rest of the world.

The oil sector will have a small value of export demand elasticity (assumed to equal 0.5). The world income is assumed to grow by 2.4% per annum with an income demand elasticity of 0.8 so that the world demand for oil will increase as well over the years. In 1990, current nominal world income will equal the base year nominal income of the world; hence, the demand of the world for oil in 1990 equals the constant parameter $\overline{E_0}$.[9]

$$M_i = D_i\left[\frac{P_i^d\delta_i}{P_i^m(1-\delta_i)}\right]^{\frac{1}{1-\rho_i^c}} \tag{4}$$

[8] The values of the share are determined by the quantity levels rather than the price level (see equation (a) in Data Requirements' section). Upon an increase on the production level, producers will allocate more outputs to be sold at a higher price, either domestically or abroad.

[9] The values of the elasticities ( < 1) indicate that the demand for oil is inelastic. Conventionally, a proportionate increase in the price of oil leads to a less than proportionate decrease in the quantity demanded so that the oil revenue will rise.

Equation (4) represents the demand for imports as a function of price of imported goods ($P_i^m$) relative to the price of domestic goods ($P_i^d$), where $\delta_i$ is the share parameter, and $\rho_i^c$ is the elasticity of substitution between imports and domestic goods.

The price of imports and exports are given by:

$$P_i^m = P_{iw}^m (1 + t_i^m) ER \tag{5}$$

and

$$P_i^e = P_{iw}^e ER \tag{6}$$

Where $P_{iw}^m$ is the world price of imports in sector ($i$), $t_i^m$ is the tariff rates on imported goods in sector ($i$), $ER$ is the exchange rate, and $P_i^e$ is the domestic price of exported goods in sector ($i$).

Equation (5) represents the domestic price of imports in sector ($i$), which is a function of the world price of imports, the tariff rate, and the exchange rate. Similarly, equation (6) represents the domestic price of exports in sector ($i$), which is a function of world price of exports and exchange rate.

$$OILREV = \sum_i P_i^x X_i - \sum_s W_s L_{is} - r_i^k K_i - tx_i P_i^x X_i \qquad i = \text{oil} \tag{7}$$

Equation (7) represents oil revenue (*OILREV*) where oil revenue equals: the total revenues for oil's output ($P_i^x X_i$) *minus* the cost of labor ($W_s L_{is}$) and of capital ($r_i^k K_i$) employed in the oil sector, and *minus* the sum of the amount of revenue allocated for Aramco ($tx_i P_i^x X_i$)

$$GR = TARIFF + INDTAX + HHTAX + BONDS + IEAR * ER + OILREV \tag{8}$$

Gross government revenue (*GR*) encompasses tariff revenue (*TARIFF*), revenue from indirect taxes (*INDTAX*), household tax income (*HHTAX*) in the form of payments for telephones and electricity services, net sales of bonds to finance the budget deficit (*BONDS*), and interest earnings on governmental oil revenue surplus invested abroad and repatriated (*IEAR*), *plus* net oil revenue.

$$ID_i = vshr_i INVEST \tag{9}$$

$$vshr_i = z_i + \eta z_i \left[ \frac{r_i^k - Ar^k}{Ar^k} \right] \tag{10}$$

$$K_i(t+1) = K_i(t) - \pi_i K_i(t) + ID_i \qquad t = 1990,\ 1995,2000 \tag{11}$$

Where $ID_i$ is the final demand for investment goods in sector ($i$), $vshr_i$ is sectoral investment share, *INVEST* is the total investment, $z_i$ is the sectoral share in aggregate returns to capital, $\eta$ is a parameter measuring the intersectoral mobility of investment funds, $Ar^k$ is the average return to capital, $K_i$ is the sectoral capital stock, and $\pi_i$ is the sectoral depreciation rate.

Equations (9), (10), and (11) define the dynamics of the model in term of the behavior of investment and investment demand. Equation (9) shows that real sectoral investment is determined by using nominal shares ($vshr_i$), which sum to one over all sectors. The nominal shares are adjusted proportionally (in equation 10) as a function of the return to capital of each sector relative to the average return to capital for the economy as a whole. Sectors with a higher than average return to capital would get a larger share of investable funds than their proportionate share in aggregate returns if there is no mobility restriction. Equation (11) implies that the model incorporates a recursive dynamic procedure to update capital stock by adding new investment sectoraly allocated by the investment share equation according to the speed adjustment factor of 0.3.

Thus, the model incorporates dynamic behavior in the sense that it is linked overtime by equations updating some variables, such as sectoral labor[10], capital stocks, and the allocation of investment shares, so that it does generate sectoral savings, investment, and demand for capital goods.

$$RGDP = \sum_i (HC_i + GC_i + ID_i + E_i - P_{iw}^m M_i ER) \tag{12}$$

Maximization of equation (12) real gross domestic product (RGDP) is the objective of the model. Its maximization depends on maximization the sum household consumption ($HC_i$), government consumption ($GC_i$), investment demand, and exports *minus* imports.

[10] The model assumes that the labor grew, exogenously, by 2.5 percent from 1990-1995 and 4 percent from 1995-2000. These figures are derived from: Ministry of Planning (1995). *Sixth Development Plan*. Riyadh, Ministry of Planing Press.

The model is one of perfect competition, as all markets clear. The closure rules of the model assume that the balance of payments will be adjusted by the flexible real exchange rate, given exogenous transactions in capital flows. We assume zero current account balance at all times; hence, savings equal investment. We, therefore, have ($n$) endogenous variables and ($n$-$1$) equations. The model thus is fully determined and satisfies Walars's Law.

## Simulations and Analysis

This section analyzes the impact on general equilibrium of both a 50 percent and a 100 percent cut in tariffs. Three time frames are examined for each tariff cut: first, the immediate impact (1990); second, the cumulative impact after five years (1995); and third, the cumulative impact after ten years (2000). Analysis is made of the impact on both the tradable sectors and on the incentives facing domestic producers and consumers. All comparisons are in real terms at 1990 prices. Moreover, the model focuses on the quantitative rather than qualitative changes in main variables such as prices, imports, exports, government revenue, real GDP, and investment.

A gradual tariff cut would lead to a decline in the price of imports as well as the price of the composite goods supply. Consequently, agriculture and manufacturing imports would increase. Under the 50 percent tariff cut, agriculture imports increase from SR 14.387 billion to SR 14.728 billion by 1995 (an increase of 2.4 percent), while the manufacturing sector witnesses an increase of imports from SR 132.014 billion to SR 134.545 billion (an increase of 1.9 percent). Under a 100 percent tariff cut, the effects on the Saudi economy are larger due to the relatively greater change in the relative prices. In 1990, the prices of agriculture imports declined by 7.9 percent under a 100 percent tariff cut, compared to merely 4.0 under the 50 percent tariff cut. By the year 2000, the percentage decline in import prices becomes relatively smaller than that of 1990 for both cases of tariff cuts.

The tariff cut causes a pressure on the exchange rate so that the real exchange rate has depreciated. Export prices, therefore, have been affected by the depreciation of the real exchange rate. Measured in domestic currency, the export prices of the non-oil sectors would increase by an amount equivalent to the change in the real exchange rate. Yet, they are cheaper for the rest of the world due to the depreciation of the real exchange rate. Under the 50 percent tariff cut, they amounted to SR 1.016 (an increase of 1.6 percent), SR 1.225 (an increase of 2.9 percent), and SR 1.322 (an increase of 3.1 percent) in 1990, 1995, and 2000, respectively. These values were almost doubled under the 100 percent tariff cut. Given the assumption of a downward sloping demand curve that the economy faces in the oil sector, the export prices of oil have increased measured in domestic currency over the three periods relative to their respective benchmark values. Quantity of oil allocated for export would increase due to an increase in the oil prices, and to the assumption that the world demand for oil would increase by 2.4 percent annually. (See prices in Tables 4 and 6)

This relative change in prices would induce changes in resource allocation towards producing more of exportable and non-tradable goods, and less for import competitive goods. This reallocation, however, is more efficient in consumption and production in the sense that larger composite goods would be available for consumption, as well as more exports would be produced. Saudi import-competitive industries will benefit only in the long run. More outputs of agriculture and manufacturing industries would be allocated for exports because of higher prices abroad measured in domestic currency. They would benefit from lower domestic and import prices, which constitute their inputs, hence become more competitive. Table 5 and Table 7 show that although the outputs of tradable sectors (agriculture and manufacture) have declined in 1990, and 1995, they are increasing by 2000.

The improvement in the welfare of society can be seen in the increase in household consumption, which rises as real wages increase.[11] In the year 2000, for instance, the real wage for skilled workers has increased from SR 49.260 thousand to SR 50.262 thousand after the 50 percent tariff cut, an increase of 2.03 percent. This percentage rate almost doubles under zero tariffs, recording a 4.2 percent increase in real wages for skilled labor.

Meanwhile, the government loses tariff revenue, and, thus its consumption is lower after the tariff cut compared to the benchmark value, particularly in the first two periods (1990 and 1995). By the year 2000, however, government spending rises to exceed its consumption before the tariffs cuts were initiated, due to an increase in government collections of indirect taxes and oil revenues.

The model is a savings-driven model. As real income increases over the three periods, savings also increases given a constant propensity to save by households, and in turn, investment rises, which leads to capital accumulation. The overall effect of a 50 percent tariff cut can be summarized as a rise in real GDP, in 1990 prices. Over time, real GDP would increase by 0.14 percent in 1990, 0.57 percent in 1995, and by 0.9 percent in year 2000, relative to its respective benchmark values. Thus, the value of real GDP gains has been almost doubled under fully liberalized trade. In general, the main macroeconomic variables increase in real terms, as the Saudi economy becomes more open to the rest of the world. In short, gradual trade liberalization exhibits positive effects on the growth path of the economy, and shows that real GDP tends to increase over time. The negative effects of tariff reduction on government revenue tends to vanish in the long run, as the government compensates for it by increases in indirect taxes and oil revenues.

[11] Cuts in tariffs led to an increase in real wages, despite real depreciation in the exchange rate, because real wages are measured in the domestic prices, which went down due to change in relative prices.

**Table 4. The effects of a 50 percent tariffs cut on price levels**

| | Years | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | | | 1995 | | | 2000 | | |
| **Sectors** | **PD** | **PM*** | **PE** | **PD** | **PM** | **PE** | **PD** | **PM** | **PE** |
| Agriculture | 0.975 | 1.077 | 1.016 | 1.103 | 1.298 | 1.225 | 1.139 | 1.401 | 1.322 |
| | (-2.5%) | (-4.0%) | (1.6%) | (-1.5%) | (-2.7%) | (2.9%) | (-1.1%) | (-2.4%) | (3.1%) |
| Mining | 1.015 | 0.000 | 1.015 | 0.540 | 0.000 | 0.568 | 0.316 | 0.000 | 0.337 |
| | (1.5%) | | (1.5%) | (1.3%) | | (1.4%) | (1.0%) | | (0.9%) |
| Manu-facture | 0.967 | 1.077 | 1.016 | 1.143 | 1.298 | 1.225 | 1.183 | 1.401 | 1.322 |
| | (-3.3%) | (-4.0%) | (1.6%) | (-1.9%) | (-2.7%) | (2.9%) | (-1.5%) | (-2.4%) | (3.1%) |
| Electricity | 0.981 | 0.000 | 0.000 | 1.256 | 0.000 | 0.000 | 1.436 | 0.000 | 0.000 |
| | (-1.9%) | | | (-0.9%) | | | (-0.6%) | | |
| Construc-tion | 1.005 | 0.000 | 0.000 | 1.112 | 0.000 | 0.000 | 1.180 | 0.000 | 0.000 |
| | (0.5%) | | | (0.09%) | | | (-0.1%) | | |
| Commerce | 0.990 | 0.000 | 1.016 | 1.148 | 0.000 | 1.225 | 1.159 | 0.000 | 1.322 |
| | (-1.0%) | | (1.5%) | (-0.09%) | | (2.9%) | (0.1%) | | (3.1%) |
| Transporta-tion | 0.989 | 0.000 | 1.016 | 1.468 | 0.000 | 1.225 | 1.890 | 0.000 | 1.322 |
| | (-1.1%) | | (1.5%) | (-0.1%) | | (2.9%) | (0.4%) | | (3.1%) |
| Finance | 0.989 | 0.000 | 1.016 | 1.116 | 0.000 | 1.255 | 1.102 | 0.000 | 1.322 |
| | (-1.1%) | | (1.5%) | (0.3%) | | (2.9%) | (0.5%) | | (3.1%) |
| Services | 0.983 | 0.000 | 1.016 | 1.387 | 0.000 | 1.225 | 1.729 | 0.000 | 1.322 |
| | (-1.7%) | | (1.5%) | (-0.6%) | | (2.9%) | (0.6%) | | (3.1%) |

PD = Price of domestic goods, PM = Price of imports, PE = Price of Exports
* the benchmark equilibrium price level for imports in 1990 = PM + tariff rate = 1+0.12= 1.12

**Table 5. The effects of a 50 percent tariffs on quantity levels**

| | Years | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | | | 1995 | | | 2000 | | |
| **Sectors** | **X** | **M** | **E** | **X** | **M** | **E** | **X** | **M** | **E** |
| Agriculture | 9.288 | 11.301 | 0.152 | 13.957 | 14.728 | 0.288 | 21.065 | 20.047 | 0.513 |
| | (-0.2%) | (2.6%) | (16.0%) | (-0.1%) | (2.4%) | (17.0%) | (0.2%) | (2.6%) | (17.1%) |
| Mining | 110.246 | 0.000 | 80.374 | 174.201 | 0.000 | 132.817 | 261.550 | 0.000 | 201.679 |
| | (0.0%) | | (0.03%) | (0.6%) | | (0.7%) | (0.9%) | | (1.1%) |
| Manufactur e | 86.672 | 91.527 | 0.929 | 135.223 | 134.545 | 1.578 | 215.066 | 188.932 | 2.999 |
| | (-0.3%) | (1.3%) | (22.6%) | (-0.2%) | (1.9%) | (21.8%) | (0.1%) | (2.4%) | (21.9%) |
| Electricity | 4.381 | 0.000 | 0.000 | 6.280 | 0.000 | 0.000 | 8.897 | 0.000 | 0.000 |
| | (-0.1%) | | | (0.3%) | | | (0.6%) | | |
| Construction | 86.442 | 0.000 | 0.000 | 131.780 | 0.000 | 0.000 | 204.655 | 0.000 | 0.000 |
| | (0.6%) | | | (1.2%) | | | (1.4%) | | |
| Commerce | 34.635 | 0.000 | 0.905 | 53.043 | 0.000 | 1.507 | 81.498 | 0.000 | 2.671 |
| | -(0.2) | | (5.5%) | (0.2%) | | (6.7%) | (0.6%) | | (7.4%) |
| Transporta-tion | 32.501 | 0.000 | 7.886 | 39.477 | 0.000 | 6.648 | 50.743 | 0.000 | 6.136 |
| | (1.2%) | | (5.9%) | (1.2%) | | (6.8%) | (1.1%) | | (6.7%) |
| Finance | 14.000 | 0.000 | 0.722 | 22.004 | 0.000 | 1.302 | 33.826 | 0.000 | 2.404 |
| | (-0.3%) | | (5.6%) | (0.2%) | | (5.7%) | (0.7%) | | (6.2%) |
| Services | 68.817 | 0.000 | 4.123 | 96.470 | 0.000 | 3.975 | 132.994 | 0.000 | 3.873 |
| | (-0.1%) | | (7.9%) | (0.3%) | | (8.6%) | (0.5%) | | (8.3%) |

X = Output, M = Imports, E = Exports

**Table 6. The effects of zero-tariff on price levels**

| | Years | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | | | 1995 | | | 2000 | | |
| Sectors | PD | PM* | PE | PD | PM | PE | PD | PM | PE |
| Agriculture | 0.984 | 1.032 | 1.032 | 1.086 | 1.260 | 1.260 | 1.125 | 1.366 | 1.366 |
| | (-1.6%) | (-7.9%) | (3.2%) | (-3.0%) | (-5.5%) | (5.8%) | (-2.3%) | (-4.8%) | (6.6%) |
| Mining | 1.030 | 0.000 | 1.031 | 0.547 | 0.000 | 0.576 | 0.318 | 0.000 | 0.340 |
| | (3.0%) | | (3.1%) | (2.6%) | | (2.9%) | (1.6%) | | (1.8%) |
| Manufac- | 0.934 | 1.032 | 1.032 | 1.119 | 1.260 | 1.260 | 1.164 | 1.366 | 1.366 |
| ture | (-6.6%) | (-7.9%) | (3.2%) | (-3.9%) | (-5.5%) | (5.8%) | (-3.1%) | (-4.8%) | (6.6%) |
| Electricity | 0.961 | 0.000 | 0.000 | 1.243 | 0.000 | 0.000 | 1.428 | 0.000 | 0.000 |
| | (-3.9%) | | | (2.0%) | | | (-1.1%) | | |
| Construc- | 1.010 | 0.000 | 0.000 | 1.112 | 0.000 | 0.000 | 1.179 | 0.000 | 0.000 |
| tion | (1.0%) | | | (0.1%) | | | (-0.2%) | | |
| Commerce | 0.979 | 0.000 | 1.032 | 1.146 | 0.000 | 1.260 | 1.159 | 0.000 | 1.366 |
| | (-2.1%) | | (3.2%) | (-0.3%) | | (5.8%) | (-0.1%) | | (6.6%) |
| Transporta- | 0.977 | 0.000 | 1.032 | 1.466 | 0.000 | 1.260 | 1.897 | 0.000 | 1.366 |
| tion | (-2.3%) | | (3.2%) | (-0.3%) | | (5.8%) | (0.7%) | | (6.6%) |
| Finance | 0.976 | 0.000 | 1.032 | 1.118 | 0.000 | 1.260 | 1.108 | 0.000 | 1.366 |
| | (-2.4%) | | (3.2%) | (0.4%) | | (5.8%) | (1.1%) | | (6.6%) |
| Services | 0.965 | 0.000 | 1.032 | 1.379 | 0.000 | 1.260 | 1.730 | 0.000 | 1.366 |
| | (-3.5%) | | (3.2%) | (-1.1%) | | (5.8%) | (0.1%) | | (6.6%) |

**Table 7. The effects of zero-tariff on quantity levels**

| | Years | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | | | 1995 | | | 2000 | | |
| Sectors | X | M | E | X | M | E | X | M | E |
| Agriculture | 9.246 | 11.617 | 0.178 | 13.947 | 15.107 | 0.339 | 21.100 | 20.604 | 0.605 |
| | (-0.7%) | (5.4%) | (35.9%) | (-0.1%) | (5.0%) | (37.8%) | (0.3%) | (5.4%) | (38%) |
| Mining | 110.247 | 0.000 | 80.399 | 175.244 | 0.000 | 133.798 | 264.155 | 0.000 | 204.029 |
| | (0.0%) | | (0.1%) | (1.2%) | | (1.4%) | (1.9%) | | (2.3%) |
| Manufac- | 86.338 | 92.762 | 1.150 | 134.948 | 137.290 | 1.942 | 215.275 | 193.687 | 3.689 |
| ture | (-0.7%) | (2.6%) | (51.7%) | (-0.4%) | (4.0%) | (50%) | (0.2%) | (4.9%) | (49.8%) |
| Electricity | 4.376 | 0.000 | 0.000 | 6.299 | 0.000 | 0.000 | 8.951 | 0.000 | 0.000 |
| | (-0.2%) | | | (0.6%) | | | (1.2%) | | |
| Construc- | 87.001 | 0.000 | 0.000 | 133.413 | 0.000 | 0.000 | 207.712 | 0.000 | 0.000 |
| tion | (1.3%) | | | (2.4%) | | | (2.9%) | | |
| Commerce | 34.550 | 0.000 | 0.957 | 53.165 | 0.000 | 1.612 | 82.047 | 0.000 | 2.880 |
| | (-0.5%) | | (11.5%) | (0.5%) | | (14.1%) | (1.3%) | | (15.8%) |
| Transporta- | 32.916 | 0.000 | 8.365 | 39.988 | 0.000 | 7.119 | 51.353 | 0.000 | 6.564 |
| tion | (2.5%) | | (12.4%) | (2.5%) | | (14.4%) | (2.3%) | | (14.1%) |
| Finance | 13.954 | 0.000 | 0.764 | 22.052 | 0.000 | 1.380 | 34.070 | 0.000 | 2.561 |
| | (0.6%) | | (11.7%) | (0.5%) | | (12.0%) | (1.4%) | | (13.2%) |
| Services | 68.746 | 0.000 | 4.462 | 96.767 | 0.000 | 4.332 | 133.709 | 0.000 | 4.210 |
| | (0.2%) | | (16.9%) | (0.6%) | | (18.4%) | (1.1%) | | (17.7%) |

X = Output, M = Imports, E = Exports

## Concluding Remarks

In this paper, the Saudi Arabian economy was subjected to a gradual tariff cut of 50 percent and then by 100 percent taking into consideration the main characteristics of the Saudi economy, including the fact that Saudi Arabia is a capital-abundant country that depends primarily upon one depletable commodity for exports – oil. Thus, we assume that Saudi Arabia has power in the global oil market, and hence, faces a downward sloping demand curve for oil exports. Other assumptions include the typical small country assumptions in a competitive, neoclassical CGE model. In standard CGE models, all products and factor markets are assumed to be fully competitive, and excess demand functions are homogenous of degree zero in prices and satisfy Walras's law. Household product demand and factor supply functions are specified to be consistent with utility maximization, subject to budget constraints, while product supply and factor demand functions of the producers are specified to be consistent with profit maximization.

By using a neoclassical dynamic CGE model, this study demonstrates the changes that can be expected over time in different sectors of the Saudi Arabian economy, and, in turn, compares and assesses the effects of different tariff cuts over three time periods. The study found that gradual trade liberalization provides the advantages of an improvement in the welfare of society as well as improved national income and a better trade balance in the Saudi economy. It also found that an initial loss in government revenue would not persist. In the long run, the effects of the tariff cuts on government revenue will disappear due to increases in collections of indirect taxes as well as in oil revenue.

The outcome of gradual tariff cuts, however, has been influenced by the relatively small size of the Saudi economy and by the specific shares of each tradable sector, as well as assumptions adopted in this study. For example, the model includes only two importing sectors, agriculture and manufacturing, which have relatively small shares of imports and exports in international trade. Moreover, the tariff rate on Saudi imports is relatively small, at 12 percent, compared to the tariff rates of other developing countries. All these specifics influence the shape of the predicted outcomes.

The study also suggests adopting an export-oriented strategy. It shows that the Saudi import-competitive industries will benefit only in the long run and only as they turn to being export-oriented industries. Lower import and domestic prices resulted from trade barrier elimination contributes to the competitiveness of export goods in world markets. This implies that Saudi Arabia should become more involved in the world economy by hastening the process of forming the GCC Custom Union and enrolling in the WTO. By doing so, the country may increase its share of exports in both the agricultural and manufacturing sectors to the countries of the GCC. The manufacturing sector's export share would increase, particularly the exports of the petrochemical industries, which are included in the manufacturing sector rather than the oil sector.

In addition, the country would benefit from technology transfers and capital flows into the country, which are anticipated as a result of greater involvement in the world market. The Saudi economy would benefit from greater capital inflows, particularly because its export sector is capital intensive. If the agriculture and manufacturing sectors expand by pursuing a gradual tariff elimination policy, they most likely would become more capital-intensive, too. The agriculture sector depends heavily on government subsidies and the latest irrigation technology rather than labor. The manufacturing sector, on the other hand, lacks skilled Saudi workers so that the producers of manufactured goods would depend on technology transfers from abroad, especially as Saudization is emphasized.

A number of limitations should be taken into consideration in interpreting the results of this study. First, the criterion that real GDP should be as high as possible may not be appropriate for long-run considerations. Within the context of the terms of trade argument against free trade, it is believed that in order to impose a sufficiently small tariff, the terms of trade benefits must outweigh the costs. Even though Saudi Arabia has some power in the oil export sector, it is a small country on the import side and, thus, has little ability to affect world prices. Thus, the effects of a policy change on its terms of trade are expected to be negligible in reality. The terms of trade argument against free trade is theoretically sound; in reality, however, a total elimination of tariffs may not be the optimal policy for Saudi Arabia. In the long run, Saudi Arabia must diversify and this requires the imposition of a sufficient tariff rate in order to protect some industries and to hedge against fluctuations in the price of oil.

Second, export supply functions may not be uniform for all sectors. In the oil sector, for example, the supply is exogenously determined and based on government decision-making within the Organization of Petroleum Exporting Countries (OPEC) framework, and is not based on relative prices as this study assumed.

In conclusion, this CGE model could be extended into a more disaggregated multisectoral model if more extensive and reliable data were available. It is, therefore, strongly recommended that the Saudi authorities prepare an official social accounting matrix for the Saudi economy, with sufficient and reliable data for the labor market, and sectoral capital stock in order to facilitate further research in this area.

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# بعض تأثيرات تحرير التجارة الخارجية التدريجي على الاقتصاد السعودي

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**ملخص البحث.** تتبنى هذه الورقة نموذج التوازن العام المحتسب ديناميكياً لتحليل أثر تحرير التجارة التدريجي على الاقتصاد السعودي. على وجه الخصوص، تهدف الدراسة إلى معرفة تحرير التجارة الخارجية التدريجي على إيرادات الحكومة، بالإضافة إلى تسعة قطاعات اقتصادية منتجة . وتتبنى هذه الدراسة فرضيات المدرسة النيوكلاسيكية لاقتصاد صغير ومفتوح ضمن أسواق تنافسية. إلا أن القطاع البترولي سيعامل كقطاع تمتلك السعودية قوة التأثير فيه. وقد أشارت نتائج الدراسة إلى أن تحرير التجارة الخارجية سيؤدي إلى تخفيض الإيرادات الحكومية، ومن ثم الاستهلاك الحكومي الحقيقي في المدى القصير. إلا أنه وفي المدى البعيد، سيتلاشى تأثير تحرير التجارة الخارجية على الإيرادات الحكومية نتيجة تعويض الفاقد من تخفيض التعريفة الجمركية عن طريق الزيادة في إيرادات الضرائب غير المباشرة و الإيرادات من البترول.