

**The effects of non-tariff barriers reduction on agricultural macroeconomic variables in a CGE framework**Solmaz Rajabli <sup>1</sup>, Seyed-Ali Hosseini-Yekani <sup>2</sup>, Mehرداد Zarenejad <sup>3</sup><sup>1</sup>. Department of Agricultural Economics, Qaemshahr Branch, Islamic Azad University, Qaemshahr, Iran<sup>2</sup>. Department of Agricultural Economics, Sari University of Agricultural Sciences and Natural Resources, Sari, Iran<sup>3</sup>. Department of Economics, Qaemshahr Branch, Islamic Azad University, Qaemshahr, Iran[solmaz\\_r6205@yahoo.com](mailto:solmaz_r6205@yahoo.com)

**Abstract:** As foreign trade liberalization is one of the tools of globalization and this is gradually developing in the world and because all countries have to join to this process, so it is essential that government makes the necessary conditions and pave the way for confronting this general development in the country. Now the continuation of economic sectors activities depends on supports. Protective policies are executed by two kinds of tools, that is, tariff and non-tariff barrier. In this study a multi-sector CGE model is developed to analyze the results of elimination non-tariff barriers in Iran. The basic required data for calibrating the model and simulating different scenarios are achieved from social accounting matrix (SAM) of country. The last version of Iranian SAM (year 2001) is utilized in this study. The results of this study show that, the policy of non-tariff barriers reduction in the agricultural sector causes the reduction of employment consumption, capital and demand for intermediate inputs, production and exports in this sector. In other words, merely liberalizing and eliminating non-tariff barriers in the agricultural sector is not an appropriate policy and can do a lot of damage to this sector.

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**1. Introduction**

The aspect of globalization after 1980s and specially following the Uruguay round negotiations, has been of particular interest to the international community (Intriligator, 2004). The world trade organization (WTO) member countries based on the agreements of this Round, were obliged to reduce the trade protection and supports (tariff and non-tariff barriers) and adapt their trading system to bilateral and multilateral agreements with the negotiating parties. These changes in the foreign trade regime had significant effects on the different economic sectors of the member countries.

Evaluating Iran's current tariff system shows that the current system of agricultural tariffs is built based on a single tool system (ad valorem tariff). Past experience shows that in spite of the high level of tariff averages, this tool could not protect domestic products effectively and efficiently.

Inefficiency of tariff tools in the past years has been put under cover of other non-tariff barriers and foreign exchange policies and there has been no attempt to make them efficient. But the country's trade regime transparency as a prerequisite for interacting with the global economy requires elimination of non-tariff barriers and unstable foreign exchange policies.

A non-tariff barrier is an action disrupting the trade volume and direction (Walter, 1972). This definition is so broad that even it includes tariff,

because tariff also disrupts, the trade volume. But it can be said that Hillman presents the most accurate definition in this regard. He considers every government barrier except tariff as a non-tariff that hinders directly the importation of goods into a country, or exerts discriminatory tariffs against importing goods (Hillman, 1991).

In a condition where the market mechanism in the international agricultural products market has been severely disrupted as a result of the wide spread use of different protective methods. The Agreement on Agriculture can be considered as one of the most important and interesting subjects in the General Agreement for Tariff and trade (GATT) 1994, because under this agreement not only for the first time the border policies of the contracting states are addressed, but domestic protective policies are also considered. Matters relating to the agricultural products trade on the Agreement are based on three main pivots:

- 1- Market access
- 2- Domestic support
- 3- Export subsidies

In the area of market access, completely revoking non-tariff barriers and converting them into tariff equivalents was the result of the Agreement. In addition, keeping current access and maintaining the minimum. In addition keeping current access and maintaining the minimum access were other agreements. Reducing the tariff rates of agricultural

goods and products was another agreement in the Uruguay Round. In regard to domestic support, the Agreement on Agriculture by introducing "Green Box" support measures has allowed such measures, on the other hand support measures subject to the reduction. Called "Amber box" measures, must be calculated and reduced in the agricultural sector of each country and finally fixed at the same level. Export subsidies with regard to the Agreement on Agriculture must be calculated and also reduced or eliminated in terms of value and quantity (volume of subsidized exports). The present study examines the effects of eliminating non-tariff barriers on macro variables of agricultural sector using the Computable General Equilibrium (CGE) model which is a multi-sector model based on the Walrasian General Equilibrium.

Azzam (1991) described a three-sector supply-demand model, was used to estimate the direct and indirect (induced) effects on government cost of changes in the soft wheat subsidy. The results of his study showed that virtually all the indirect effects come from the soft wheat market itself. The indirect effects emanating from the related markets were negligible.

Dhehibi and Gil (2003) assessed the impact of two alternative schemes of price subsidies management. Food demand forecasts in this study were based on estimated parameters from an AIDS model together with some assumptions about the exogenous variables and population projections. Results indicated that a gradual subsidies removal will not affect substantially food expenditure structure. Non subsidized food products would increase their relative position while traditional products would lose slightly.

Jensen and Tarr (2003) developed a multi-sector CGE model with ten rural and ten urban households to analyze the various reforms, separately and together. Reflecting the large initial distortions, they found that the combined reforms could generate large welfare gains equal to about 50% of aggregate consumer income. Moreover, the results showed that well-intentioned policies of commodity subsidies for the poor can have perverse effects. Even non-targeted direct income payments to all households (not just the poor) would enormously and progressively increase the incomes of the poor compared to the status quo.

For more information see Lofgren and El-Said (1999), Arndt et al. (2001), Ramaswami and Balakrishnan (2001), Ahmed and Bouis (2002), Coady and Harris (2004), Dutta and Ramaswami (2004), Kochar (2005), Mane (2006), Afsaw (2007) and Gelan (2007).

## 2. Material and Methods

In this study a multi-sector CGE model is developed to analyze the results of elimination non-tariff barriers in Iran. The basic required data for calibrating the model and simulating different scenarios are achieved from social accounting matrix (SAM) of country. The last version of Iranian SAM (year 2001) is utilized in this study. Parameters, variables and relations in CGE model of current research followed by Lofgren (1999) are as below:

(1) Value added function

$$VA_j = b_j \prod_h FD_{hj}^{\beta_{hj}}$$

(2) Demand function for intermediate factors

$$X_{ij} = ax_{ij} \cdot Y_j$$

(3) Value added demand function

$$VA_j = ay_j \cdot Y_j$$

(4) Factors demand function

$$FD_{hj} = \frac{\beta_{hj} \cdot PN_j (1 - sa_j)}{W_h} \cdot VA_j$$

(5) Cost function

$$PS_j = ay_j \cdot PN_j (1 - sa_j) + \sum_i ax_{ij} \cdot PQ_i (1 - sq_i)$$

(6) Households income

$$YH = \sum_h W_h \cdot FS_h + GOVTH + EXR.REMIT$$

(7) Indirect tax relation

$$ITAX_j = tx_j \cdot PS_j \cdot Y_j$$

(8) Direct tax relation

$$DTAX = td \cdot YH$$

(9) Tariff income relation

$$TARIFF_j = tm_j \cdot PM_j \cdot M_j$$

(10) Subsidy of consumption

$$SC_i = sq_i \cdot PQ_i \cdot Q_i$$

(11) Subsidy of production

$$SP_i = sa_i \cdot PN_i \cdot VA_i$$

(12) Government income

$$GR = DTAX + \sum_j ITAX_j + \sum_j TARIFF_j + (EXR.GIR) - \sum_j (SC_j + SP_j)$$

(13) Private sector consumption

$$C_i \cdot PQ_i (1 - sq_i) = \lambda g_{ci} (YH - DTAX - HSAV)$$

(14) Public sector consumption

$$C_i \cdot PQ_i (1 - sq_i) = \lambda g_{ci} \cdot GDTOT$$

(15) Investment demand function

$$ID_i - PQ_i(1 - sq_i) = \mu_i \cdot INVEST$$

(16) World export price relation

$$PE_i = pwm_i \cdot EXR$$

(17) World import price relation

$$PM_i = pwm_i \cdot EXR$$

(18) Armington CES function

$$Q_i = \gamma_i (\alpha_{mi} M_i^{\rho_{mi}} + \alpha_{di} D_i^{\rho_{mi}})^{\frac{1}{1-\rho_{mi}}} \cdot Q_i$$

(19) Import demand function

$$M_i = \left( \frac{\gamma_i^{\rho_{mi}} \cdot \alpha_{mi} \cdot (1 - sq_i) \cdot PQ_i}{(1 + tm_i) \cdot PM_i} \right)^{\frac{1}{1-\rho_{mi}}} \cdot Q_i$$

(20) Domestic goods demand function

$$M_i = \left( \frac{\gamma_i^{\rho_{mi}} \cdot \alpha_{di} \cdot (1 - sq_i) \cdot PQ_i}{PD_i} \right)^{\frac{1}{1-\rho_{mi}}} \cdot Q_i$$

(21) Transfer CET function

$$Y_i = \theta_i (\beta e_i \cdot E_i^{\rho_{ei}} + \beta d_i \cdot D_i^{\rho_{ei}})^{\frac{1}{\rho_{ei}}}$$

(22) Export supply function

$$E_i = \left( \frac{\theta_i^{\rho_{ei}} \cdot \beta_{di} (1 - tx_i) \cdot PS_i}{PE_i} \right)^{\frac{1}{\rho_{ei}}} \cdot Y_i$$

(23) Domestic goods supply function

$$D_i = \left( \frac{\theta_i^{\rho_{ei}} \cdot \beta_{di} (1 - tx_i) \cdot PS_i}{PD_i} \right)^{\frac{1}{\rho_{ei}}} \cdot Y_i$$

(24) Private sector saving

$$HSA = S_{hoh} \cdot YH$$

(25) Public sector saving

$$GSAV = S_g \cdot GR$$

(26) Total investment relation

$$SANVING = (HSAV + GSAV + EXR \cdot FSAV)$$

(27) Factor market clearing relation

$$\sum_j FD_{hj} = FS_h$$

(28) Composite goods market clearing relation

$$Q_i = C_i + G_i + ID_i + \sum_j X_{ij}$$

(29) Balance of payment

$$\sum_i pwe_i \cdot E_i + FSAV + REMIT + GIR = \sum_i pwm_i \cdot M_i$$

(30) Investment-Saving equality

$$SAVING = INVEST$$

(31) Price normalize relation

$$PINDEX = \sum_i \omega_i PQ_i (1 - sq_i)$$

Endogenous variables inside the above relation are as following:

1.	Value added	VA <sub>j</sub>
2.	Value added price	PN <sub>j</sub>
3.	Factor price	W <sub>h</sub>
4.	Factor demand	FD <sub>hj</sub>
5.	Supply price	PS <sub>j</sub>
6.	Gross output	Y <sub>j</sub>
7.	Composite good price	PQ <sub>i</sub>
8.	Intermediate factor	X <sub>ij</sub>
9.	Households consumption	C <sub>i</sub>
10.	Household income	YH
11.	Direct tax	DTAX <sub>r</sub>
12.	Households saving	HASV
13.	Indirect tax	ITAX <sub>j</sub>
14.	Total subsidy of consumption	SC <sub>i</sub>
15.	Total subsidy of production	SP <sub>i</sub>
16.	Tariff income	TARIFF <sub>j</sub>
17.	Import domestic price	PM <sub>j</sub>
18.	Import	M <sub>j</sub>
19.	Government expenditures	G <sub>j</sub>
20.	Government income	GR
21.	Government saving	GSAV
22.	Investment demand	ID <sub>i</sub>
23.	Total investment	INVEST
24.	Export domestic price	PE <sub>i</sub>
25.	Exchange rate	EXR
26.	Composite good	Q <sub>i</sub>
27.	Domestic good	D <sub>i</sub>
28.	Price of domestic good	PD <sub>i</sub>
29.	Export	E <sub>i</sub>
30.	Government foreign income	GIR
31.	Total saving	SANVING

Exogenous variables of model are as following:

1.	Foreign saving	FSAV
2.	Important world price	Pwm <sub>i</sub>
3.	Export world price	Pwe <sub>i</sub>
4.	Factor supply	FS <sub>h</sub>
5.	Government consumption	GDTOT
6.	Transfer payment from government to households	GOVTH
7.	Net rest of the world payments	REMIT
8.	Price index	PINDEX

Finally, parameters of model are:

1.	Efficiency parameter in production function	b <sub>j</sub>
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- 2. Share parameter in production function  $\beta_{hj}$
- 3. Input parameter of Leontief production function  $\alpha x_{ij}$
- 4. Output parameter of Leontief production function  $ayi$
- 5. Share parameter in utility function  $\lambda_{ci}$
- 6. Consumption subsidy rate  $sqi$
- 7. Production subsidy rate  $sai$
- 8. Indirect tax rate  $txj$
- 9. Direct tax rate  $td$
- 10. Tariff rate  $tmj$
- 11. Share parameter of government  $\lambda_{gi}$
- 12. Share parameter of investment  $\mu_i$
- 13. Share parameter in Armington function  $\alpha_{mi} \alpha_{di}$
- 14. Substitution elasticity parameter  $\rho_{mi}$
- 15. Efficiency parameter in CET function  $\theta_i$
- 16. Share parameter in CET function  $\beta_{ei} \beta_{di}$
- 17. Transfer propensity to saving of private sector  $\rho_{ei}$
- 18. Average propensity to saving of private sector  $Shoh$
- 19. Average propensity to saving of public sector  $S_g$
- 20. Weight of prices  $\omega_i$

substitute for domestic goods and mixed goods are reduced.

By reducing mixed goods, the demand for domestic products, which has a direct relationship with mixed good is also reduced. The reduction of demand for domestically produced goods, in turn, leads to the decrease in the product supply. Changes in production usually cause a change in the demand for the work force and the reduction of the extent of demand with respect to the conditions occurred for supplying the products of this sub-sector is completely rational.

Table 1- The effect of different scenarios of non-tariff reduction on macro variables of agricultural and horticultural sub-sector

	20%	40%	60%	80%	100%
Imports	10.51	11.24	12.01	12.84	13.27
Exports	-0.3	-0.4	-0.5	-0.6	-0.7
Production volume	-0.76	-0.86	-0.97	-1.1	-1.2
Employment level	-0.63	-0.73	-0.83	-0.95	-1.10
Household consumption	0.45	0.50	0.56	0.64	0.73

Furthermore, the decreasing export trend as this variable is a direct function of the production volume is completely unquestionable. The decreased production and supply in the agricultural sector results in the reduction of exports. Because the total workforce in the model under study is assumed to be fixed, this reduction means that these inputs are transferred into other production sectors that in the next tables can be observed in come of private sector and consequently the private sector consumption is also increased.

**3. Results and discussion**

Regarding the objective of the study which is to examine the effect of reducing non-tariff barriers in all sectors on the key variable in the agricultural sector, this reduction is addressed gradually from of 20, 40, 60, 80 and 100% scenarios. The results obtained from simulations are shown in tables 1-4.

In the process of trade liberalization, the reduction of important non-tariff barriers affects the imports of goods and services. Changes in imports, in turn, cause some changes in the production of goods and services in the country that these changes might be positive or negative. As shown in table 1. Following the reduction of non-tariff barriers in the agricultural and horticultural sub-sectors, the imports variable shown the highest present change among the macro variables of this sub-sector. In fact, by reducing non-tariff barriers, the import commodity price is reduced inside the country and this, in turn, result, is the increased demand for imports. As based on the Arlington hypothesis imported and domestically produced goods are imperfect substitutes to each other, thus, foreign goods

Table 2- the effect of different scenarios of non-tariff reduction on macro variables of animal husbandry

	20%	40%	60%	80%	100%
Imports	6.71	6.93	7.17	7.43	7.71
Exports	0.18	0.19	0.21	0.24	0.27
Production volume	-0.27	-0.28	-0.30	-0.31	-0.32
Employment level	-0.13	-0.13	-0.14	-0.14	-0.15
Household consumption	0.40	0.43	47	0.51	0.56

Tables 2 and 3 show that, the reduction of non-tariff barriers in the agricultural and horticultural subsector is in the same conditions as the reduction in the animal husbandry and industry sub-sector if the exports variable is ignored. The increased exports in the horticultural and industry sectors is the result of

the fact that the increased consumption is less than the increased imports in these two sectors, resulting in the exportation of part of the imported goods (re-exporting). Table 4 shows the effect of different scenarios of non-tariff reduction on macro variables of the oil and mining sector as it is observed, all variables (imports, exports, production volume, employment level and house hold consumption) have increased.

Table 3- the effect of different scenarios of non-tariff reduction on macro variables of industry

	20%	40%	60%	80%	100%
Imports	2020	2.50	2.84	3.22	3.66
Exports	1.07	1.15	1.24	1.35	1.47
Production volume	-0.21	-0.21	-0.21	-0.21	-0.21
Employment level	-0.09	-0.08	-0.08	-0.08	-0.07
Household consumption	1.02	1.12	1.24	1.37	1.53

Table 4- the effect of different scenarios of non-tariff reduction on macro variables of services sector

	20%	40%	60%	80%	100%
Imports	0.460	0.462	0.465	0.467	0.472
Exports	1.52	1.58	1.66	1.74	1.83
Production volume	2.20	2.23	2.26	2.30	2.35
Employment level	1.37	1.44	1.52	1.60	1.70
Household consumption	0.41	0.42	0.44	0.45	0.46

#### 4. Conclusion

As foreign trade liberalization is one of the tools of globalization and this is gradually developing in the world and because all countries have to join to this process, so it is essential that government makes the necessary conditions and pave the way for confronting this general development in the country.

Now the continuation of economic sectors activities depends on supports. Protective policies are executed by two kinds of tools, that is, tariff and non-tariff barrier. Tariff barrier are price tools that the degree of their transparency is higher in economy and today, the general goal of the global economy is to direct support measures towards price tools because the damage resulting from this tool is less than non-tariff barrier, or in other words, the extent of disruption due to non-price tools is higher than price tolls. Non-tariff barrier include restrictions, import quotas, foreign exchange allocation, limitation in regulations and quotas are specified by laws and some have no executive rule or standard in terms of

from and execution. In fact, the government by prohibiting the importation of many goods has made the conditions for production and activity in this sector. It is quite likely that by eliminating import non-tariff barriers, many sectors because of inefficiency and not having the competition power with global goods, suffer serious damage and irrecoverable losses.

Undoubtedly, with rapid progress towards globalization the government should reduce its support and protection for industries and sectors. But suddenly reducing non-tariff barriers may cause severe problems for many industries and sectors in the country whereas the long- term and gradual reduction of non-tariff barriers can make the conditions that some of these sectors and reach the global level. In addition, factors of production from inefficient industries and sectors are transferred into sectors with a higher efficiency promoting the growth of these sectors. Therefore the entry to the WTO requires the identification and adoption of appropriate policies to consolidate the country's status in the arena of global competition.

#### 5. Recommendations

1- The policy of non-tariff barriers reduction in the agricultural sector causes the reduction of employment consumption, capital and demand for intermediate inputs, production and exports in this sector. In other words, merely liberalizing and eliminating non-tariff barriers in the agricultural sector is not an appropriate policy and can do a lot of damage to this sector.

2- The model used in this study is a four-sector model. If the objective of the study is to examine the effect of this policy on special products or smaller sectors, the model can be divided into smaller components for examining the full details of the effect of a policy.

3- In this model, only the reduction of import non-tariff barriers as an index of trade liberalization is used, whereas in determining the broad effects of liberalization, all related laws and regulations including tariff barrier must be considered.

4- Because the model is calibrated based on "social accounting is prepared using the data of input-output tables and national accounts, so the precise collection of the country's statistical information by the authorities can be effective in the precision of the country's statistical information by the authorities can be effective in the precision of the simulation results.

5- The model employed in this study is a static model which is solved based the information relating to one base year. In other words, the factor of



time in not introduced in to model. Thus, by introducing the time variable into the model and converting it into an inter-temporal model, the effects of implementing a policy on the change, trend of a variable over the time can be examined, because most policies such as liberalization are long term policies that can produce different results in the long-term relative to a given time section.

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