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Production Subsidies Elimination on Iranian Economy (Applying CGE Model)

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Abstract

In present study, the impacts of production subsidies elimination on production, export, import, employment, and different macroeconomic variables have been evaluated based on a Computable General Equilibrium model (CGE) for Iran's economy. The model applied the Iranian input-output table data of year 2002. Three scenarios include 25, 50, and 100 percent reduction in production subsidizing rate were analyzed, respectively. Results did not show any significant change in production and employment rate in oil and mineral production sectors, but implied a reduction in production, employment rate and exports of industry, agriculture and service in all scenarios. It found the food industry was the most vulnerable part of Iran's economy, so paying more attention to growth rate of agriculture and food industry may inevitably facilitate the elimination policy of production subsidies. With regard to negative consequences of production subsidies elimination overall agricultural sector, the agricultural products need more support on productivity growth in factors of production.

Keywords: production subsidy, CGE model, subsidy elimination, agricultural economics, Iran

1- Introduction

Price has a central role in economic activities, so the price has a special position in theoretical basics of economics. Governments typically react to some prices' changes, and try to prevent price reduction or inflation through supervision or implementing some policies in the country. On hand, some economists believe that government intervention in market mechanism caused disturbances in prices and consequently, these prices cannot guide

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consumers, producers and investors. On the other hand, some economists believe in government intervention to support domestic production and vulnerable communities. However, it is clear that any government intervention makes disturbances in market price mechanisms and such prices are not representative of social realistic expenses in competitive conditions (Royanni, 2009).

Most countries which accomplished agricultural subsidies program have leaded to subsidies reforms. Some reasons that countries changed polices are included redistributing wealth, preventing more economy, trade and environment damages. protests at the farm subsidies plan point to negative results of that pattern such as curbing trade opportunities and distorting competitiveness (ICTSD, 2012)

2- Background

In 1960, the first general equilibrium model was used by Johansen for Norway's economy. Since, mid-'70s, CGE models widely are used as models for policy analysis. For instance, Lofgren and El-Said (2001) applied a CGE framework to investigate food subsidies (mainly oil and sugar) in Egypt. The results showed that the removal of subsidies led to a decrease in income and consumption. Therefore, targeted subsidies need to assist the first two deciles of income.

Elliot et al, (2010), explored answers of two questions, what are the effects of ethanol production on food and duel markets? And what will be ethanol production impacts if it is excluded? Two scenarios: ethanol production eliminate (a) if it was completed to the end of 1999, and (b) if it is applied at the end of 2011. A computable general equilibrium model is used to test impacts of these scenarios in their study. Simulation results indicate that crude oil and refined petroleum prices have faster growth than corn and corn-based ethanol prices. The difference between the wholesale gasoline price in the baseline and ethanol elimination scenarios will be 12.5 percent in 2025.Maipita et al (2012) used a Computable General Equilibrium model to examine the effects of fuel subsidy on income levels if it deviates from food crops to non-food crops sector. Results demonstrate that if fuel subsidy shifts to non-food crops, level of household income will increase and so poverty decline. This progress has an impact on rural households higher than urban households. Since many studies emphasized the

elimination of subsidies remedy distorted prices, this study peruses the effect of subsidies elimination on Iranian economy. Holland et al, (2007) attempted to predict the effect of increased energy prices on U.S. agricultural economy in a study for the department of agriculture. Results showed that sectors that were highly energy dependent, an increase in energy price would cause cost growth and loss of competitive advantage. This research suggested that the growth of energy price can be compensated by an improvement in efficiency of technology and replacement with more efficient technology in energy. In 2010, Lin and Jiang analyzed the energy subsidies reform by using general equilibrium in China. The results showed that a reduction in subsidies, have significant effects on energy demand and has a negative impact on macroeconomic variables(Lin and Jiang, 2010).

Iranian government applied subsidies on food production and consumption by covering the difference between artificially high support producer prices and low consumer prices. The government buys the grain (for example, corn and wheat) from the farmers at any naturally high support price and sells it to the producers of the final goods (for example, tortillas and bread) at an artificially low price(Saboohi,2001).

This government has introduced prices ceilings in the final goods. The volume of the subsidy obviously depends on the difference of demand and supply and between disturbed price and equilibrium price. The total subsidy also includes the cost of the grain imports which sells to the final goods producers at any price below cost. Akbari moghaddam (2005) accomplished a study to evaluate impacts of reduction in agricultural subsidies (farming activities subsidies) and the change in the labor tax rate on production level, rural and urban household incomes. A multi-sector computable general equilibrium model has been applied into five levels in rural and urban households. He found that reduction in agricultural subsidies (farming activities subsidies) will have a negative impact on all productive sectors. It also has a negative effect on urban and rural incomes. The effects of food subsidy reforms on households' welfare and government spending were explored by Karami et al in Iran in year 2010. A computable general equilibrium (CGE) model was applied for this research. Three scenarios include in removing of subsidy through a three and five years and immediately food subsidy elimination. The results of this study point to a 5.8% reduction in government expenditure, and decline in import and export

of agricultural and non-agricultural goods. Furthermore, all scenarios result to fall in the households' welfare. Applying the removal food subsidy to apply the removal food subsidy through a long term (five years) and object to lower income groups(Karami et al, 2010). Also, Karami and et al (2012) studied to the effects of alternative food subsidy reform in Iran, The results indicated that in these polices government expenditure decreases by 5.8%, and resulting to decrease in import and export of agricultural and non-agricultural goods, but decreases in import exceeds the export reduction. Jensen and Tarr (2003) studied Trade, Exchange rate, and Energy pricing reform in Iran. They find that the combined reforms could generate large welfare gains equal to about 50% of agree gate consumer income. Moreover, the results show that well –intentioned policies of commodity subsidies for the poor can perverse effects.

This research analyses the short-run economic effects of elimination production subsidy in Iran, using a computable general equilibrium model. The ORANI applied a general equilibrium (AGE) model of the Australian economy was first developed in the late 1970s as part of the government-sponsored impact project[1]. The model has been widely used as a tool for practical policy analysis by academics, and by economists employed in government departments and in the private sector. ORANI-G is a single-country CGE model designed for comparative-static analysis of a variety of policy issues. The version of the model taken as a starting point for this study is as documented in Horridge (2003). It distinguishes the 91 sectors listed on the right hand side of Table 1. Our computations use a 91-sector database, but to simplify presentation, we have aggregated 91-sector results into the 13 broad sectors listed on the left-hand side of Table 1. In addition to the 91 sectors the model discerns household, government, investment, inventory and export final demanders. From among common models of computable general equilibrium include ORANI, Dixson et al (2010), Horridge and Pierson (2003), Loufghen (2001), Mansur and Whaley(1994), Johansson (1960) and many investigators applied it to analyze different macroeconomic shocks. The present study has used a computable general equilibrium model (ORANI_G). The mentioned model is chosen for its

structure which is fully compatible with the basic theories of economy. In addition, it put more emphasis on performance and distributive effects of different economic policies. We used an elimination production subsidies policy on economy of Iran. Subsidization has been pursued in Iran since early 1970s. One of the primary objectives of this study was to identify the effect of changing subsidy system policy, which protected food security of the poor in a cost-effective manner. According to many experts we can conclude that the Iranian government has intervened extensively in market price system (Behkish, 2002). From among common models of computable general Equilibrium include MSG, Johansson (1960) and SCGE, Shauwn and Walley (1984, 1998) and Loufghen (2000), ORANI, Dixson et al (1997), Horrige and Pierson (2003) the present study have used a computable general Equilibrium (ORANI_G). This study aims to investigate the effects of alternative subsidy rate reforms on production, export, import, employment sections of economic, and different macroeconomic items in Iran's economy. For this purpose, computable general equilibrium (CGE) model was applied. The scenarios consist of, gradual omission of production subsidy during 2 and one scenario complete omission of production subsidy.

3- Method

ORANI-G determines supplies and demands of goods and services through optimising behaviour of agents in competitive markets. Optimising behaviour also determines sector demands for primary factors, such as labour, capital, and land. In the short-run application described here we assume that capital and land are industry-specific and in fixed supply. The basic theoretical assumptions made in ORANI-G are as follows:

4- Markets

Demand equals supply in all markets. Each market is assumed to be competitive, implying equality between the price received by the producer and the producer’s marginal cost. However, taxes and subsidies on commodities and primary factors can drive wedges between prices paid by purchasers and prices received by producers. In markets for traded commodities, buyers differentiate between domestically produced products and imported products with the same name.

Input demands for production of commodities

Two broad categories of inputs to production are recognised: intermediate inputs and primary factors. Each sector is assumed to choose the mix of inputs to minimise total cost for a given level of output. Sectors are constrained in their choice of inputs by a two-level nested production technology. At the first level, intermediate-input bundles and primary-factor bundles are used in fixed proportions. At the second level, intermediate input bundles are formed as combinations of imported bundles and domestic goods with the same name, and primary-factor bundles are formed as combinations of labour, capital and land. In both cases the aggregator function has a Constant Elasticity of Substitution (CES) form.

Household demands

There is a single representative household, which buys composite commodities according to the Linear Expenditure System (LES). In the simulation reported here, aggregate real household expenditure is exogenous (alternatively it may be linked to GDP).

Demands for Inputs to Capital Creation and the Determination of Investment

For each sector, a cost-minimising capital creator combines inputs to assemble units of capital, subject to a nested production technology similar to that facing each sector for current production. The only difference is that the capital creator does not use primary factors. The use of primary factors in capital creation is recognised indirectly through inputs of commodities to capital construction. Investment expenditure is distributed between sectors according to sectoral profitability. Sectors that experience increases in their rate of return relative to the average will attract more investment.

Government demands for commodities

Government demands are set exogenously.

Export demands

Exporters of each commodity face a downward-sloping, constant-elasticity demand curve._Manufactured goods are supplied to the local market or for export to foreign countries. Foreign demand for exports related to foreign prices (relative prices) and exchange rates, and any other transfer is that the foreign demand curve to shift in ORANI_G pattern.

The database used for this simulation is derived from the official-2007 Iranian Input-Output Table, which had 91-sectors. To convert the IO table into a CGE database, it was necessary to make a series of uniformity assumptions (for example that import/domestic usage rates were uniform across users). The entire database was uniformly scaled, so that GDP was equal to the world bank 2007 estimate of 331.2 billion dollars US. Parameter values were set at typical values seen in other CGE models. For example (Horridge, 2003):

- the elasticity of substitution between capital, labour and land was set to 0.5 for all sectors.
- The Armington elasticity of substitution between domestic and imported equivalents was set to 2.0 for all commodities.
- Export demand elasticity was set to -5.0.

The IO table distinguished two types of primary factor inputs: wages and profits. The wage values appeared not to include the contribution of owner-operators in agriculture or small business. Corresponding amounts were subtracted from each industry's profit, so that industry outputs were unaffected.

The Closure and Shocks

The model has more variables than equations. So values for some variables are termed exogenous that the number of variables equals the number of equations and the model can be solved. For the main simulation reported here, the exogenous variables were (Horridge, 2003):

All tax rates, all technological coefficients, Industry-specific use of capital and land, CPI-indexed wages, import prices, position of export

demand curves, and the exchange rate, Components of absorption: aggregate investment, household consumption, and government demand. The third two assumptions are distinctive of a short-run simulation. We assume that the timescale for the simulation is too short to allow fixed capital or land to shift between industries. At the same time, there is a slack labour market: labour is in elastic supply at fixed real wages. The fixed capital stocks, and substitution between capital and labour, together imply that each industry has an upward-sloping short-run supply curve.

5- Simulation Results and Discution

Gradual elimination of production subsidies on different sectors of economy are analyzed simultaneously using a general equilibrium model. Table 2 shows the effect on various economy-wide variables, of the decreased production subsidy rate.

All results are percentage changes. In this model, elimination of production subsidies is regarded as an exogenous variable which is independent from other economic variables. For this purpose, three scenarios have been chosen: % 25 reductions in production subsidies rate, % 50 reductions in production subsidies rate, % 100 reductions in production subsidies (or removing production subsidies) in short run. After setting the parameters with different assumptions, and stipulation of model, it was resolved with regard to above scenarios in GEMPACK programming environment. Estimations for different gradual reduction in subsidies scenarios are as follow: reduction production subsidies cause increases price index and the scale for consumer price index is empirically stronger. It decreases GDP in income/expense side with a stronger GDP reduction in income side. Parallel to GDP reduction in above scenarios, the employment rate reduction are -7.45, -14.9, and -19.1 percent, respectively. There are reductions by 1 and 2 percent in trade equilibrium situation which cut back through household consumption except for first scenario. Also, these scenarios have no considerable impact on government consumption.

Results are explicated in table 3, and summarized as below:

1- Labor demand for agriculture sector in all scenarios retreat. Also, this sector will suffer from decline in production and increase in import which, in comparison with other sections, is a notable phenomenon.

2- Labor demand for gas and oil section retreat in third scenario (%100 subsidies elimination) but they progress in first and second scenarios. Although we can see production boost in first scenarios, findings show an insignificant decline in second and third scenarios. This section enjoys increase in exports and decrease in import, although changes are not considerable.

3- Labor demand for mines has retreated in all scenarios and changes in employment are bigger than gas and oil section. Here, we found increase in export and decrease in import with slight changes in production reduction.

4- Labor demand for food industries retreated in all scenarios with a stronger reduction in third scenario in comparison with gradual elimination of production subsides (%50 reduction in third scenario). Due to internal inflation, increase in currency rate related to production subsides elimination (because most subsides have been allocated to this section), the production and export suffer from severe decline with a considerable rate. Imports follow an ascending trend in this section

5- Labor demands, exports, productions and imports of textiles and clothing drop by all scenarios, considerably large reduction in third scenario.

6- Labor demands, exports, productions and imports decline in the field of metal productions through all scenarios. Reduction in this section is stronger than previous one and here again it suffers from severe reduction in third scenario.

7- The production in the field of machinery and outfit shows an insignificant rise in first scenario, but it reduces together with labor demand, exports, and imports in second and third scenarios. Gradual elimination of subsides – second scenario - have had a greater influence in making changes in comparison to other scenarios.

8- Results prove that productions and exports of other industries fall by using all scenarios while this decline is insignificant for labor demand and imports (less than %1).

9- Energy related activities show decline in all scenarios, while first scenario is making a stronger reduction. Exports and labor demand follows a slight descending trend. In contrast, imports follow an ascending trend except for first scenario which is neutral.

10- Productions in the field of construction experienced similar decline as agriculture, food production and energy sections in all scenarios, but this decreases more considerably in third scenario. Exports suffer from a slight reduction while labor demand gets pleasure from all scenarios. There is similar growth in imports except for second scenario which is neutral (less than %1).

11- Transportation experiences a cutback with a considerable decrease in its labor demand.

12- Just like construction field, private services experienced much more reduction in comparison with public ones. Exports, labor demand and imports follow a descending pattern, so there must be more focus on private section.

6- Conclusion

Present study attempts to evaluate impacts of production subsides reduction and elimination on production, employment, exports, and imports in different sections of Iranian economy applying a computable general equilibrium framework (CGE). This model was simulated by three scenarios using input-output table basic information (2007). Results showed that reduction in subsidies and or its elimination is a kind of government contractive financial policy or in other words, it tries to reduce government expenses. Such a policy reduces demands for domestic and imported goods which resulted in reduction in domestic productions and input demands (labor and capital). As a consequence of such reductions, households, companies, and government experience a cutback in their incomes. On the other hand the currency and prices will follow an ascending trend line which

encourages investment and demand for capital goods with an unknown impact on exports. This contractive policy has posed its greatest influences on agriculture and food industries while gas and oil productions and mines are experiencing the least influences. Severe reductions in textile and food industries productions are very disturbing. It seems that on the lack of relative advantages, using old technologies and splurge nature of these industries are leading to disaster. The most important policy implication of this study is the reallocation of production subsidy gradually among lower income quintiles groups.

Table 1: Aggregated Section Used for this Report

Original 91 sections	Broad groups	
Wheat Rice Paddy SugrBeetCane OthIndstCrop OthFarming Livestock Poultry Fishing Honey Etc Wood ForstPrd	Agriculture	1
Crude_NatGas NaturalGas	Crude Oil & Natural Gas	2
Coal IronOre CopperOre BldingStones OthOres	Mining	3
DairyProds Sugar Oils_Fats AnimalFeeds Tobacco_Cigs OthFoodProds	Food Processing	4
TextilesEtc Carpets_Rugs Clothing Footwear	TCF	5
BasIronSteel Copper_Prods OthNFerMtlPr MetlForIndCn	Metal Products	6
IndustMchnry AgricMachnry RadioTvEqp MotorVhicles	Machinery & Equipment	7
PaperPulp Print_Pblish PaperProds SawmillProds WoodStrawPrd Cement GlassProds OthNonMtlMin ChemicalFert Plastc_MMFbr Pharmaceutcl OilProds RbbrPlstcPrd OthChemPrd OthManPrd	Other Manufacturing	8
Electricity Water	Utilities	9
Infrastruct ResBuildings OthConstruct	Construction	10
TradeWholRtl DistGas_Oil RestrantCafe HotelsAccom FreightTrans RoadP_AirTrn TransportSvc	Trade & Transport	11
Communcation FinanclInst RealEstate BusinessSvc ReligiousEtc ArtsCultSprt RepairSvc OthSvc	Private Services	12
PublicAdmin MilitPolice HigherEdRsch PublicEducn TechVocEducn HospitalsEtc VetrinarySvc CharitySvc publicHospital private Hospital privateEducn	Public Services	13

Statistical Center of Iran, input-output table, 2007

Table 2: Short-Run Macro Effects of Decreased Production Subsidy Rate

100% decreased subsidy rate	50% decreased subsidy rate	25% decreased subsidy rate	Symbol	Description
-19.1	-14.9	-7.45	employ_i	**Aggregate employment: wage bill weights**
-2.1	-1.09	-0.12	p0gdpexp	**GDP price index, expenditure side**
0.17	0.12	0.1	p0gne	**GNE price index**
1.01	0.9	0.02	p0toft	**Terms of trade**
2.10	1.34	0.14	p1prim_i	**Index of factor cost**
1.25	1.12	0.19	p2tot_i	**Aggregate investment price index**
0.9	0.19	0.03	p3tot	**Consumer price index**
1.01	0. 87	0.01	p4tot	**Exports price index, local currency**
0.061	0.0	0.0	p5tot	**Government price index**
0.03	0.09	0.0	p6tot	**Inventories price index**
0.09	0.01	0.0	phi	**Exchange rate, local currency/$world**
0.0	0.0	0.0	real wage	**Average real wage**
-1.06	-0.93	-0.019	x0gdpexp	**Real GDP from expenditure side**
0.060	-1.02	-0.01	x1prim_i	**Aggregate effective primary factor use**
-1.01	-0.01	0.0	x3tot	**Real household consumption**
-0.08	0.08	0.02	x4tot	**Export volume index**
-0.09	0.0	0.0	x5tot	**Aggregate real government demands**
0.0	0.0	0.0	x6tot	**Aggregate real inventories**
-1.03	0.16-	-0.08	xgdpfac	**Real GDP at factor cost (inputs) = x1prim_i**
-0.09	-0.01	-0.003	delB	**(Nominal balance of trade)/{nominal GDP} (change)**

Research finding

Table 3: Effect of Decreased Production Subsidy on Production, Employment, Export and Import

Broad Section

100%decreased subsidy rate				50% decreased subsidy rate				25% decreased subsidy rate				Broad section
Employment	Export	Import	production	Employment	Export	Import	Production	Employment	Export	Import	Production	
2.54	16.42	-4.74	-11.8	9.49	-5.53	2.54	-6.1	-4.74	-2.82	1.6	-2.99	**Agriculture**
-1.65	-2.2	9.25	-1.5	1.4	4.65	-1.65	-0.32	9.25	3.31	0.5	1.3	**Crude Oil & Natural Gas**
6.62	7.8	-2.87	-2.9	-5.73	6.63	6.62	-1.8	-2.87	2.34	0.254	-0.87	**Mining**
14.48	15.22	-17.48	-19.2	-34.9	-34.48	14.48	-13.8	-17.48	-21.23	0.009	-6.83	**Food Processing**
-9.1	-9.9	-2.71	-6.5	-5.21	-9.1	-9.1	-2.4	-2.71	-4.54	-0.014	-1.4	**TCF**
-23.8	-35.87	-6.26	-7.8	-12.5	-21.3	-23.8	-4.5	-6.26	-12.78	0.133	-3.33	**Metal Products**
8.38	11.63	5.45	-4.3	-10.9	-8.38	8.38	-2.4	5.45	-5.98	-0.014	1.97	**Machinery & Equipment**
-2.58	-3.63	0.89	-11.6	1.1	-25.6	-2.58	-6.7	0.89	-5.31	0.072	-3.16	**Other Manufacturing**
2.2	1.2	-0.1	-4.5	-1.1	-5.15	2.2	-2.4	-0.1	-0.66	0.028	-0.87	**Utilities**
0.02	0.3	0.8	-6.8	1.9	-1.4	0.02	-1.5	0.8	-1.6	0.687	-0.49	**Construction**
13.4	17.6	-19.19	-12.1	-21.1	-1.2	13.4	-9.6	-19.19	‘-1.09	0.014	-0.78	**Trade & Transport**
-9.8	12.43-	-4.10	-12.8	-8.8	-21.3	-9.8	-13.7	-4.10	-0.15	0.006	-2.45	**Private Services**
-8.4	-12.42	-1.34	-3.4	-4.5	-1.9	-8.4	-1.1	-1.34	-0.66	-0.0	-0.52	**Public Services**

List of abbreviation

Abbreviation	Component world
CGE	Computable General Equilibrium
ORANI-G	ORANI is an applied the general equilibrium model which has been applied for many countries, G is shown "generic"
AGE	A General Equilibrium
CES	Constant Elasticity of Substitution
IO	Input- output
LES	Linear Expenditure System
GDP	Gross Domestic Production
CPI	Consumer Price Index
GEMPACK	General Equilibrium Modeling PACKage

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