APPLYING THE GENETIC ALGORITHMS OF SORTING THE ELITIST NON-DECISIVE SOLUTIONS IN THE CASE STUDY "RESOURCE ALLOCATION"

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ABSTRACT

To achieve the purposes of the permanent development, a good energy Policy should take into account the various range of the political, economical, social and environmental considerations. On the other hand, the energy resources and technologies at hand are limited. Due to the complexity of the elements affecting the decision-making process, the usage of modelling methods in the energy sector has major importance. Unfortunately, the old methodologies of the energy systems Modelling are not suitable for multi-objective purposes, and they don't have the capability to lead the systems to the desirable optimum point. Given the development of multi-objective evolutionary algorithms and the increasing usage of them in engineering problem solving, the motivation for this research in optimizing energy systems based on multi-objective purposes, have been inconsistent and not co-scaled. In this paper, using genetic algorithms of sorting the elitist non-decisive solutions, the resource allocation was considered as a sample, which was modulated and analyzes. The present study shows that applying post-research decision-making methods based on multi-objective optimization, besides developing the possibility of analyzing the balance multi-objective, inconsistent and non-co-scaled purposes in energy systems, will also increase the power of policy-maker and politicians in predicting and improving the results from different decisions and support them in making better decisions. Applying other new optimizing methods in analyzing energy systems is recommended.

KEYWORDS: *Energy Policy, Multi-Objective Purpose Optimization, Genetic Algorithms, Resource Allocation.*

I. INTRODUCTION

According to the recent studies in the framework of a general equilibrium model can be calculated[1] CGT; works carrying energy prices on economic sectors and inputs to put the experience and analysis. Developed general equilibrium pattern contains 6 cantons: ***1-production***, ***2-energy***, ***3-commercial sector***, ***4-production factors***, ***5-block prices***, ***6-market clearing block***. The result shows soaring energy prices caused less relative price deviation and decrease indiscriminate energy utilization in terms of productivity and household's energy. On the other hand increasing productivity prices, inflation in economy, economic prosperity decreased in society by soaring energy prices, increase every county's incomes by growth energy aspects. Hence they can compensate for reduced welfare and developing atonement infrastructure; by astronomical prices. In short period of time by putting the people with exiguous incomes and directly paying subsides, compensated the low level of convenience.

CGT: Compated General Equilibrium[1]
CES: Constant Elasticity Substitution[2]

Hence they can compensate for reduced welfare and developing atonement infrastructure; by astronomical prices. In short period of time by putting the people with exiguous incomes and directly paying subsides, compensated the low level of convenience. At the time, they have to put the efficient investment as an infrastructure for transportation and remarkably increasing public transportation, according to the recent studies, has got the high test fee, production expenditure and welfare caused it to scale down.

I.1 Calculated Relative Equilibrium Pattern Framework (CGE):

Developed general equilibrium pattern contains 6 blocks which every individuals of them covering several blocks; such as: ***1-production, 2-energy, 3-commercial,***
4- Production factors, 5- price and 6- market clearing.

I.1.1 Production block:

Manufacturing block in aimed pattern is well known as the three nested production function. Assuming an imperfect replacement of production factors from the production function of Constant Elasticity Substitution. [First Diagram] At the first level, production (ADI) that each part of the function is the two relative inputs (QINTI) and (QVAEI) is the total value added. [1]

$$AD_i = a_i[\delta_i QVAE_i^{-\rho_i} + (1-\delta_i)QINT_a^{-\rho_i}]^{-1/\rho_i} \quad (1)$$

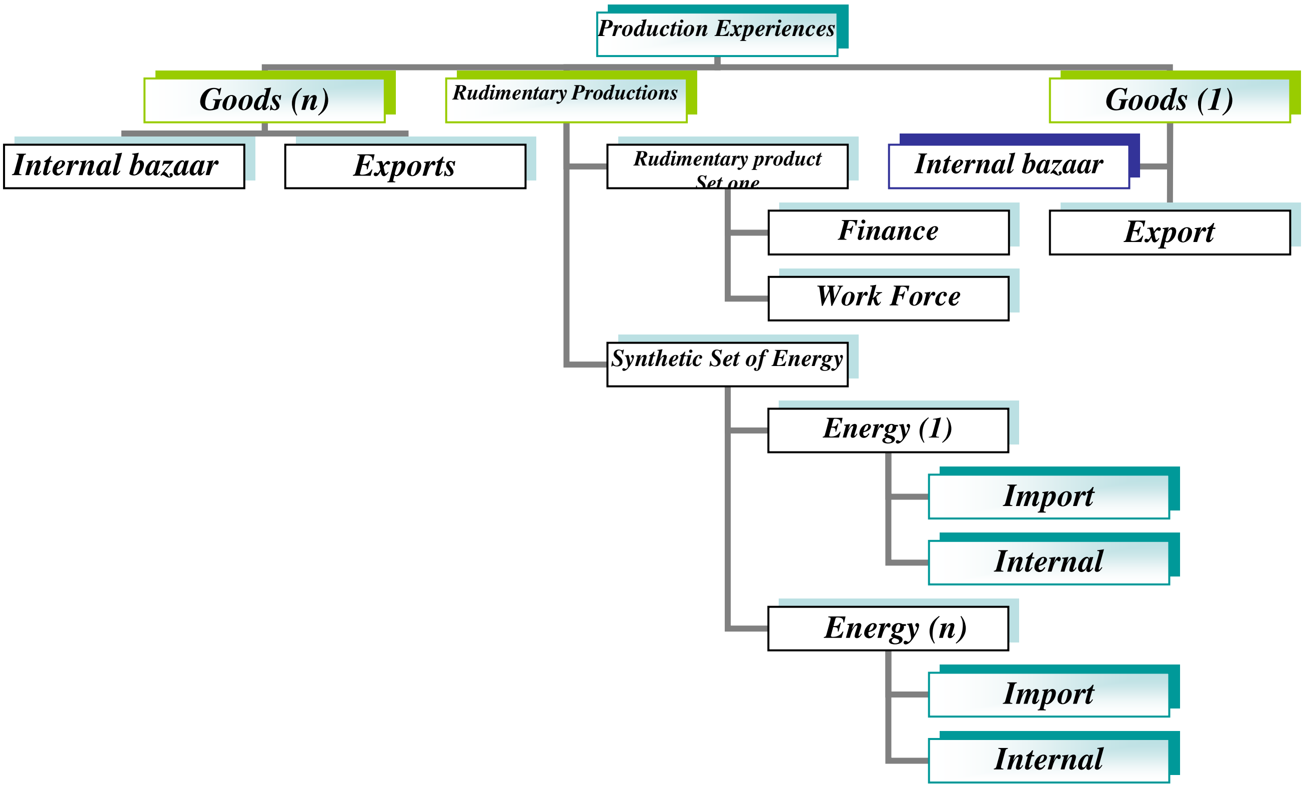

Fig.1 Structure of the production section

Standard reduced form for maximum benefit is the fixed proportion of inputs:

$$\frac{QVAE_i}{QINT_i} = [\frac{\delta_i}{(1-\delta_i)} * \frac{PINT_i}{PINT_i}]^{\frac{1}{1+\rho_i}} \quad (2)$$

Wherein (PVAEI) and (PINTI) is the total value added price –energy inputs and relative input prices for “I” section. It is worth to mention that the second formula (2) titled optimal condition CGS inputs function, and CGS followed the Oiler's laws: [2]

$$(PAD_i)AD_i = (PVAE_i)QVAE_i + (PINT_i)QINT_i \quad (3)$$

Which PDAI is the total production value, Therefore this is the demand for input function: [3]

$$j = c_1 .....c_n \longrightarrow QINT_{j,i} = a_{j,i}^{\text{int}} \times QINT_i \quad (4)$$

Wherein AJI is the technical coefficient data and output, QINTJI: inputs produced by sector J and consume by sector I. Total value added-energy input(QVAE) assuming an imperfect replacement between initial factors & energy inputs in subdominant CES figure, function of the total value added (QVAI) and the whole energy inputs (QVEI).[4]

$$QVAE_i = a_i^{vae}[\delta_i^{vae} QVA_i^{-\rho_i^{vac}} + (1-\delta_i^{vae}) QVE_i^{-\rho_i^{vac}}]^{-1/\rho_i^{vae}} \quad (5)$$

According to the first production function, optimal established input and following the function of CES [2] from the Oiler's law shall specify the demand and price: [5]

$$\frac{QVA_i}{QVE_i} = [\frac{\delta_i^{vae}}{(1-\delta_i^{vac})} \times \frac{PVE_i}{PVA_i}]^{\frac{1}{1+\rho_i^{vae}}} \quad (6)$$

$$(PVAE_i)(QVAE_i) = (PVA_i)(QVA_i) + (PVE_i)(QVE_i) \quad (7)$$

Also, the total value added (QVAI), in subdominant form CES [2] from (QFFI) inputs which contains the workforce and capital (HSJ). [6]

$$QVA_i = a_i^{va} \sum \delta_i^{vae} QF_f^{-\rho_i^{va}} \quad (8)$$

And optimal input Equation (the first law), is obtained from the final factor prices and final production benefits Equality:

$$WF_{f,i} = PVA_i a_i^{va} QVA_i [\sum_f \delta_{f,i}^{va} QF_{f,i}^{-\rho_i^{va}}]^{-1} \delta_{f,i}^{va} QF_{f,i}^{-\rho_i^{va}-1} \quad (9)$$

Wherein (WFFI), is the input prices for 'F' which defined section 'I'. [7, 8]

I.1.2 Energy section:

Six energy carries petrol, kerosene, fuel oil, LPG and electricity. Considering that the aim of this study is about investigating on mentioned carrier prices on various economic sections. Thus the CGE pattern has been developed to determine the prices.

For this purpose the whole energy input function (QVEI), is a CES function from 6 inputs energy. [9]

$$QVE_i = a_i^{ve} \left[\sum_e [\delta_i^{ve} QFE_{i,e}^{-\rho_i^{ve}}] \right]^{-1/\rho_i^{ve}} \quad (10)$$

Wherein (QFEei) is the energy carriers and e=1, 2.........6 indices are for every individual carrier. The first step for choosing a beneficial energy carrier:

$$PDE_{i,e} = PEE_i \cdot \frac{\delta QVE_i}{\delta QFE_{i,e}} \quad (11)$$

Where in (PDEie), the price of every carrier and (PEEi) the whole energy input prices.

$$\frac{\delta QVE_i}{\delta QFE_{i,e}} = QFE_{i,e}^{-\rho_i^{Ve}-1} a_i^{ve} \delta_i^{ve} \left[\sum_e \delta_i^{ve} QFE_{i,e}^{-\rho_i^{Ve}} \right]^{\rho_i^{\left(\frac{-1}{Ve}-1\right)}} \quad (12)$$

By replacing above equation in equation number 10 we would have:

$$\frac{\delta QVE_i}{\delta QFE_{i,e}} = QFE_{i,e}^{-\rho_i^{Ve}-1} \delta_i^{ve} QVE_i \left[\sum_e \delta_i^{ve} QFE_{i,e}^{-\rho_i^{Ve}} \right]^{(-1)} \quad (13)$$

And as a result of the first step we would have:

$$PDE_{i,e} = PDE_i \cdot QFE_{i,e}^{-\rho^{Ve}-1} \cdot \delta_i^{ve} QVE_i \left(\frac{QVE_i}{a_i^{Ve}} \right)^{\rho_i^{Ve}} \quad (14)$$

And by calculating equation number 13 which is by the (QFEie), demand for carriers will be determined: [10, 11, and 12]

$$QFE_i \left[\frac{PDE_i a_i^{\rho_i^{Ve}}}{PEE_i \cdot \delta_i^{Ve}} \right]^{-1/(\rho_i^{Ve}+1)} \quad (15)$$

And the whole energy carrier prices are defined as follows:

$$PEE_i QVE_i = \sum_e PDE_{i,e} QFE_{i,e} \quad (16)$$

I.2 Foreign Trade Block:

I.2.1 Export section:

In this section by equation of internal production (Xdi) to the internal market (XXDi) and export Qui, utilize the Constant Elasticity of transformation of equation [13].

One of the crucial properties of this function is the conversion between the production for foreign and internal market.

$$xd_i = B_i \left(\theta_i qe_i^{\rho_i^T} + (1-\theta_i) xxd_{i^{\rho^T}} h \right)^{1/\rho_i^T} \quad (17)$$

I.2.1.1 Export Supply Equation:

Indeed, equation for export is implying, each section can produce two kinds of goods for the domestic market and foreign market. Thus the combination of manufactured goods and for domestic market and foreign for maximum sale:

$$px_i \cdot xd_i = pe_i \cdot qe_i + pd_i \cdot xxd_i \quad (18)$$

To limit the export function (4-16 equation) will become:

$$qe_i = xxd_i \cdot \left(pe_i / pd_i \cdot \frac{1-\theta_i}{\theta_i} \right)^{\frac{1}{1-\rho_i^T}} \quad (19)$$

Wherein (Pxi) is the whole manufactured goods prices, Xdi is the amount of domestic production, (Quei) amount of export, (Pdi) prices of goods supplied have been manufactured and sold, XXDi is the domestic sales. [14, 15, 16]

I.2.1.2 Export Prices:

A unit for Export prices according to the definition of foreign export prices PWEI and TEI is for the rates and taxes for exports: [18, 19]

$$pe_i = pwe_i \cdot exr \cdot (1 + te_i) \quad (20)$$

This is very important to mention this point about the last equation that is assumed that the price of the export and the finance rate (related to the financial rules in every country) in flexible and the prices of the external export is constant. The main of the non-flexibility of the recent prices is related to be small economy compare with the world Economy that it has very far reaching. According to the absorption equation, the price of composite commodities equal to the sum of production:

$$p_i \cdot x_i = pd_i \cdot xxd_i + pm_i \cdot qm_i \quad (21)$$

Wherein PI is price of composite commodities, XI is the amount of domestic manufacturing production and export, QMI is the total amount of export. Imperfect replacement between internal and exporting production is one of the aspects that modern theories considered them. KURGMAN and HELPMAN's Researches is in the frame work of various production, therefore implies on a specified manufacturing section which can export or import the production as they produce. [20]

II. ANALYSIS OF RESULTS AND DISCUSSION

The present study attempted to show in the general form of equating (CGE), the effects of the increasing the carrier energy prices into the sections and securitize this important factors in every sections of each country that is demonstrated in Fig.2. In this figure, 12 sections are showed to the effects of the accounting matrix in every year and we can see how the sections of each country can influence in the accounting of one year. [21]

Social Accountiong Matrix

		1	2	3	4	5	6	7	8	9	10	11	12
activity	1		1149120.90419						13009.00772				1162129.91191
commoditiy	2	417435.36446				147490.59738	249885.71429		104733.41200	157720.00000	30625.19134	177592.62473	1285482.90419
factors													
laber	3	153435.00000											153435.00000
capital	4	478182.54745											478182.54745
household													
rural	5			61374.00000	50865.96825			54709.90000	6394.08000				173343.94825
urban	6			92061.00000	76298.95238			165855.30000	4262.72000				338477.97238
enterprise	7				279084.22682								279084.22682
government	8	21977.00000	9386.00000		71933.40000	4245.76000	6368.64000	12371.90000					126282.70000
rest of world	9		124976.00000										124976.00000
stock change	10											30625.19134	30625.19134
accumulative capital	11	91100.00000				21607.59088	82223.61809	46147.12682	-2116.51972	-32744.00000	2000.00000		208217.81607
total	12	1162129.91191	1283482.90419	153435.00000	478182.54745	173343.94825	338477.97238	279084.22682	126282.70000	124976.00000	32625.19134	208217.81607	

Fig.2 Effects of each section into the accounting of financial economy

III. CONCLUSIONS AND FUTURE SCOPE

Many are faced with staggering capital requirements for new plants, significant fluctuations in demand and energy growth rates, declining financial performance and political or regulatory and consumer concern about rising prices. Results shows that increasing of the energy carriers price with prepare of decreasing in the aberrance of relating prices, decreased the waste consume of the households. Until the beginning of the industrial revolution several centuries ago, this was the major environmental impact of human activities. Today, we are approaching the limit of available land for agricultural purposes, and only more intensive use of it can provide food for future increases of world population.

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