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Investigation of Optimal Transitions of Oil Revenues in Different Periods of Time with the Assumption of Dutch Disease in Iran Through Dynamic Computable General Equilibrium Model

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Abstract
The existence of multiple shocks and changes in an economic system creates numerous effects on internal variables and economic sectors, and any changes in the production structure can affect the external sector of the economy or the distribution of household incomes and their welfare. This study, assuming the existence of the Dutch disease, examines the amount of oil revenue transfers using the social accounting matrix and a meaningfully calculated general equilibrium approach. The results showed that in the scenario of equal interest rates and time preference rate, the amount of oil revenues each year should increase at a rate of 10%, which can be maintained at the National Development Fund, so that oil revenues can be optimized using it. In the disparity scenario of interest rates and time preference rates, only when the time preference rate should be much lower than the interest rate at the present time, due to the increasing consumption path and the increase in tradable goods consuming to be exchanged relative to the non-exchangeable part, the optimal Dutch disease can be achieved. Otherwise, the Dutch disease will be worse off due to a reduction in the exchangeable part and increased imports.

Keywords: Dynamic Computable General Equilibrium, Management of Oil Revenue, Optimal Dutch Disease, Iran.

JEL Classification: D5, Q3, I31.

1. Purpose
Iran, as a country with an array of natural resources, especially oil, has been plagued by the Dutch disease for years due to its inadequate management. For this purpose, in this study, the optimal management and allocation of oil revenues is investigated assuming the existence of the Dutch disease in the country. The main question addressed in the present study is how much oil revenues should be consumed at each time period (year) and how much should be transferred to the next period. Well-advised management of foreign exchange earnings from oil revenues plays a decisive role in the Iranian economy. In each country, depending on the type of policies adopted by governments, increasing oil revenues could affect the economic sectors. For example, Manzor et al.

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(2011) assessed the impact of increasing oil revenue shock by 30% in each sector including imports, exports, and the level of prices in manufacturing sectors as well as household welfare changes. Their results showed that demanding all commodities in the economy is accelerated by a 30 percent increase in oil revenues. This leads to an increase in foreign goods imports into the country. In spite of the increased imports, the surplus of demand is not cleared and hence domestic prices rise. As a result, price fluctuations in economic sectors, especially in the non-exchangeable sectors such as building, government services and housing rent, must be effectively managed in the economy so that a country could stabilize the behavior of economic entities, especially if it is dependent on oil revenues.

2. Method

In this study, social planner seeks to maximize social utility with the assumption of Dutch disease in Iran. The target function is:

$$U = \sum_{t=1}^{M} \left(\frac{1}{1+\delta}\right) t - 1[\gamma logCT + (1-\gamma) logCNt],$$

The variables are used in this equation include:

δ: Social preferences rate
CTt: The amount of tradable goods consumed in period t.
CNt: The amount of non-exchangeable goods consumed in period t.

Since the static demand function is the sum of the revenue (the amount of work that the workforce does) and the rate of transfer to the next generation, so we have: Y = H + R
The total consumption in period t is:

Ct = CTt + CNt = γYt + (1-γ) Yt = Rt + Ht.

where γ is the level of the exchangeable goods of production and (1- γ) is the level of the non-exchangeable goods of production.
Social Planning Target Function Rewritten:
γlogCTt + (1-γ) logCNt = logCt + γlogγ + (1-γ) log (1-γ).
Thus, the social welfare function that is maximized includes:

$$Max\ U = \sum_{t=1}^{M} \left(\frac{1}{1+\delta}\right) logCt.$$

$S.t$ Ht+1 =Ht (1+αγ) – α(1-γ)Rt
CAt= rWt- Rt

The objective function constraints also include productivity level at time t + 1 (static Dutch disease) and budget constraint (Economics Accounting).

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R is the political tool of the model, which is the amount of cross-border transfers of oil revenues under Dutch disease conditions.

The research model includes an end-to-end resource, a public service sector, and a manufacturing sector. Households make a living from the supply of labor and capital and benefit from the consumption of desirable goods and services. The government earns income from oil exports. This income is spent on investment in the production of public goods as well as on the cost of public services. The economy is related to the outside world, and imported goods substitute incomplete domestic goods, and it is also assumed that producers seek the minimum cost of production per period. It is also assumed that the aim of households is to maximize utility in each period.

The model is set as non-random with a recursive approach. It is important to note that the decisions of production activities as well as the oil group are taken at any time, and therefore, inter-sector optimization is considered only for household consumption and savings. Intergenerational household decisions are made in the form of a modified growth model.

Household savings are allocated to investments, which determine the capital stock of the next period of the economy. Thus, in the next period in the capital market, the rate of capital formation in each sector is determined based on the relationship between supply (capital) and demand. The demand for each segment of capital level depends on the price of capital, the price of the product, the price of other production entities, and the level of activity of the sector, all of which are determined intrinsically in the model. Time is also considered as an indigenous variable in the model.

The model parameters are estimated in the dynamic computable general equilibrium model and in the GAMS environment. First, optimal consumption is determined and, then, different scenarios are presented for allocating the country's oil revenues.

3. Conclusion

In this study, assuming the existence of the Dutch disease, the optimal transmission of oil revenues at different time periods was investigated in three scenarios. In the scenario of interest rates and time preferences rates, the rate of transfers of oil revenues should be increased by 4% per year, which can be kept in the National Development Fund so that different generations could make optimal use of oil revenues. But regarding the rejection or acceptance of Troik's theory, the optimal Dutch disease in Iran cannot be accepted if the interest rate and the preference rate are equal even if the consumption path is increased with no economic growth in the country. It seems that there are other ways to achieve the optimal Dutch disease. In the scenario of interest rate inequality and time preference rate, only when the time preference rate is much lower than the current rate of interest, the optimal Dutch disease can be optimized due to the increasing consumption path and increasing the portfolio of the tradable sector relative to the non tradable sector. Otherwise, the effects of the Dutch disease will worsen due to decreasing the tradable basket and increasing imports.

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