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Impacts of Iranian Oil Sanctions on the Welfare of Households: A Recursive Dynamic Computable General Equilibrium Approach

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EXTENDED ABSTRACT

INTRODUCTION
Especially since the end of the Cold War, economic sanctions have been increasingly used as an alternative to military action to exert economic pressure on countries for a broad range of objectives. Empirical evidence suggests that sanctions affect the economy of the target countries in various ways. These studies use different approaches examine the adverse effects of sanctions on economic variables such as GDP, production costs, capital formation, trade, government expenditures, exchange rate, private expenditures, and household welfare. Following the 1979 Islamic Revolution, Iran became subject to extensive economic sanctions, which have intensified in recent years. Given the dependence of Iranian economy on oil revenues, the oil sector has been one of the main targets of these sanctions. Banking sanctions have also been used as an attempt to prevent the transfer of oil revenues to Iran as part of "smart sanctions" against the country. Sanctions imposed on Iran's oil exports can intensify fluctuations in macroeconomic variables by reducing foreign exchange earnings and restricting

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access to capital and intermediate goods, and impact household welfare by affecting relative prices as well as household income and consumption expenditure. Therefore, the present article examines the impact of oil export sanction on the welfare of households in Iran using Equivalent Variation (EV) criterion. Due to the capabilities of Computable General Equilibrium (CGE) models compared to single-equation models, a recursive dynamic CGE model has been used based on the Social Accounting Matrix (SAM) data of 2016. In order to study and compare welfare changes in different groups of urban and rural households, 70 percent reduction in oil exports has been simulated for the entire period under study.

METHODOLOGY

In this study, PEP-1-t, a recursive dynamic CGE model developed by Decaluwe et al. (2013), has been used to investigate the welfare effects of reduction in oil exports. This model is the result of the joint effort between the Partnership for Economic Policy (PEP) and the International Food Policy Research Institute (IFPRI) in the context of the African Growth and Development Policy Modeling Consortium (AGRODEP) project. PEP-1-t is a recursive dynamic model with a multi-sector, single-country framework containing a broad set of tax instruments and several categories of workers and capital. It is compatible with social accounting matrices that have the accounts required for the main categories and also has standard assumptions. In this model, labor, capital, and intermediate inputs are used in the production process. At the highest level of production, a Leontief production function is considered which combines intermediate inputs and added value to determine the level of activity. Labor and capital are also combined in a production function with Constant Elasticity of Substitution (CES). Each activity produces one or more commodities. The product is then converted into an export commodity and a market commodity using a Constant Elasticity of Transformation (CET) function. Consumers buy composite goods, which are either imported or produced domestically. The composite of imports and domestic production is determined by the Armington function, which is a CES function. The country in question is a "small country" that receives global export and import prices at a fixed level. By establishing factor market equilibrium, commodity market equilibrium, savings-investment equilibrium, domestic market equilibrium, and export market equilibrium, equilibrium is established in the whole system. This model has a set of simultaneous equations, many of which are nonlinear. In the present article, the impact of oil export sanction has been simulated following Farzanegan et al. (2015). Moreover, to study consumer behavior and calculate welfare changes based on the EV criterion, the Linear Expenditure System (LES) and the Stone-Geary utility function have been used, and EV criterion calculation codes have been incorporated into the model. Since the structure of the SAM as the database of this article should be consistent with the general equilibrium model used, a SAM has been developed for the year 2016. In addition to SAM, a number of behavioral parameters adopted

from other studies have been used to solve the model. GAMS software has been used for calibration and simulation.

FINDINGS

Regarding the impact of oil export sanction on some macroeconomic variables, the results show that a decrease in oil exports leads to an increase in exchange rate and non-oil exports, as well as a decrease in domestic absorption, total imports and exports, and GDP. Regarding the impact of reduced oil exports on these macroeconomic variables, the results are consistent with Gharibnavaz and Waschik (2017), Farzanegan et al. (2015), Mohammadikhabbazan et al. (2015), Haqiqi and Bahalou (2013), and Haqiqi and Bahador (2015) who also used a CGE modeling approach. In addition, other studies such as Nakhli et al. (2020), Keshavarz Haddad et al. (2020), Kiumarthi et al. (2019), Tuzova and Qayum (2016), Marzban and Ostadzad (2015) and Siddig (2011) have shown the adverse effects of economic sanctions on key macroeconomic variables. As oil exports decrease, the income and consumption expenditures of urban and rural households decline over this period. The decrease in income and consumption expenditures of different groups of urban and rural households has an increasing trend. Also, the upper deciles of urban and rural households experience more decline in their income and expenditures. In addition, the income and expenditures of rural households are more affected than urban households. Calculating the EV as an indicator of household welfare in the studied period shows that the welfare of urban and rural households declines in all groups and the upper deciles experience more decline in welfare. Also, the decline in welfare of all rural household groups during the period is always more than urban households. In addition, with the continuation of the oil export sanction, the gap between the welfare decreasing of rural and urban households declines. Regarding the adverse welfare effects of oil export sanction, similar results have been reported in Farzanegan et al. (2015) and Mohammadikhabbazan et al. (2015) using a static CGE modeling approach, while more limited effects have been reported in Gharibnavaz and Waschik (2017) using the same approach. Marzban and Ostadzad (2015) have also shown the tangible effect of oil sanctions on social welfare by developing a generalized stochastic growth model. Cheptea and Gaigné (2020) and Siddig (2011) have also shown the negative effects of economic sanctions on the welfare of households in the target country. Eventually, sensitivity analysis to the key elasticities of the

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model demonstrates that by changing the initial elasticities individually and in combination, no significant change is observed, therefore, it confirms that the main results are robust.

CONCLUSION

This article investigates the impact of oil export sanction on the welfare of urban and rural households in Iran. To this end, PEP-1-t, which is a recursive dynamic CGE model developed by Decaluwe et al. (2013), has been used based on the SAM data of 2016. Also, the EV criterion has been used to examine welfare changes in different groups of urban and rural households. Between 2012 and 2019, Iran's crude oil exports have dropped by about 70 percent. Therefore, 70 percent reduction in oil exports has been applied to all periods in the model to simulate the sanction scenario. The results reveal that the reduction in oil exports leads to an increase in exchange rate and non-oil exports, as well as a decrease in domestic absorption, total imports and exports, and GDP. Our results show that with a reduction in oil exports, the income, consumption expenditures, and welfare of urban and rural households decrease, and this downward trend continues over the studied period. Moreover, in both urban and rural households, upper deciles experience more reduction in income, consumption expenditures, and welfare. In addition, the shock of reduced oil exports affects the income, consumption expenditures, and welfare of rural households more strongly than urban households. The results also indicate that although the welfare loss of all rural household groups is always higher than urban households during this period, the welfare gap between rural and urban households decreases as oil export sanction continues. Sensitivity analysis to the key elasticities confirms the robustness of the main results.

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