

The Effect of Foreign Direct Investment on Water Pollution

Sima Kalami¹ (Corresponding author), Fatemeh Zandi², Mohammad sadegh Avazalipour³, Shermineh Majdabadi Farahani⁴

¹ MA-Economics - Islamic Azad University, South Tehran Branches, Tehran, Iran

² Ph.D-Faculty Member of Azad University, South Tehran Branches, Tehran, Iran

³ Ph.D-Statistical Researches and Training Centre, Statistical Centre of Iran

⁴ MA-Economics-Islamic Azad University, Central Tehran Branches, Tehran, Iran

Simaklmi@gmail.com

Abstract: During recent decades and as a result of globalization, the increase of Foreign Direct Investment was being tested. Foreign Direct Investment in pollutant industry is effective in inspiring the trend of economic growth and it is one of the most important sources of make disturbing the environment in the host country. In this respect, the main objective of this research is to explore the relationship between FDI and the quality of environments (chemical pollution of water). So, first the countries are divided in terms of development into two groups, including OECD countries and Non-OECD countries, then by using panel data method for period 1996-2007, the relationship between FDI and chemical pollution of water was investigated. The results showed the increase of inflow for FDI in OECD countries; based on decline the amount of chemical pollution of water. While in Non-OECD countries, increasing FDI lead to grows up the amount of water pollution. In other words, Foreign Direct Investment causes environmental disturbances in Non-OECD countries (developing countries). Furthermore, the results indicated an increase in the amount of Gross National Income, Manufacturing Value Added and Energy Consumption in OECD countries, would make decrease of chemical pollution of water, while in Non-OECD countries the amount of chemical pollution of water reduces as a result of the growth of GNI.

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1. Introduction

In the twentieth century, private foreign capital mostly flowed in the form of indirect investments from Developed Countries to the under developed countries. Such capital as flowed to low income countries in the 1920, the form of direct investments changed into production for export. Very little after, it changed into manufacturing for home market. But since the Second World War, over half the private investment has been directed. Direct private investment has been concentrated mainly in the extraction of raw materials like iron, crude oil, manganese, bauxite, copper, electric energy, etc.

Foreign investment has advantages and disadvantages [3]. FI provides finance, managerial, administrative and technical assistance for underdeveloped countries. FI has also encouraged local enterprise to invest more itself in ancillary industries or collaboration with foreign enterprise. But FI has some disadvantages recipient countries may be required to provide basic facilities, land, power and other public utilities. FDI also affects income distribution when it competes with home investment.

During recent decades, there was an increase in Foreign Direct Investment, in underdeveloped

countries. FDI increases economic growth and expansion process but, on the other hand it may effect on environmental resources. For instance, during past twenty five years, China has experienced an extraordinary economic expansion and FDI compared to other developing countries [5]. But China has suffered more air pollution in urban areas. This research follows evaluation of the impact of FDI on environmental issues. A number of studies have reported on the beneficial aspects of more open trade regimes, noting, for instance, that export expansion raises the rate of economic growth based on its impact on total factor productivity [2],[6]. Other studies link greater openness to deteriorating social and environmental conditions, such as increased income inequality or greater emissions of greenhouse gases [1], [4]. In developing countries, the entry of foreign direct investment facilitates would strengthen the environmental regulations. This was achieved in two ways: Direct effect through a direct influence on capital accumulation and increased ability to reduce pollution in the host country and indirect effect through the impact on income growth, which they in turn benefit from better environment increases [7].

2- Data and Methodology

In this study, first we have applied data and information from World Development Indicators, (WDI) and UNCTAD from 1996 to 2007. Then all selected countries are divided into two categories such as OECD and Non-OECD countries as below:

Table 1: Selected Countries in OECD and Non-OECD

Categories	Countries
OECD	Denmark- France- Poland- Portugal- England-American- Austria- Slovakia- Hungary
(Non-OECD)	Syrian Arab Republic-Tajikistan- Iran- Jordan - Kazakhstan-Romania- Lithuania-Latvia- Oman

After more consideration and using from the related tests for choose of proper model, fixed effects model was confirmed. In the following model by the fixed effects methods the impacts of independent variables on dependent variable was estimated. The model which has been applied is as follows:

$$LBOD_{it} = a + b_1LGNI_{it} + b_2LFDI_{it} + b_3LMV_{it} + b_4LEU_{it} + u_{it}$$

Where LBOD shows the logarithm of water chemical pollution as dependent variable; LGNI indicates the logarithm of per capita national income; LFDI is the logarithm of FDI; LMV shows the logarithm of value added of industries and LEU is the logarithm of energy consumption.

3- Estimation of Model

As it was mentioned in the previous section, by using the regression model and Eviews software, the above equation was estimated. In order to evaluation the significance of model, some Statistical tests such as Hausman test have been applied. By this way, it's possible to show the effect of foreign direct investment on water pollution in developing countries (Non OECD).

4- Results

The estimated coefficients for elected countries in OECD region are shown in table 2.

Table 2: Results of the Estimation for OECD Selected Countries

Variables	Coefficient	Std Error	t -Statistics
C	2.50	0.06	36.00
LGNI	-0.19	0.01	-18.94
LFDI	-0.001	0.00	-7.25
LMV	-0.29	0.01	-24.84
LEU	-0.11	0.01	-10.24

R-squared= 0.9 98745

Adjusted R-squared= 0.998587

F-statistic= 6301.829

Based on the results from the estimation of the model, it's concluded: It was observed that all estimated coefficients were completely based on the expectations and in the framework of theory and by considering the statistics of the test and the estimated coefficients, all the coefficients of the model at 5 percent level were significant and acceptable. Also R² of the model has a high degree of validity as well.

In the continuation the analysis, the coefficient of per capita national income (LGNI) in table 2 has been estimated and was equal to -0.19 that shows a negative relation of this variable with the quality of environment (chemical pollution of water). This means that ten percent increase in per capita national income will decrease chemical pollution of water by 1.9 percent. In other words, this coefficient shows the decrease of the level of contamination propagation for each unit increase in GNI per capita. The coefficient implicitly explains this reality that the experience of economic growth of the countries that have passed the industrialization period shows that necessarily the economic growth (increase of per capita revenues) was not accompanied with the creation and intension of contamination.

The coefficient of foreign direct investment (LFDI) has been estimated as equal to -0.001. It means that the foreign direct investment will be increased by ten percent; so the pollution will be decreased by 0.01 percent. The existence of negative relationship between the amount of chemical contamination of water as the indicator of the quality of the environment and the foreign direct investment shows that in these countries the rapid economic growth and increase of demand for being benefitted from better environment is accompanied with the intension of environmental regulations. The existence of intense environmental regulations and preserving the environmental standards in these countries has resulted the entrance of foreign direct investment in these countries which has been accompanied with technologies that at the side of more efficiency have been created less contamination.

In developing countries with high income, rapid economic growth and increase of demand for being benefitted from better environment is accompanied with the intension of environmental regulations. The existence of intense environmental regulations and preserving environmental standards in these countries has been resulted the entrance of foreign direct investment in these countries which have been accompanied with technologies that at the side of more efficiency, creates less contamination. In other words, the activity of multinational enterprises in these countries as a host country has considerable share in increasing efficiency and has removed the obstacles

and bottlenecks of supply and by entering new technologies for the production or support from the environment and training the workers and directors, has broken down the existing monopolies and has encouraged the efficiency and competition. This matter depends on the power and amount of reaction of the local enterprises. In reality, the operations of multinational enterprises in these countries are in such a way that it is possible they transfer the specified technologies for the management of the contamination of the environment or controlling the quality and its operations. They may claim the supply of cleaner goods from local enterprises in these countries and encourage the local enterprises in these countries to increase the related management effects or some marketing techniques used by multinational enterprises in the level of local markets or in the international level. In other words, the entrance of foreign direct investment to these countries has spillover positive effects on the technological specialties of local enterprises.

Table 3: Results of the Estimation for Non-OECD Selected Countries

Variables	Coefficient	Std Error	t -Statistics
C	-0.59	0.12	-4.79
LGNI	0.26	0.03	8.57
LFDI	0.01	0.00	6.33
LMV	0.17	0.03	5.59
LEU	0.15	0.02	5.57

R-squared= 0.9964

Adjusted R-squared= 0.9959

F-statistic= 2192

Table 3 shows the estimated coefficients for elected countries in Non-OECD region. A positive relationship between independents variables and water's chemical contamination variable is revealed. Considering all other affecting elements constant, if gross national income per capita raises about 10% pollution will raise about 2.6%. LFDI coefficient is estimated to be 0.01, assuming other influencing elements if direct international investment raises 10%, water's chemical pollution will raise 0.1%. Existence of a positive relation between levels of water contamination as an environmental quality indicator and foreign direct investment represents the fact that most of the polluting industries comes from foreign countries via direct investment. In other words, the positivity of this coefficient shows that in Non-OECD countries there is a direct relationship between water pollution which demonstrates the quality of environment and foreign direct investment. This result shows that Non-OECD countries import polluting

industries. This is due to the fact that polluting industries manufacturers in OECD countries face limitations because of severe environmental pollution. Therefore they tend to move these products to countries with lower environmental standards and this is done by foreign direct investment. Hence in non-OECD countries the relationship between water pollution and direct foreign investment is positive.

According to acquired coefficients from the model, LMV has been evaluated 0.17 which means that if the added value of a factory increases 10%, chemical water pollution increases 1.7%. Assuming all other influencing factors is constant. The existence of a direct relationship between levels of water pollution, as an environmental quality indicator, and LMV shows that these countries are in era of industrialization and cause harm to their environment by importing polluting industrial facilities. It can also be concluded that in these countries due to incompatibility of environmental laws, the composition of industries is so that mainly includes polluting industries.

LEU has been estimated to be 0.15 which reports a positive relation between this variable and water chemical variable. This means that if all other elements stay constant, a 10% increase in energy consumption variable, increases the dispersed water pollution by 1.5%. The discussed countries in this group which mainly are developing countries, mostly are in era of industrialization and mostly do not pay enough attention to natural fuels.

5- Conclusion

The main objective of this study was an evaluation of water pollution in Non-OECD and OECD selected countries by using panel data model for the period of 2007-1996. This study has revealed, there is significant difference between Non-OECD and OECD selected countries in terms of water and environmental quality. In fact, foreign direct investment will increase the water pollution in Non-OECD selected countries. In this paper, it was assumed that the conditions of globalization and environmental regulations were easier to come into force in developing countries. In fact, such regulation went into an advantage in this situation is causing pollution attractive to foreign capital. Because investors seek a haven for their pollution control rules to avoid paying heavy environmental pollution costs in destination country. As the above tables have shown, the relationship between GDP per capita and water pollution in OECD selected countries is negative and in Non-OECD selected countries is positive. In other words, GNI coefficient for OECD countries show low levels of pollution emitted per unit increase in GNI per capita.

Corresponding author:

Sima Kalami
Simaklmi@gmail.com

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