The Relationship between Foreign Direct Investment and Total Factor Productivity: The Case of Top 10 Oil Producing Countries

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ABSTRACT

So many years countries, which were not in a good economic situation attempted to attract foreigner to invest and do business in their countries. The evidences show that this strategy would have a positive affect on Economic Growth as well as Total Factor Productivity of the host countries. This thesis examines the relationship between Foreign Direct Investment and Total Factor Productivity in short-term and long-term period between years 2011 and 2015 by using panel data analysis with the world's top ten oil-producing courtiers as a sample. First Panel Unit Root Test is conducted to find whether variables are stationary or not. Then the Co-integration and panel error correction modeling tests are conducted to detect possible relationships between variables.

Results suggest that in long-term period, Foreign Direct Investment affects Total Factor productivity of these countries in a positive way while in short-term period there is no affect. On the other hand Labor Quality Index doesn't have any influence on TFP in both long-term and short-term period. Moreover, TFP merges to its long-term path significantly through its determinants, whereas it converges to their own equilibrium level.

Keywords: Foreign Direct Investment, Total Factor Productivity, Labor Quality Index, Oil-producing countries, Panel Unit Root Test, Co-integration Test, Panel Error Correction Model

ÖZ

Uzun zamandan beri ülkeler ekonomik olarak zorluk çekmektedir. İlgili ülkelerdeki ekonomik kalkınma için dogrudan yabancı sermayeyi ve iş dünyasını kendi ülkelerine çekmeye çalışırlar. Bu tez dogrudan yabancı sermaye, toplam faktör verimliliği ve emek arasındaki ilişkiyi uzun ve kısa dönem olarak belirlemek için 2011 ve 2015 yıllarını kullanarak ölçmeye çalışır. Bu çalışmada, Panel eşbütünleme, hatta düzeltme modeli ve panel birim kök teknikleri en fazla petrol üreten 10 ülkeye uygulanmıştır.

Ampirik sonuçlar doğrudan yatırım ve toplam faktör verimliliği arasında uzun süreli pozitif bir ilişki göstermektedir. Ayrıca, sonuçlar Emek'in büyümesi toplam faktör verimliliği üzerinde ne kısa nede uzun dönem etkisi olmuştur. Buna ilaveten, toplam faktör verimliliği uzun dönemde kendi dengesine yakınnaştığı tespit edilmiştir.

Anahtar Kelimeler: Dogrudan yabancı yatırım, Toplam faktör verimliliği, Emek, petrol üreten ülkeler, Refah, Panel Eşbütünleme testi, Panel Birim Kök Testi, Panel hatta düzeltme testi

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INTRODUCTION

1.1 Aim of the Study

In this thesis, we investigate possible relationship between Total Factor Productivity and Foreign Direct Investment as well as Labor Quality Index. Panel data is examined during period of 2011 and 2015. The sample is chosen from world's top oil-producing countries to show as an exogenous modeling framework, other factors from outside affect the economy of a country as well.

1.2 Methodology and Data Collection

The sample used in this case is world's top ten oil producing countries, which are listed as follows: Russia, Saudi Arabia, United States, Iraq, China, Canada, Iran, UAE, Kuwait and Venezuela. Panel Root Test and Panel Co-integration Test are conducted to find the empirical results. Data were collected form World Bank and Conference-board data bank from 2011 to 2015[1].

1.3 Theory behind FDI and TFP

In recent years the relationship between FDI and TFP was one of the major subjects studied by the economists. These studies show that by FDI there would be new technology, knowledge and managerial skills spillover as well as labor effects for host countries. Furthermore, based on the studies and definition of TFP any improvement of technology in a country directly affects TFP.

[1] See the web page ''data.worldbank.org/for more details''.

1.4 Research Question

Although previous studies found that there is a correlation between FDI and economic growth of a country, in this paper we are going to investigate whether there is a positive relationship between FDI and TFP or not?

1.5 Findings of the Research

Results suggest that in long-term period, Foreign Direct Investment affects Total Factor productivity of these countries in a positive way while in short-term period there is no affect. On the other hand, Labor Quality Index doesn't have any influence on TFP in both long-term and short-term period. Moreover, TFP merges to its long-term route significantly via its determinants, which were foresaid previously.

1.6 Structure of Thesis

This dissertation is going through following chapters: Second chapter gives a review on previous researches, which is called literature review. Third chapter gives more details about our sample, which are world's top ten oil-producing countries. Fourth chapter is about our data and methodology used in this case. In Chapter Five all the results found from tests are going to be analyzed and Finally Chapter Six gives a summary of the findings, policy implications and further research.

Chapter 2

LITERATURE REVIEW

The contribution of FDI to the economies has been extensively examined in the relevant literature. Many studies conclude that FDI significantly contributes to real income growth of countries (Nazlioglu, Yalama & Aslan (2009), Guris (2012), Kalim, Ali & Shahbaz (2012), Taspinar (2014), Kurtovic, Todorovic & Siljkovic (2014), Guris, Sacildi & Genc (2015), Yilmaz & Can (2016)).

An important argument in FDI is whether openness to foreign investments has a significant effect on economic growth, especially on Total Factor Productivity (TFP) of the host countries. In this case, we are going to discuss about ten top oil-producing countries including; Russia10.5 million barrels per day. Saudi Arabia10; United States 9.2; Iraq 4.3; China 4.1; Canada 3.8; Iran 3.5; UAE 2.7; Kuwait 2.5; Venezuela 2.4. (CNNmoney)

In past years, after the globalization process hast started, through which all the barriers were removed between countries. This caused so many physical and financial investments in both developing and developed countries especially in last

thirty years. FDI played an important role in fortifying Globalization in its third wave[2] (Soubbotina, 2014).

Through two perspectives the importance of FDI for world economy can be defined. First, the share of world capital flows and the other one is the benefits to economy of the host countries. According to IMF, 2011: 134, about 50% of total Foreign Direct Investments were occurred in developing countries between 1990s and 2000s whereas in industrial countries it was less than 40% and also less than 20% in advanced countries. These statements will arise questions like why foreigners invest in specific countries? Which factors of host countries attract the investors? According to OLI approach created by Dunning, these questions can be answered.

Investors seek for the countries, which have the following characteristics; Ownership advantages, Location advantages and Internationalization advantages. Ownership advantage, 'O', specifies who is going to generate abroad 'and for that matter, other forms of international activity'. Location advantage 'L' 'influencing the where to produce' and International advantage 'I' which 'addresses the question of why firms engage in FDI rather than license foreign firms to use their proprietary assets' (Ahmed M, 2016). Moreover, there are other factors, which attract investors for investments in other countries like inexpensive labors, less political risks, stable inflation rates and exchange rates in host countries.

[2] Globalization includes three waves: The first wave happened between 1870 and 1914, it was specified by growing Trade, FDI. Second wave was between 1950 and 1980, in which, in addition to the previous characteristics, General Agreement on Tariffs and Trade (GATT) was established and the last one started from 1980 until today which includes more of advanced technologies and financial movements.

FDI may have so many impacts on different aspects of the host countries in case of financial, social, political and economy. In this paper we are going to find how FDI affects economy of the host countries in terms of TFP. There have been so many arguments whether financial openness helps the productivity growth. In recent years, there have been so many studies stating that FDI would affect the economy, especially TFP, of the host countries in a positive way.

According to Kose et al. in press, financial openness has some indirect benefits for host countries and it causes growth in TFP. These benefits can be defined as improvement in domestic financial part, preferable macroeconomic policies, also transfer of more advanced technology from investor's country and managerial expertise which increase total efficiency and Total Factor Productivity in host countries.

FDI is affiliated with both Import and Export trade of goods, which will help the host countries to improve their export industry. FDI is a factor of change in economics of both investor's home and host countries (Lyold, 1996). Multinational Corporations (MNCs) have a significant influence on improving the host countries capacity of productions, which can be caused by export-oriented activities. MNCs bring new technology and management skills to the host countries that make local firms eager to compete (Chen, C., Chang, L. and Zhang, Y (1995)).

According to Nazanin Yazdanian (2014), Foreign Investment can be defined as "funds or physical capital transfer from a country to another to be used in founding an economic firm in the latter country for taking its advantages either directly or indirectly". There are two types of Foreign Investments, Foreign Direct Investment

(FDI) and Foreign Portfolio Investment (FPI). In FDI the direct investors are allowed to gain access to the economy of the enterprise in which they are investing where as in FPI they have rights to make any changes or influence on management of the enterprise.

One of the first pioneers in theory of FDI spillovers was Findlay (1987). Findlay claims that “contagion effect” is the benefit that FDI can bring to the host countries. By “contagion effect” he means transferring advanced technology, marketing and managerial skills from foreign firms (Dr. Sauwaluck Koojaroenprasit, 2012).

Regarding to research, which Botirjan Baltabaev did on 49 countries in the period of 1974 – 2008, he found that increase in FDI stock leads to an improvement in productivity growth of the countries (Botirjan Baltabaev).

Development of Multinational companies in 1970s and its dominant role in economy world made domestic companies to improve their technology in competence with the foreigners. These made economists to make some models to analyze the effect of remaining of Multinational companies on technological improvements of domestic firms.

As mentioned earlier, Findlay (1987) was on of the first researchers of FDI spillovers theory. According to Findlay, in backward regions, the firms can’t learn to use the advanced technology only by imitation but they have to try harder. As a result, more Multinational firms in a backward region, the efficiency of the backward firms will improve faster.

The advanced technology is not enough solely, since there should be educated or trained labors who can use or work with these technologies. According to Fosfuri (2001), in order to transfer the advanced technology to a region, domestic workers should be trained first. In future, domestic firms will hire these workers or they may run their own business even more productive.

Corrado, Lengermann, and Slifman did a research on the relation between FDI and labor productivity in United States. They separated the products produced by exclusively domestic firms and multinational firms. Between 1977 and 2000 they found about 75 percent growth in labor productivity in domestic firms. (Silvio Contessi and Ariel Weinberger, 2009)

Caves found that FDI increased productivity in host countries. He examined the effect of FDI in manufacturing sections of two countries: Canada and Australia and explained that improvements occurred by competition between the enterprises (Magnus & Ari, 2001). Also Steven Globerman (1979) mentioned that presence of FDI in Canada led to higher labor productivity as well as technology spillovers.

Between 1991- 1995 Liu et al. (2000a) did an empirical analysis on 48 UK industries using panel data. According to the findings, the British firms with higher technological possession were receiving more benefits from FDI. They also did another research on Chinese electronics industry, which showed that presence of foreign firms in a region led to a more productive domestic labor.

Although most of the studies show that the impact of FDI on labor productivity is positive, there are also some researches indicating negative or ambiguous effects.

Based on Aitken and Harison (1999), when FDI increased in Venezuela, the productivity of domestic firms decreased. But they also asserted that positive relation between joint venture companies and domestic labor productivity is only for domestic firms with less than 50 labors. There is an affirmative relationship between total factor productivity of small and less technological UK firms and FDI (Sourafel Girma and Katharine Wakelin, 2007). Beata Javorcik (2004) also showed data from Lithuania's firm proving that in developing countries, FDI doesn't have positive effect on firms, which have intermediate supplies. Konings (2000) found that in emerging market economies like Bulgaria, Romania and Poland, FDI has negative effect on productivity of the host countries.

According to Priit Vahter (2004), the positive correlations between FDI and productivity of the host countries depends on the types of FDI, whether it's a joint venture or totally foreign firm, how developed is the country and how skillful are domestic labors.

Chapter 3

THE CASE OF TOP TEN OIL PRODUCING COUNTRIES

In this chapter more detailed information about GDP, TFP and FDI for each of ten countries is given. The countries are mentioned in order of highest to lowest rate of oil production.

3.1 Russia

According to last statistics, Russia produces 10.5 million barrels per day on average while it reached to 10.83 million barrels per day in December 2015. Following, there is a graph showing amount of oil produced in Russia between 2011-2015.

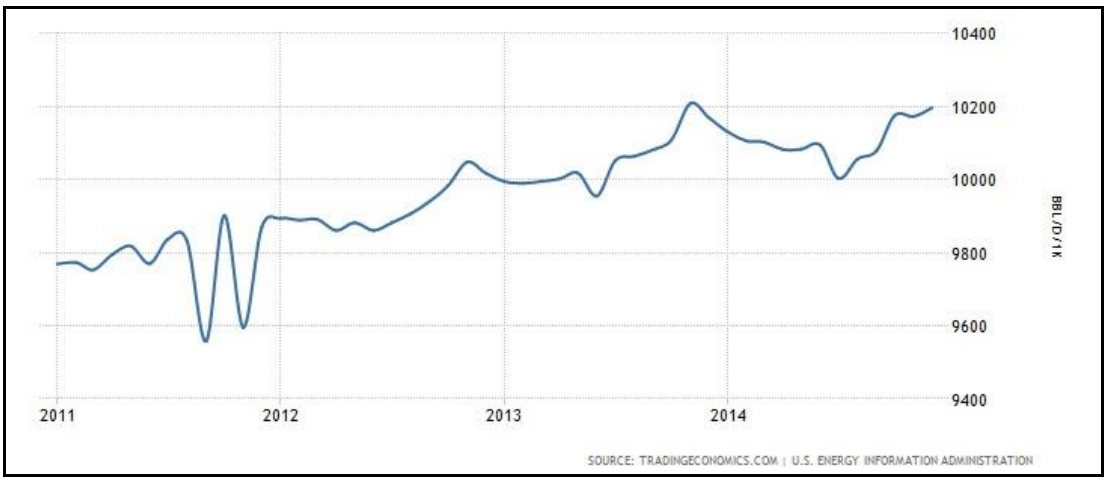

Figure 1: Russia Oil Production
Source: Tradingeconomics.com

In 2016, the Gross Domestic Product per capita was 11099.20 US Dollars. Russia owns 88 percent of average world GDP per capita, which based on records between 1989 till 2016 the average GDP was 8713.78 USD. In 2013 it reached the highest rate of 15543.677 USD.

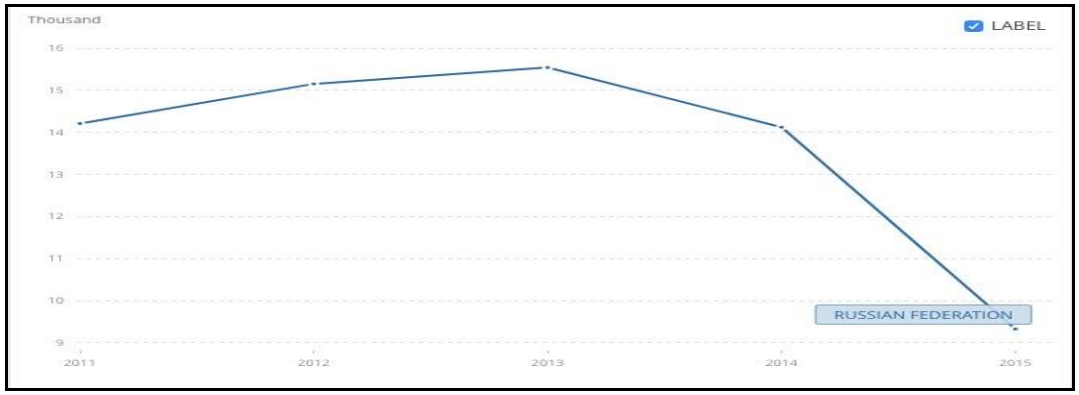

Figure 2: GDP per capita (Current US Dollars)
Source: worldbank.org

According to above graph, Russia's GDP per capita started from 14212.1 USD in 2011 and reached to the highest amount at 15543.677 USD in 2013 then started to decrease to 9329.298 USD in 2015.

Based on The Conference Board database, it's been found that Total Factor Productivity growth in Russia started from 2.3% in 2011 and ended to -3.90% in 2015.

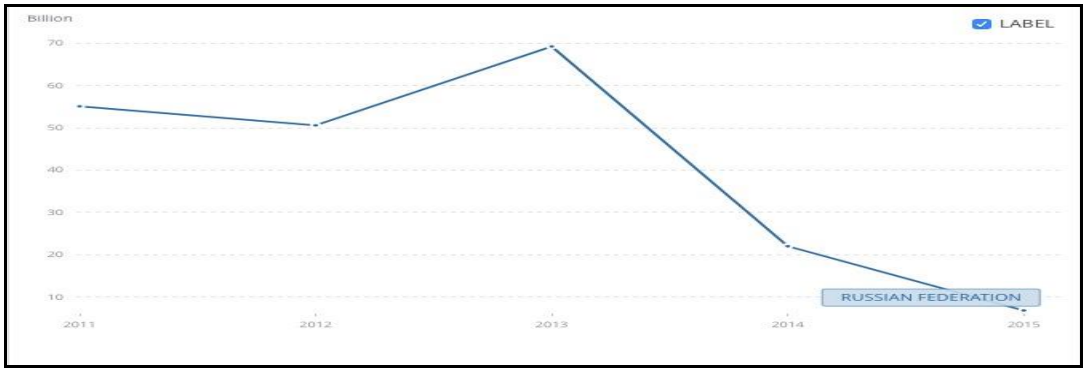

Figure 3: FDI net inflows (Current US Dollars)
Source: worldbank.org

The graph shows FDI net inflows in Russia was 55.084 Billion Dollars in 2011, which it increased to 69.219 Billion Dollars in 2013. In 2015, Foreign Direct Investment net inflows reached to its lowest rate of 6.853 Billion.

3.2 Saudi Arabia

Based on statistics, Saudi Arabia produces 10 million barrels of crude oil per day and it owns 22 percent of world's petroleum reserves. Saudi Arabia is one of the largest petroleum exporters (Saudi Arabia Facts and Figures, 2017). The following graph shows the amount of oil produced between 2011-2015 in Saudi Arabia.

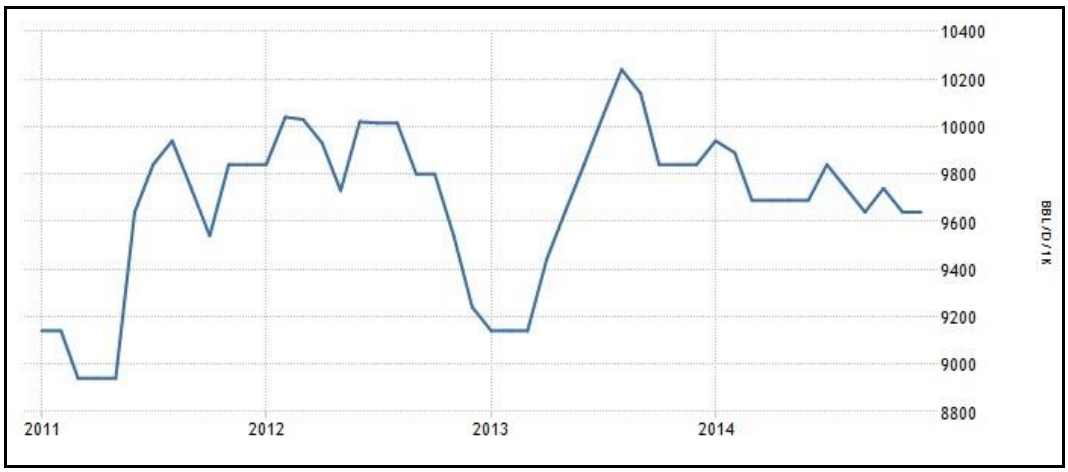

Figure 4: Saudi Arabia Oil Production
Source: Tradingeconomics.com

According to the graph, at the begging of 2011 Saudi Arabia has the lowest rate of petroleum production with less than 9000 BBL/D/1K while it reached its highest amount between 2013 and 2014 with more than 10200 BBL/D/1K.

The following graph indicates Gross Domestic Production per capita in Saudi Arabia between 2011-2015. In 2012 it was the highest rate of 25303.095 USD, which, in 2015 GDP per capita reached the lowest rate of 20732.862 USD.

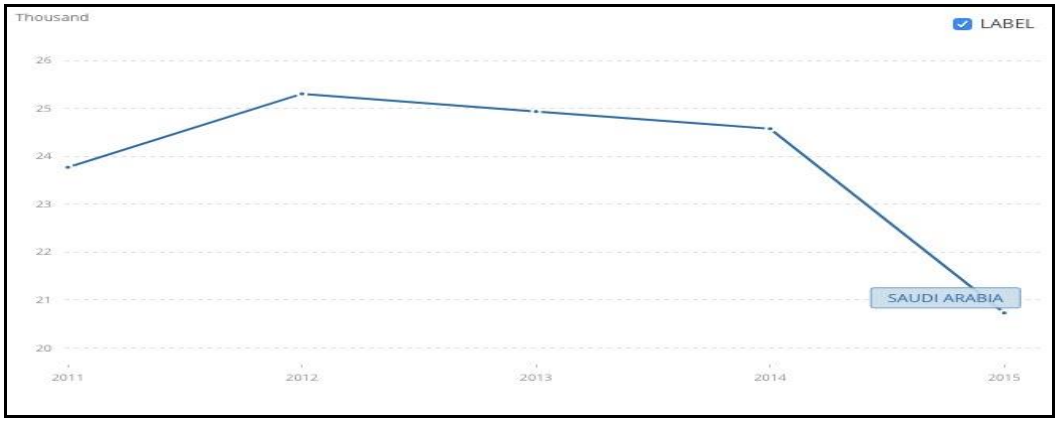

Figure 5: GDP per capita (Current US Dollars)
Source: worldbank.org

In 2011, Total Factor Productivity growth of Saudi Arabia was -4% which reached to -2.60% in 2015. It shows that in overall economy, there was an estimation of 1.3% growth in TFP through these five years.

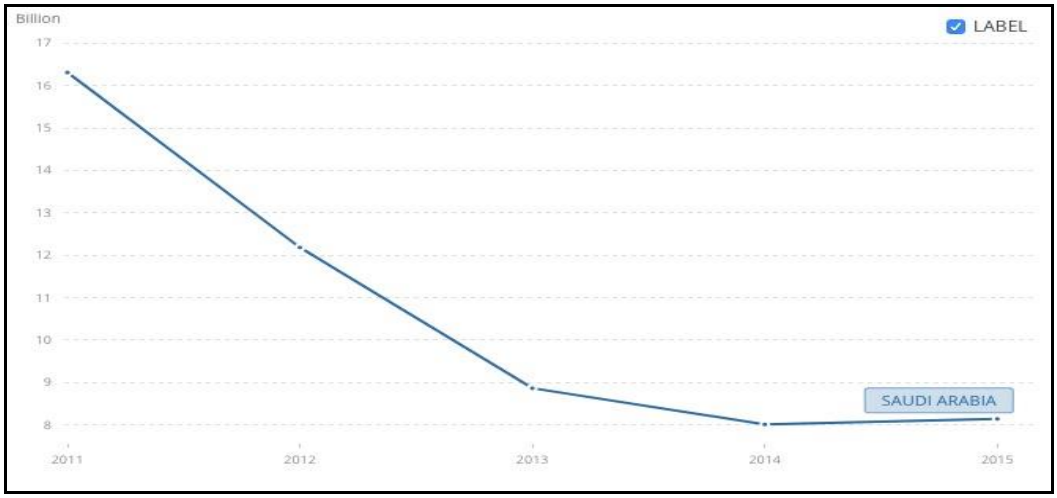

Figure 6: FDI net inflows (Current US Dollars)
Source: worldbank.org

The amount of Foreign Direct Investment in Saudi Arabia was at the highest rate of 16308 Billion Dollars in 2011, which reached to its lowest rate in 2014 with 8012 Billion Dollars.

3.3 United States

After Russia and Saudi Arabia US is the largest world's petroleum source. In United States of America, 9.2 Million barrels of crude oil are produced per day. The graph shows a growing process in US between 2011 and 2015. In 2011, 5.6 Million barrels per day was produced which increased to 9.4 Million in 2015.

Figure 7: US Oil Production
Source: Tradingeconomics.com

United States' GDP per capita is 413 percent of word's average (United States Crude Oil, 2017). According to the following graph GDP per capita in US, like its oil production, had a growing process from 2011 to 2015. In 2011, it was 49790.665 USD, which reached to its highest rate of 60207.037 USD.

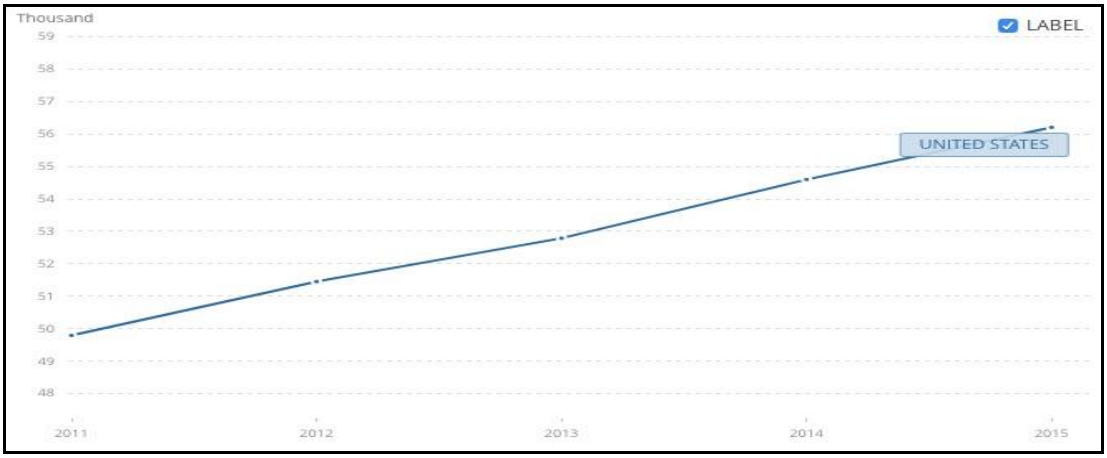

Figure 8: GDP per capita (Current US Dollars)
Source: worldbank.org

Based on statistics, TFP in US started from -0.4% in 2011 and ended with -0.3% in 2015. Although in first two years TFP had an increasing process which reached to 0.2% in 2013 but it didn't last more than that.

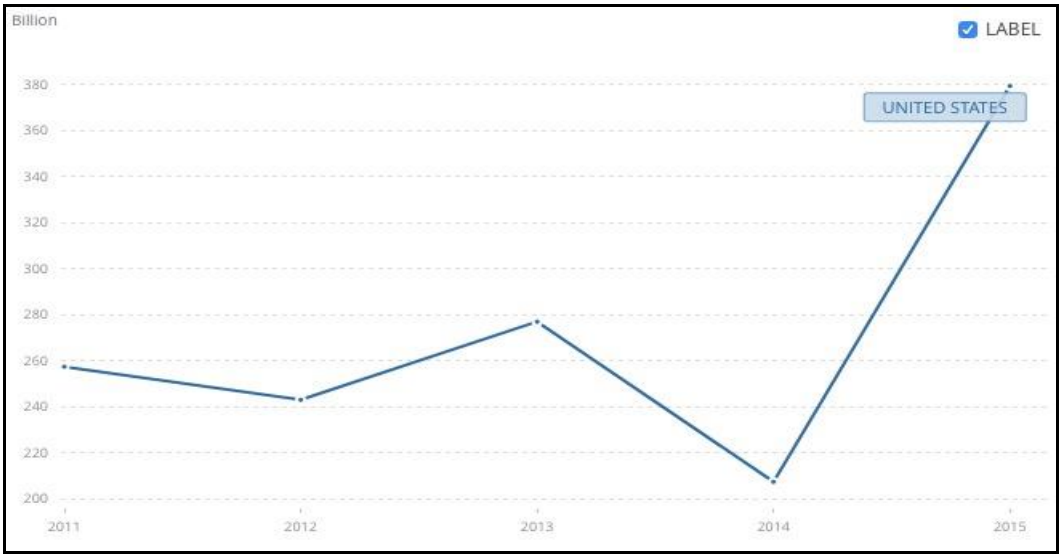

Figure 9: FDI net inflows (Current US Dollars)
Source: worldbank.org

In 2011, Foreign Direct Investment net inflows were 257.41 Billion Dollars, which reached to its lowest rat of less than 220 Billion Dollars in 2014. US had its highest rate if FDI net inflows of these five years in 2015 with 379.434 Billion Dollars.

3.4 Iraq

According to the graph, oil production in Iraq had an increasing process between 2011 and 2015. In 2011, Iraq produced more than 2.6 Million barrels per day, which in 2015, it reached to more than 3.7 Million barrels per day.

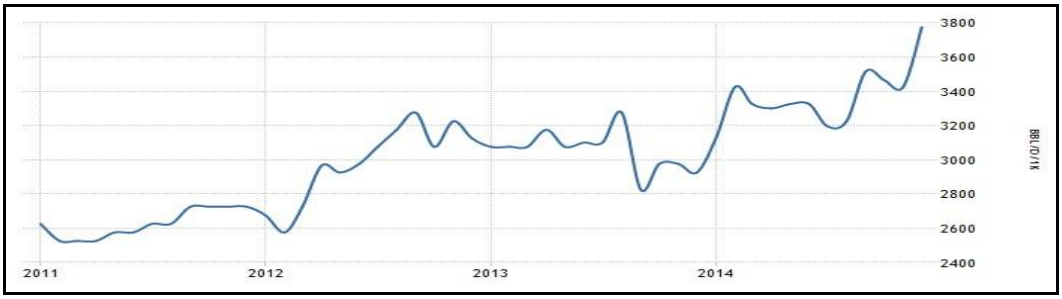

Figure 10: Iraq Oil Production
Source: Tradingeconomics.com

Iraq's GDP per capita is 45 percent of word's average. As the graph shows, between 2011 and 2015, the lowest rate of GDP per capita was in 2015 with amount of 4974.027 USD, while the highest value was in 2013 with 6925.224 USD.

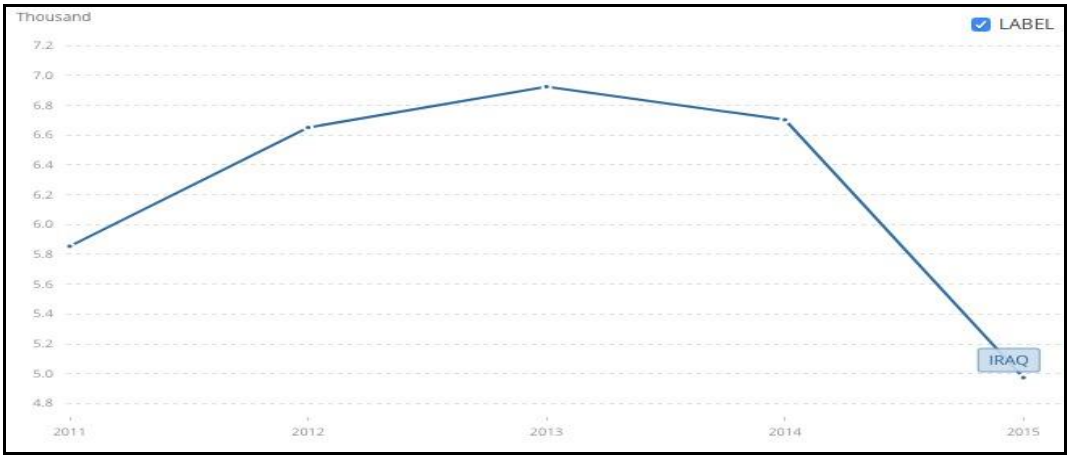

Figure 11: GDP per capita (Current US Dollars)
Source: worldbank.org

In 2011, TFP in Iraq was 5.9%, which in 2012 it reached to the highest point of these five years with rate of 10.8% but after that it continued with a decreasing process. In 2015 Iraq's TFP reached to 1.5%.

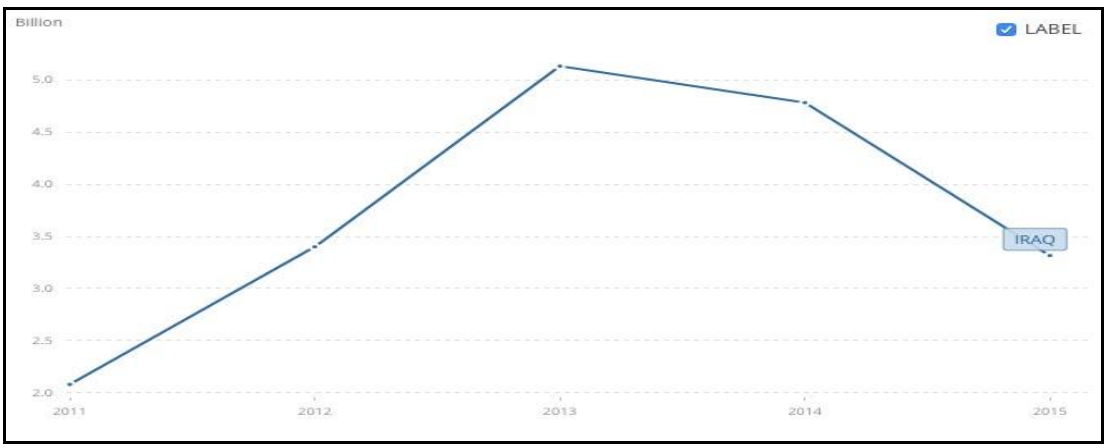

Figure 12: FDI net inflows (Current US Dollars)
Source: worldbank.org

As it's indicated in last graph, FDI net inflows in Iraq was 2.082 Billion Dollars, which was the lowest rate of these five years. Then it reached to the highest rate in 2013 with 5.131 Billion Dollars but it didn't last since Iraq's FDI net inflows in 2015 was 3.316 Billion Dollars.

3.5 China

According to the current statistics, China produces 4.1 barrels of oil per day. As it shows in the graph, there were fluctuations in oil production between 2011 and 2017. In 2011 China produced around 4.3 million barrels per day. The lowest production was in the last quarter of 2011 with around 3.9 million barrels per day while highest one happened in 2015 with around 4.3 million barrels.

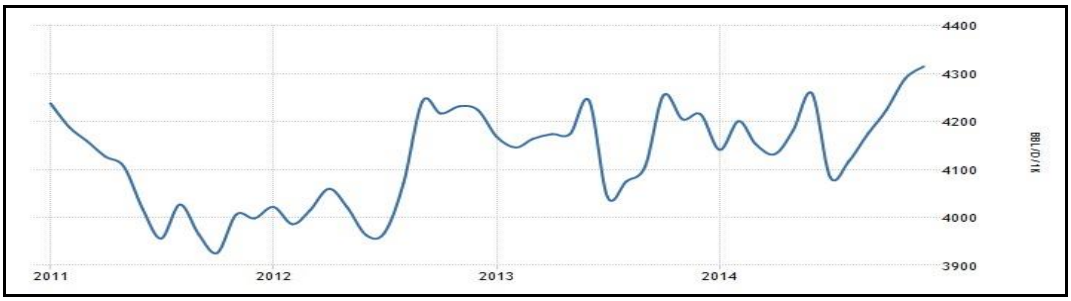

Figure 13: China Oil Production
Source: Tradingeconomics.com

China's GDP per capita is 81% of world's average. There was a growing process in China's GDP per capita between 2011 and 2015. In 2011, it was 5633.794 USD while it reached to its highest point in 2015 with 8069.212 USD.

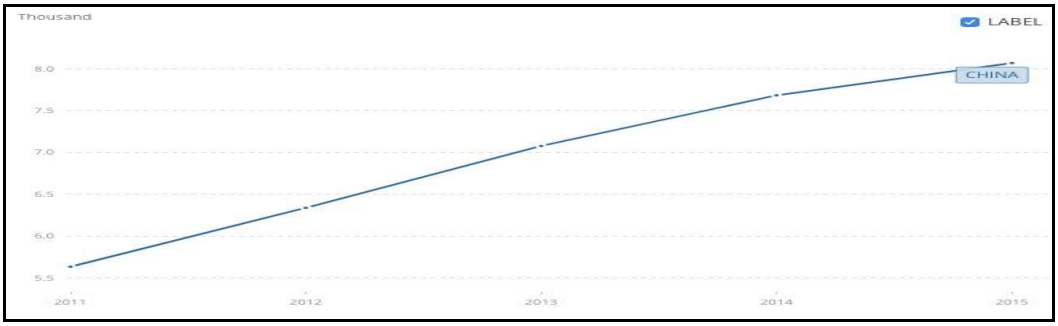

Figure 14: GDP per capita (Current US Dollars)
Source: worldbank.org

TFP in China was estimated 0.7% in 2011 then it decreased to -0.2% in 2012. In 2013 and 2014 TFP reached to 0.4% but it dropped to -2.3% in 2015.

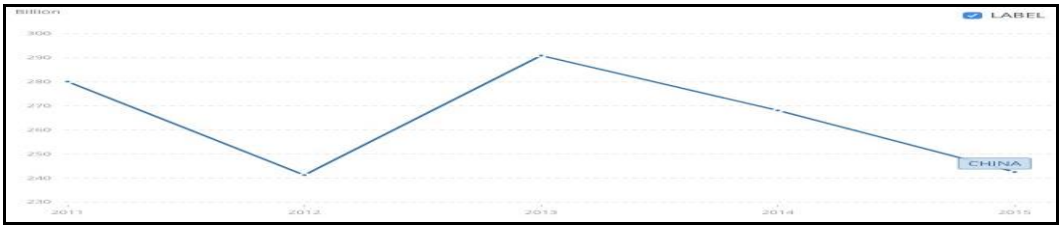

Figure 15: FDI net inflows (Current US Dollars)
Source: worldbank.org

Based on the graph, FDI net inflows in China, like GDP, had fluctuations. In 2011, it started with 280.072 Billion Dollars then there was a fall to 241.214 Billion Dollars in 2012. The highest amount of FDI net inflows in China happened in 2013 with 290.928 Billion Dollars but after that it fell to 242.289 Billion Dollars in 2015.

3.6 Canada

Canada is the sixth country among top ten oil producing countries in the word. Based on the statistics, 3.8 million barrels of oil are produced per day in Canada. In second quarter of 2011 their oil production was at its lowest point of less than 2.6 million barrels per day while it reached to the highest rate of all these five years in 2015 with near 3.8 million barrels per day.

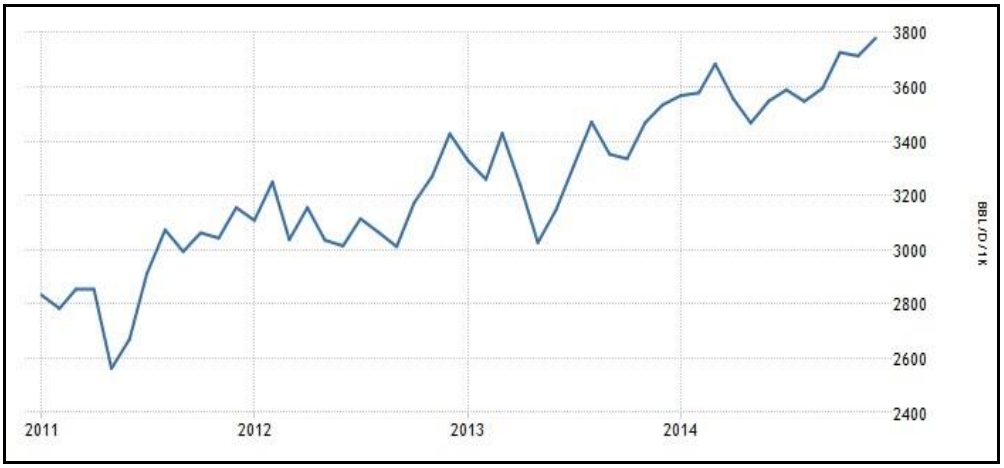

Figure 16: Canada Oil Production
Source: Tradingeconomics.com

Canada's GDP per capita is equal to 389 percent of world's average. Between 2011 and 2013 it was around 52000 USD but afterwards it continued with a decreasing process, which reached to 43315 USD in 2015.

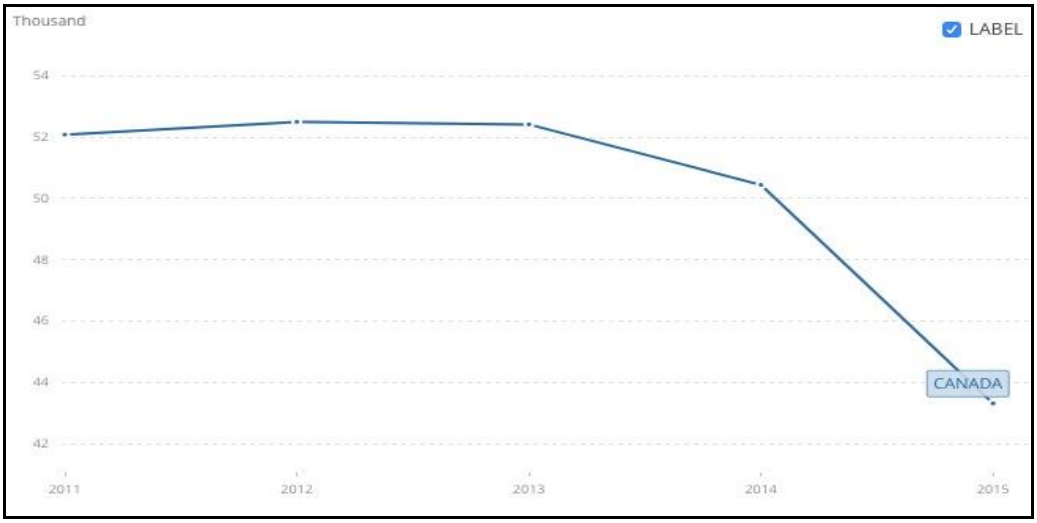

Figure 17: GDP per capita (Current US Dollars)
Source: worldbank.org

In 2011, TFP was 0.5% in Canada then it decreased to -1.20%. TFP increased to 0.30% in 2013 while it reached to its highest level in 2014 with 0.90% but it didn't last much since again it decrease to -0.90% in 2015.

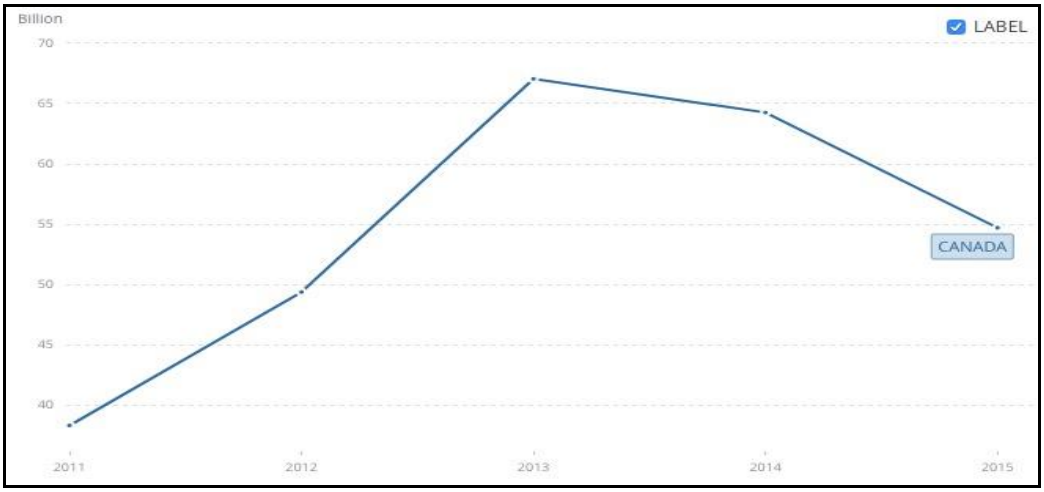

Figure 18: FDI net inflows (Current US Dollars)
Source: worldbank.org

According to the graph, FDI net inflows in Canada were at its lowest point in 2011 with 38.318 Billion Dollars. Then it reached to its highest level of these five years in 2013 with 67.048 Billion Dollars. Between 2013 and 2015 FDI net inflows had a decreasing process, which reached to 54.702 Billion Dollars in 2015.

3.7 Iran

Statistics show that Iran produces 3.5 Million barrels per day. Iran produced around 3.6 million barrels per day in 2011; it reached to its lowest point of these five years in mid 2012 but they could get back on track again in 2013. Iran's oil production was around 3 million barrels per day in 2015.

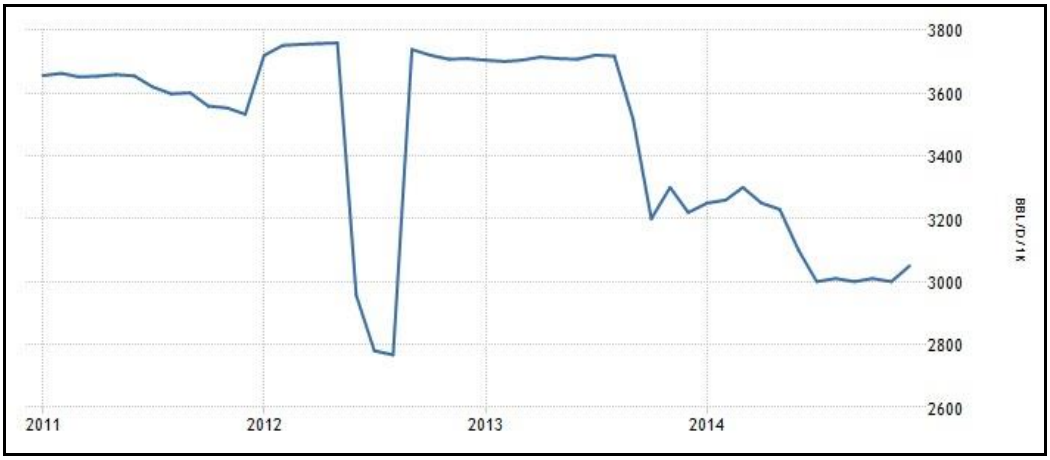

Figure 19: Iran Oil Production
Source: Tradingeconomics.com

GDP in Iran is about 46% of world's average. According to the graph, Iran's GDP had a decreasing process between 2011 and 2015. It was at its highest point of these five years in 2011 with 7842.435 USD white it got to the lowest value of 4957.581 USD in 2015.

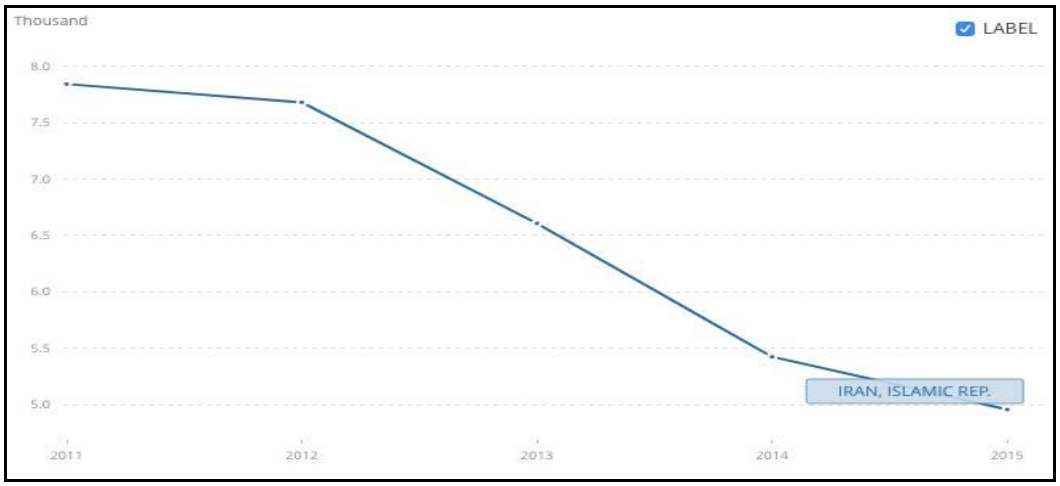

Figure 20: GDP per capita (Current US Dollars)
Source: worldbank.org

TFP in Iran started from -3.80% in 2011 and reached to its highest point of these five years in 2014 with 0.8% in 2014. But in the end it decreased to -2.30% in 2015.

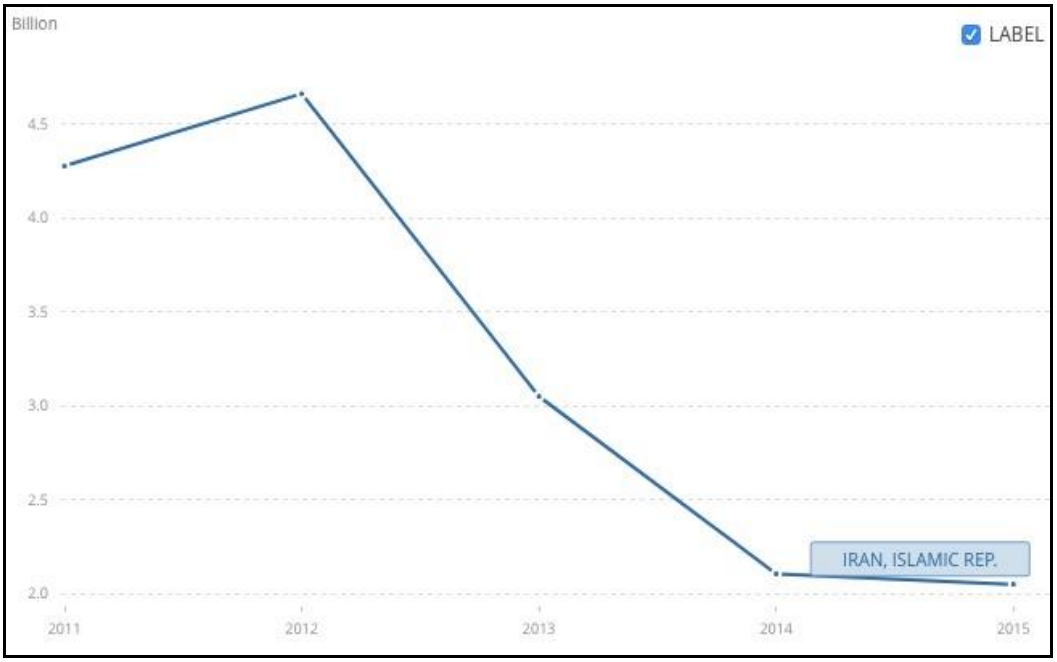

Figure 21: FDI net inflows (Current US Dollars)
Source: worldbank.org

According to the graph, like its GDP, Iran's FDI net inflows had a decreasing process between 2011 and 2015. In 2011, rate of FDI net inflows was equivalent to 4.277 Billion Dollars. Its highest rate was in 2012 with 4.662 Billion Dollars but again it continued its reduction to 2.05 Billion Dollars in 2015.

3.8 UAE

The UAE produces about 2.7 Million barrels per day. Following graph shows that there have not been too many fluctuations in oil production between 2011 and 2015. It was almost between 2.4 and 2.9 million barrels per day but in mid 2014 there was a sudden decrease in oil production to about 300 million barrels per day.

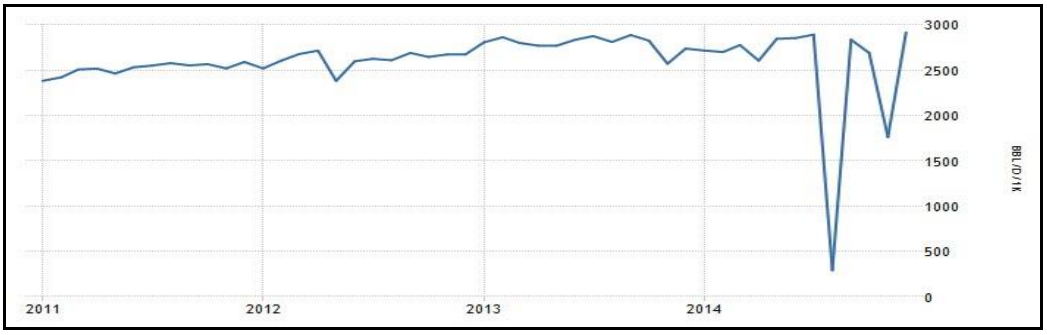

Figure 22: UAE Oil Production
Source: Tradingeconomics.com

According to OPEC, 40 percent of UAE's GDP is based on its oil and gas production. In 2011, GDP in UAE was 40462.312 USD then it reached to its highest value of these five years in 2014 with 44449.74 USD. Finally in 2015 UAE's GDP decreased to 39101.747 USD.

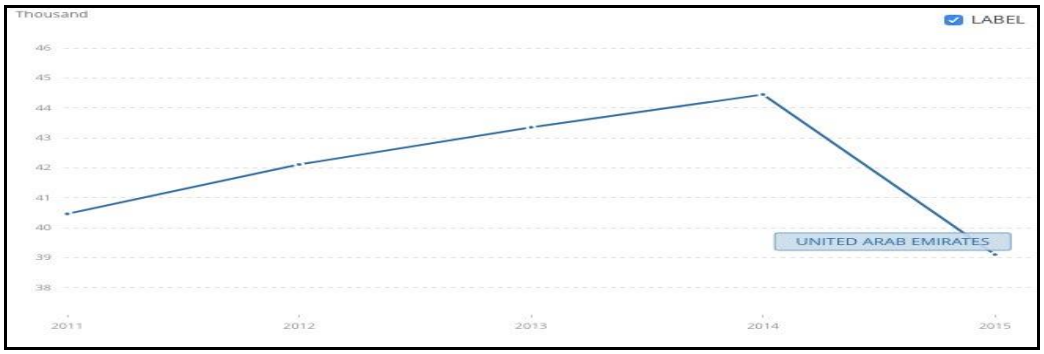

Figure 23: GDP per capita (Current US Dollars)
Source: worldbank.org

In 2011, UAE's TFP growth was estimated as -0.8% then it increased to 1.3% in 2012 but again it started to decrease for the last three years. In 2015 TFP was -0.1%.

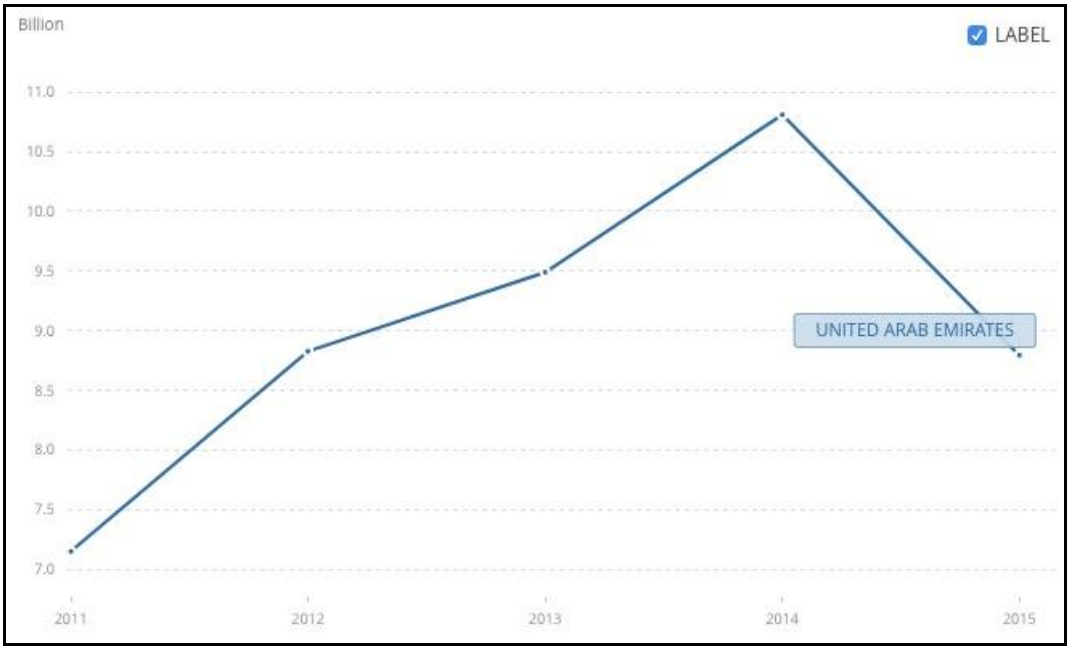

Figure 24: FDI net inflows (Current US Dollars)
Source: worldbank.org

Based on the graph, between 2011 and 2014 there was a growth in FDI inflows. In 2011 it was 7.152 Billion Dollars and it attained its highest level with 10.81 Billion Dollars in 2014. Finally, in 2015 UAE's FDI inflows were estimated as 8.795 Billion Dollars.

3.9 Kuwait

There are around 2.5 million barrels of oil produced in Kuwait based on statistics. It's been on its lowest level in 2011 with around 2.2 million barrels per day. From 2012, there was an increasing process in Kuwait's oil production, which reached to its highest point of these five years in first quarter of 2012 with around 3 million barrels per day. Finally, in 2015, Kuwait's oil production decreased to 2.8 million barrels per day.

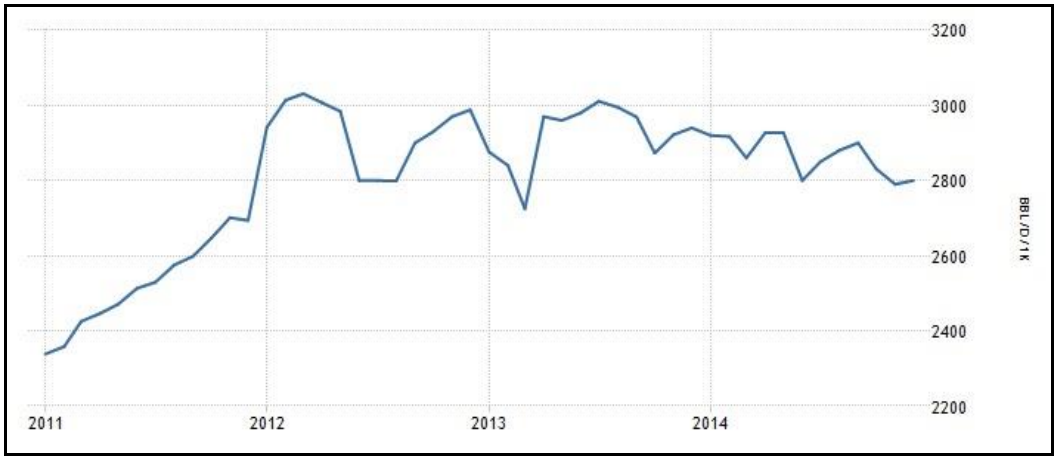

Figure 25: Kuwait Oil Production
Source: Tradingeconomics.com

GDP in Kuwait is equal to 281 percent of world's average. As it's indicated in the following graph, GDP per capita had a decreasing process in Kuwait between 2011 and 2015. In 2011, GDP per capita was estimated as 48268.591 USD, which attained its highest level in 2012 with 51264.071 USD. After 2012 there was a reduction in Kuwait's GDP per capita that gained the lowest point in 2015 with 28975.401 USD.

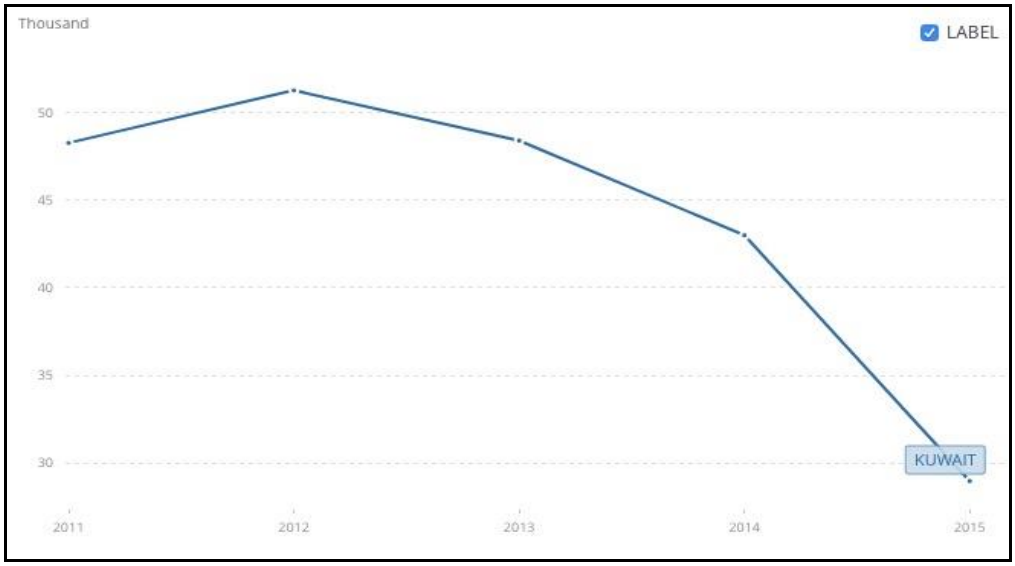

Figure 26: GDP per capita (Current US Dollars)
Source: worldbank.org

Kuwait had the highest TFP growth in 2011 with 3.4% but afterwards it started to decrease which reached to it lowest point in -6.3% in 2014 and in 2015, it reached to -4.3%.

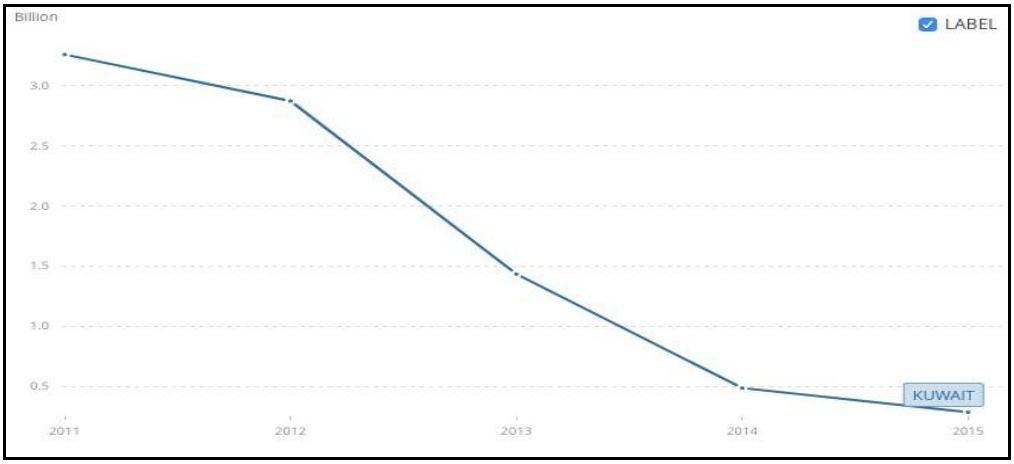

Figure 27: FDI net inflows (Current US Dollars)
Source: worldbank.org

According to the graph, FDI net inflows had a decreasing process in general. In 2011, it was at its highest point of these five years with 3.259 Billion Dollars and then in 2015, it reached to the lowest level of 284,647,623.805 Million Dollars.

3.10 Venezuela

Venezuela produces around 2.4 million barrels per day. In 2011, Venezuela's oil production was at its lowest rate of these five years with around 2.3 million barrels per day, which in 2015, it reached to around 2.7 million barrels per day.

Figure 28: Venezuela Oil Production
Source: Tradingeconomics.com

GDP per capita in Venezuela is equal to 101 percent of world's average. According to the graph in 2011, it was 13940.9211 USD then it started to increase which reached to the highest level in 2012 with 14514.8127 USD. But then GDP per capita reached to its lowest point of 12793.7773 USD in 2015.

Figure 29: GDP per capita (Current US Dollars)
Source: Tradingeconomics.com

TFP growth in Venezuela was estimated 1.6% in 2011 then it increased to 2.3% in 2012 but after that there was a reduction in TFP growth, which reached to -6.3% in 2015.

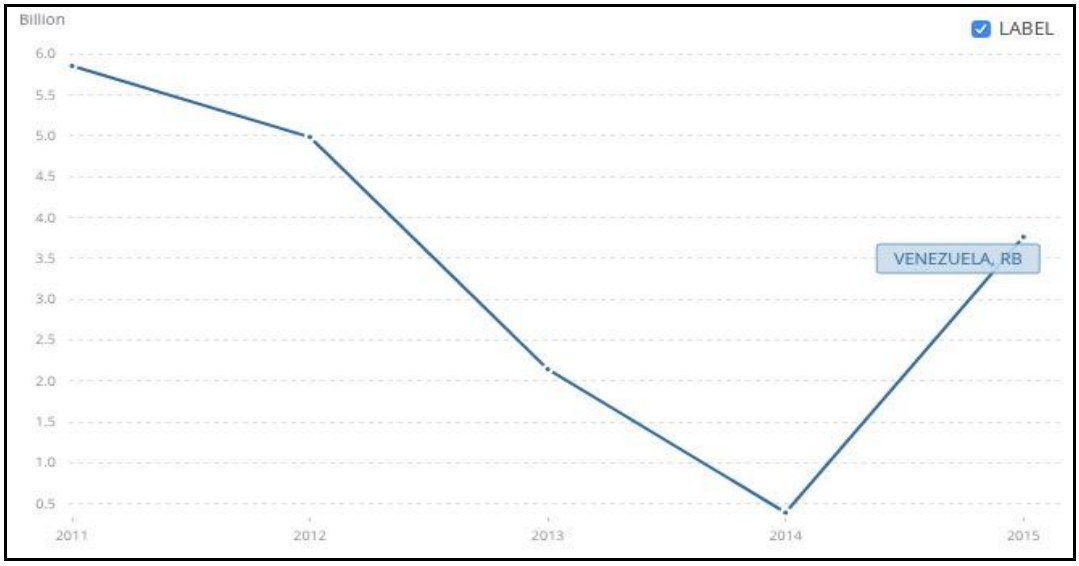

Figure 30: FDI net inflows (Current US Dollars)
Source: worldbank.org

According the above mentioned graph, FDI net inflows in Venezuela was at its highest level in 2011 with 5.855 Billion Dollars but then it decreased to 390,000,000 Million Dollars in 2014. And in 2015, again there was a growth in FDI net inflows, which reached to 3.764 Billion Dollars.

Chapter 4

DATA, METHODOLOGY AND EMPIRICAL MODEL

4.1 Data: Types and Sources

Data for the world's top ten oil producing countries are collected according to annual figures between 2011-2015 using panel data method. This top ten countries are as follows, they are going to be mentioned in order of highest to lowest oil production ranking; Russia, Saudi Arabia, United States, Iraq, China, Canada, Iran, UAE, Kuwait and Venezuela. In our model the output, which is TFP (Total Factor Productivity), is going to be measured by FDI (Foreign Direct Investment), LQI (Level of Labor Quality Index in the form of long-linear model) and ε is the usual error term. Data are gathered from following websites: WORLDBANK[3] and CONFERENCE-BOARD[4].

4.2 Methodology

As it was mentioned earlier, in this research panel data method has been conducted in which data were tested in three following ways: Panel Unit Root Test, Panel Co-integration Test and Panel Error Correction Modeling Test based on Pedroni, Im Pesaran and shiu and Koa approaches.

[3] See www.worldbank.com for more detail
[4] See www.conference-board.org/data/economydatabase for more detail

4.2.1 Panel Unit Root Test

Unit Root Test is used for cross-sectional and time series analysis in order to find whether variables used in that empirical work are stationary or not. In this test many approaches like ‘Levin, Lin and Chu’, ‘Im, Pasaran, Shin W-stat’, also ‘ADF-Fisher Chi-square’ and ‘PP-Fisher Chi-square’, finally ‘Breitung t-test’ have been used to check the variables.

4.2.2 Panel Co-integration Test

As opposed to Unit Panel Test, this one is being used to test the non-stationary series to find if there is any correlation between variables in a longer period of time. In this part, Perdoni Residual Co-integration test has been applied.

4.2.3 Panel Error Correction Model Test

In the end, Panel Error Correction Model Test has been conducted to investigate both long-term, short-term coefficients as well as possible errors and also to find out based on the empirical equation, how long does it take to be corrected.

4.3 Empirical Model

In order to find if there is any relationship between FDI and TFP as well as Labor Quality Index, following models are going to be used for both short-run and long run (Dierk Herzer, 2016).

$$TFP = a + b\,FDI + c\,LQI + \varepsilon \quad (1)$$

$$\Delta TFP = a + ECT(-1) + b\,\Delta FDI + c\,\Delta LQI + \varepsilon \quad (2)$$

In the equations, TFP refers to Total Factor Productivity, FDI stands for Foreign Direct Investment, LQI is Labor Quality Index and ε represents the usual error term.

As it’s mentioned in second equation, ECT stands for Error Correction Term (Cem Tintin 2010 and Prince Ilboudo, 2014).

Chapter 5

EMPIRICAL ANALYSIS

5.1 Unit Root Test of Panel Data Analysis

Unit root test is used to determine whether the variables used in this case are stationary or not. All the following econometric approaches, Levin, Lin & Chu, ADF – Fisher Chi-square, PP – Fisher Chi-square, have been done on the level and first difference form of top ten oil producing countries. According to the panel data for the level form for these countries, null hypothesis has been rejected, which in intercept and without trend model. Hence TFP (Total Factor Productivity), FDI (Foreign Direct Investment) and LQI (Labor Quality Index) become non-stationary. Unit root test results in level are shown at following table.

Table 1: Panel Unit Roots Tests

Variables	LEVEL		
	Method	Statistic	Prob.
TFP	LLC	-1.22074	0.1111
	ADF	16.7580	0.6686
	PP	18.3924	0.5616
FDI	LLC	-1.46495	0.0715
	ADF	23.5451	0.2628
	PP	31.1180	0.0537
LQI	LLC	-0.86472	0.1936
	ADF	1.90791	0.9280
	PP	1.68917	0.9460
DIFFERENCE			
D(TFP)	LLC	-2.65935	0.0039
	ADF	19.0199	0.5205
	PP	24.3416	0.2278
D(FDI)	LLC	-2.12491	0.0168
	ADF	34.9771	0.0202
	PP	35.3841	0.0182
D(LQI)	LLC	-3.84565	0.0001
	ADF	6.43791	0.3760
	PP	7.95194	0.2416

Note: LLC refers to Levin, Lin & Chu, and ADF –Fisher Chi-square, PP – Fisher Chi-square. TFP represents total factor productivity, FDI represents foreign direct investment and LQI stands for Labor Quality Index.

Unit root tests in difference for top ten oil producing countries are also illustrated in above table. According to Levin, Lin & Chu, ADF – Fisher Chi-square and PP – Fisher Chi-square tests null hypothesis is rejected, which in intercept and without trend model. Therefore TFP (Total Factor Productivity), FDI (Foreign Direct Investment) and Labor Quality Index become stationary in difference.

5.2 Co-integration Tests of Panel Data Analysis

Having conducted the unit root tests, co-integration test is engaged to find the long term relation between variables in equation (4.3.2). Usually Pedroni (Engel-Granger based) and Kao (Engel-Granger based), also Fisher (combined Johansen based) tests

are conducted for co-integration test which Pedroni has been used in this case. Here Engle – Grenged based Pedroni co-integration examination with no deterministic intercept or trend assumption has been conducted.

Table 2: Panel Co-integration

Model: TFP = FDI, LQI				
Method	Statistic	Prob.	Statistic (weighted)	Prob.
Panel v	-3.764902	0.0999	-1.076570	0.8592
Panel rho	0.546461	0.7076	0.199956	0.5792
Panel PP	-0.901037	0.1838	-1.166985	0.1216
Panel ADF	-2.903047	0.1033	-1.167168	0.1216
Group rho	1.108266		0.8661	
Group PP	-5.708519		0.0000	
Group ADF	-6.370794		0.0000	

Results in Table 5.2.2 show the co-integration results for top ten oil producing countries. According to the Engle - Grangel based Pedroni test results it has been found that an autoregressive coefficient, which is inside the dimension, only rejected the null hypothesis for no co-integration with trend assumption of no intercept or trend based on 10% alpha level of v-Statistic, PP-Statistic and ADF-Statistic as well.

5.3 Error Correction Models for Panel Data Analysis

For this part, error correction term will be investigated to find how fast disequilibrium between short-run and long-run coefficients of total factor

productivity, which is formulated in equation (4.3.2), will be eliminated. These factors will be defined by level assessment, which is framed in equation (4.3.1).

In table 5.3.3 estimations of long-run co-integration between variables are illustrated while in the last table, error correction pattern is defined.

Table 3: Panel Co-integration/Long-Run Estimates

Variables	Dependent: TFP
FDI	0.444775 (5.03309)
LQI	0.679070 (3.97981)
C	0.277112 (3.244816)
R-Square	0.775300
Adj. R-Square	0.644225
Durbin–Watson statistic	1.94

Note: FDI represents foreign direct investment, TFP represents total factor productivity and LQI stands for Labor Quality Index.

In level equation, Foreign Direct Investment is statically significant and has positive effect on Total Factor Productivity in long-run while Labor Quality doesn't have any affect. One percent changes in Total Factor Productivity leads to 5.03% increase in

Foreign Direct Investment while the same changes in TFP leads to 3.97% decrease in Labor Growth.

Table 4: Panel-VEC model/ Short-Run Estimates

Variables	Dependent: DTFP
ECT(-1)	-0.618 [-2.690]
DLNTFP(-2)	0.465 [2.569]
DLNFDI(-1)	0.450 [2.324]
DLNLQI(-2)	0.707 [1.677]
C	-0.249 [-2.528]

Note: All variables are significant at 5% level. R-Squared equals to 0.775, Adj. R-squared is 0.644, F-statistic is 5.914 and Akaike AIC equals to 1.134. ECT represents error correction term, TFP represents total factor productivity, FDI stands for foreign direct investment and LQI is Labor quality Index.

According to the error correction pattern, error correction interval is statistically significant (-2.69) also based on expectations it's negative and low. Pursuant to the error correction term in table 5.3.4, 61.8% of discrepancy among long-run and short-run equilibrium would be removed at the end of each year. So based on the results disequilibrium in Total Factor Productivity is going to be converged equilibrium fast.

At last, short-term coefficients of Foreign Direct Investment and Labor Quality are statically insignificant on Total Factor Productivity therefore it represents that FDI and LQI (LQG) doesn't have any effect on TFP in short-run.

Chapter 6

CONCLUSION AND RECOMMENDATION

6.1 Summary of Discoveries

The purpose of this dissertation is to find possible relationship between Total Factor Productivity and Foreign Direct Investment as well as Labor Quality Index. In the beginning our intention was to do the research on developing countries but since there had been other research in this regard on the same sample we decided to change our sample to world's top ten oil producing countries between years 2011 and 2015. The main question of this study is that — Does Foreign Direct Investment has any affect on Total Factor Productivity?

This case is a panel study so panel data has been used to compare the results over time. According to the panel data approaches, it's been found that there is an economic and statistical relationship between Total Factor Productivity of these world's top ten oil producing countries and its determinants which are Foreign Direct Investment and Labor Quality Index. Results indicate that FDI has a positive effect on TFP of these countries in a long-term period while it's not significant in short-term period. On the other hand, LQI is not significant both in long-term and short-term period.

6.2. Policy Implications and Future Research

The main outcome from the case of these top ten oil-producing countries suggests that, foreign investments in a country lead to an increase in Total Factor Productivity

of the host countries. And like it was foresaid in literature review of the case, many researches had been done through the history to find the relationship between these two factors, which almost all of them found a positive relation, therefore our findings are in accordance with the results of previous researches. Outcomes show that in short-term duration there is not significant relationship amid FDI and TFP while in long-term period a positive effect has been found. All these findings help economists and policy makers to remove or decrease all the barriers on the way of FDI in their countries in order to have a more productive economy. And although results show that there is no relationship between TFP and Labor Quality but according to the literature it's been already proved that FDI has a significant effect on Labor Quality in so many ways like knowledge spillover. Since just one sample is not enough to get to the reliable conclusion, in near future we are going to do more research on different countries around the globe.

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