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## An Applied Analysis for whether the Relation between Innovation and Foreign Direct Investment is Vicious for Turkey after the early 1980s

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### Abstract

The relation between innovation and foreign direct investment (FDI) is investigated in this paper by using time series Vector Autoregression (VAR) method. The main research question of the paper is whether FDI contributes on development of innovation in Turkey or vice versa. In Turkey, after the structural transformations in Turkish economy, export led growth is taken as vein that feeds to the economic development and thus importance of foreign direct investments have been increasing in the post-1980 period. The obtained findings show that FDI has not been contributing to innovation; however, development of innovation attracts the FDI inflows in that period.

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### 1. Introduction

In the early 1980s, Turkey has experienced new structural policies after the 1978 debt crisis. After the 24<sup>th</sup> January Decisions, Turkey has been taking different structural policies for economic development, and export orientation apparently was described as ‘a new vein’ that feeds to economic development.

After the 1978 Crisis, which happened in the state owned markets, and the import substitution policies had been using until to pre-crisis era, there was a closed economy in Turkey. However, due to failures of

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the import substitution policies, following to the 1978 crisis and the military coup in 1980, 24<sup>th</sup> January Decisions were taken in Turkey. In those policies, export oriented policies were taken as basis for economic development for Turkish economy. Export oriented policies and industry led export oriented policies were taken as centre of the economic development.

Following the 24<sup>th</sup> January Decision, in 1989, the capital movements were liberalized in Turkey under the no.32th Enactment in Turkey. The liberalization policies show that there were structural transformations in Turkish economy, and the economy has become outward oriented.

While the 24<sup>th</sup> January Decisions are structural restructuring for Turkish Economy through export orientation vein, there has been problematic part for Turkish economy by which widening the current account deficit. As a matter of fact whether the foreign financing sources could be stimulate the competition and thus innovation or not is a real question for Turkish economy.

In this paper, the relation between innovation and FDI inflows is investigated in Turkey between 1980 and 2011. Whether innovation is dependent on FDI or not is a main research question of the paper, especially in the post-1980 Turkish economy.

The rest of paper is following; in the first chapter, the brief literature review is given, in the second part of paper, empirical application is employed, and in the third part of the paper, general discussion is given.

## **2. Innovation and Openness: Is there a link between them?**

There is no consensus about whether FDI inflows increase technological progress or not in the relevant literature. FDI has been positively contributed on innovation and R&D investments are found in the relevant literature. However, the most recent researches show that there is not a ‘law’ for the relation between the variables and the relation may vary on the level of openness and development of host country.

While Findlay (1978) pointed out that FDI increases technical progress, Tang and Zhang (2015) pointed out that whether FDI ameliorates to the host country’s export performance varies. FDI and export boom relation is based on FDI’s absorptive capacity of the host country according to Tang and Zhang (2015). Pegkas (2015:124) emphasized that

“This effect of FDI on economic growth is dependent on the level of technological advance of a host economy, the economic stability, the state investment policy, the degree of openness and the amount of human capital.”

Danilovic and Croucher (2015) have examined investment in personnel and FDI inflows relation in Belarusian companies between 2009 and 2014, and they found that the 2008-09 crisis hit to the investment expenditures in personnel, and the companies reduce their expenditures of training, and personnel development. This situation does not attract FDI inflows to Belarus, and it reduces to the innovation in the firm level due to human capital based expenditures has decreased.

Guimon (2011) researched that globalization of corporate R&D policies and its effect on FDI and innovation policies, especially on government policies in the EU. For Guimon (2011), the relation between FDI oriented policies and innovation policies is essential for economic development.

Minin et al. (2012) investigated that China’s internationalization of R&D policies by using FDI in the EU. The FDI inflows which are China based to the EU has some benefits for China, i.e human resources excellence, technology exploration and technology exploitation simultaneously, assessing to domestic competitive advantage, thus China based companies have established overseas R&D units in the EU. Huang (2013) found that when FDI outflows increase in the host country, the companies which are host country based increase their R&D expenditures. Huang (2013)’s findings show the reversal relation between FDI inflows and development of innovation.

Wang and Wong (2012) reached that FDI inflows are beneficial for technological efficiency of domestic country according to their findings from panel data analysis for 77 countries between 1986 and 2007. Wang and Kaufouros (2012) found that innovation can be benefited from FDI inflows, however the effect of FDI inflows is based on national policies for innovation.

### 3. Data and Methodology

In this paper, FDI and total factor productivity (TFP) are used for empirical analysis. TFP data were taken from Penn World Table 8.1, which are based on Feenstra et al. (2013) and updated in 2015, and FDI data were taken from World Bank Development Indicators (2015). The time span is between 1980 and 2015. TFP variable were taken as proxy of innovation.

#### 3.1. Vector Autoregression Model (VAR)

For determining to the direction of the relation between FDI and innovation, Vector Autoregressive Model was estimated. VAR model is described as bunch of ordinary least squares, and it has dynamic framework, hence a simple VAR model which has two variables and lag length is 1 written as follows;

$$y_t = b_{10} - b_{12}z_t + c_{11}y_{t-1} + c_{12}z_{t-1} + \varepsilon_{yt} \quad (1)$$

$$z_t = b_{20} - b_{21}y_t + c_{21}y_{t-1} + c_{22}z_{t-1} + \varepsilon_{zt} \quad (2)$$

with  $\varepsilon_{it} \sim i.i.d(0, \sigma_a^2)$  and  $cov(\varepsilon_y, \varepsilon_z) = 0$  (Enders, 2005:294-295). In the VAR analysis, y and z are counted as FDI, and TFP, respectively in this paper.

#### 3.2. Findings

Table 1. Descriptive Statistics

	<b>FDI</b>	<b>TFP</b>
<b>Mean</b>	0.83	0.93
<b>Maximum</b>	3.80	1.02
<b>Minimum</b>	0.02	0.83
<b>Observations</b>	32	32

In Table 1, descriptive statistics are given. As seen in Table 1, the mean of FDI is 0.83 as of GDP; of total factor productivity is 0.93. Growth rate of both series were calculated,

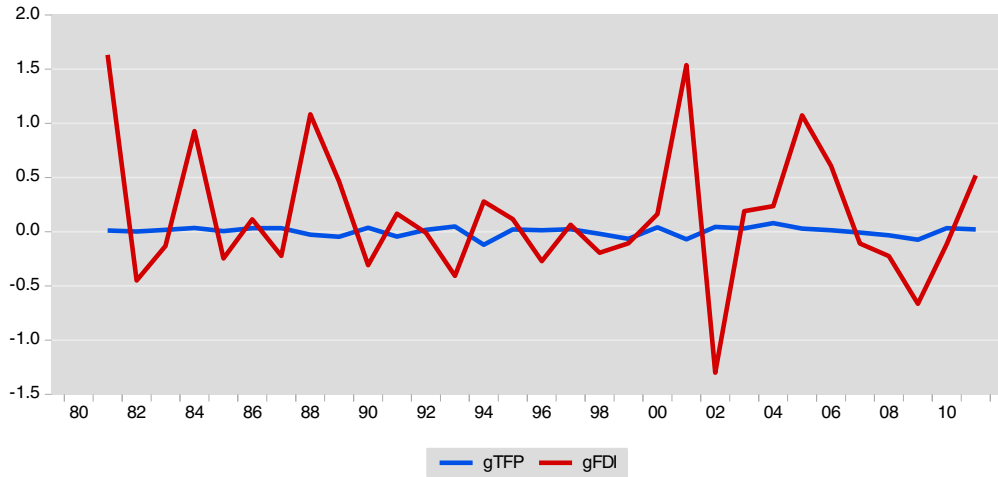


Figure 1. TFP and FDI growth between 1980 and 2011

Note: g prefix denotes the growth rates.

The growth rates of FDI and TFP are seen in Figure 1 between 1980 and 2011. TFP growth rate seems to be stagnant, while the growth rate of FDI inflows has been increasing or decreasing in the time span.

Table 2. Correlation between the variables

	<b>TFP</b>
<b>TFP</b>	-
<b>FDI/GDP</b>	0.29

As in Table 2, the correlation between FDI and TFP is %29. Apparently, innovation has benefited from FDI inflows. The results are counted as a paradoxical structure of innovations in Turkey. In the VAR analysis, the crisis dummy which consisted of 1999,2001,2007-2011 crises were taken as exogenous in the VAR model.

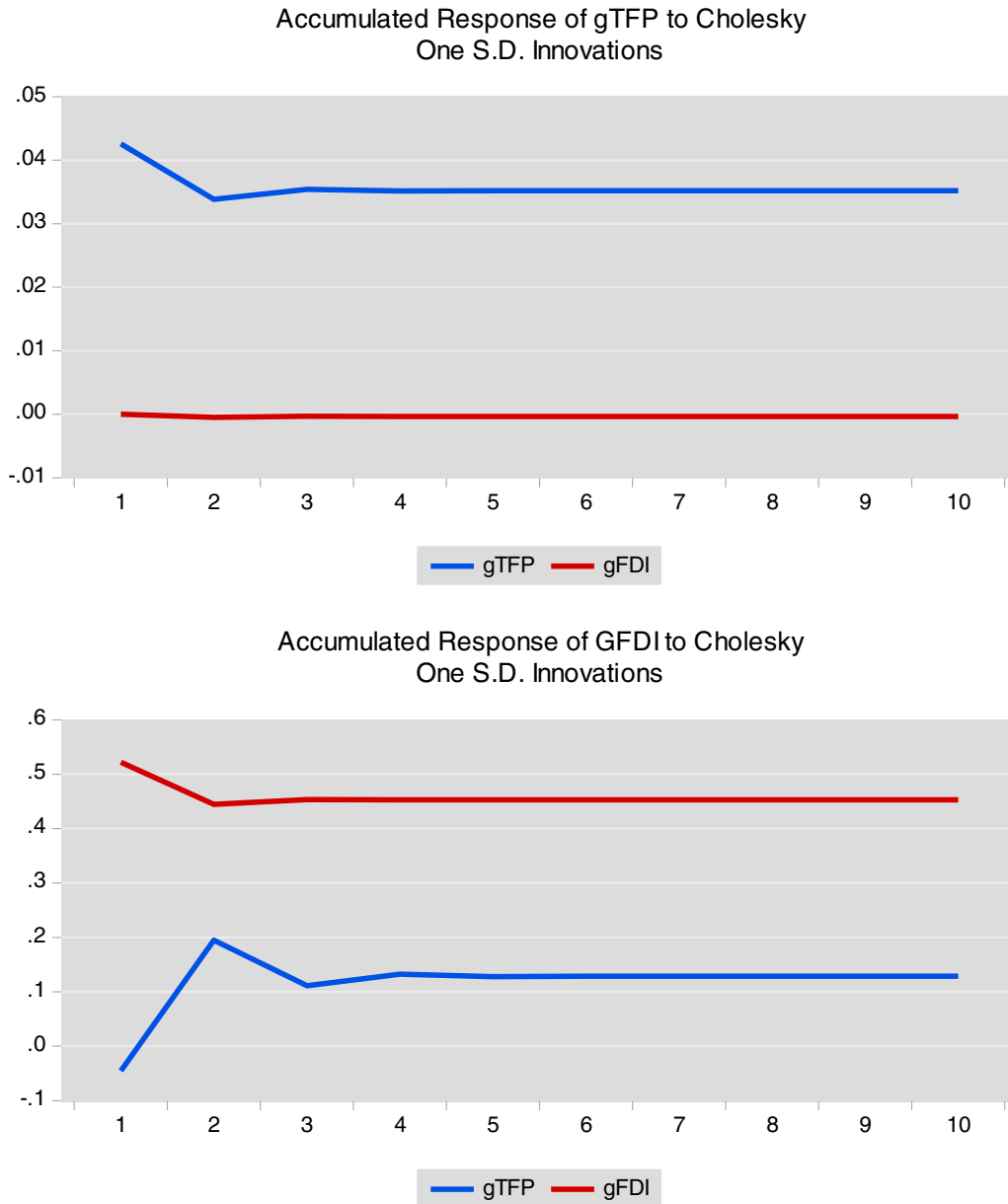


Figure 2. The Cumulative Accumulated Responses of the VAR model

The accumulated impulse response estimations show that there is very poor contribution of FDI inflows on TFP. However, it seems that growth of TFP attracts to FDI inflows, which shows the reversal relation

between FDI and innovation in Turkey since 1980. The impulse response estimations are seen in Figure 2.

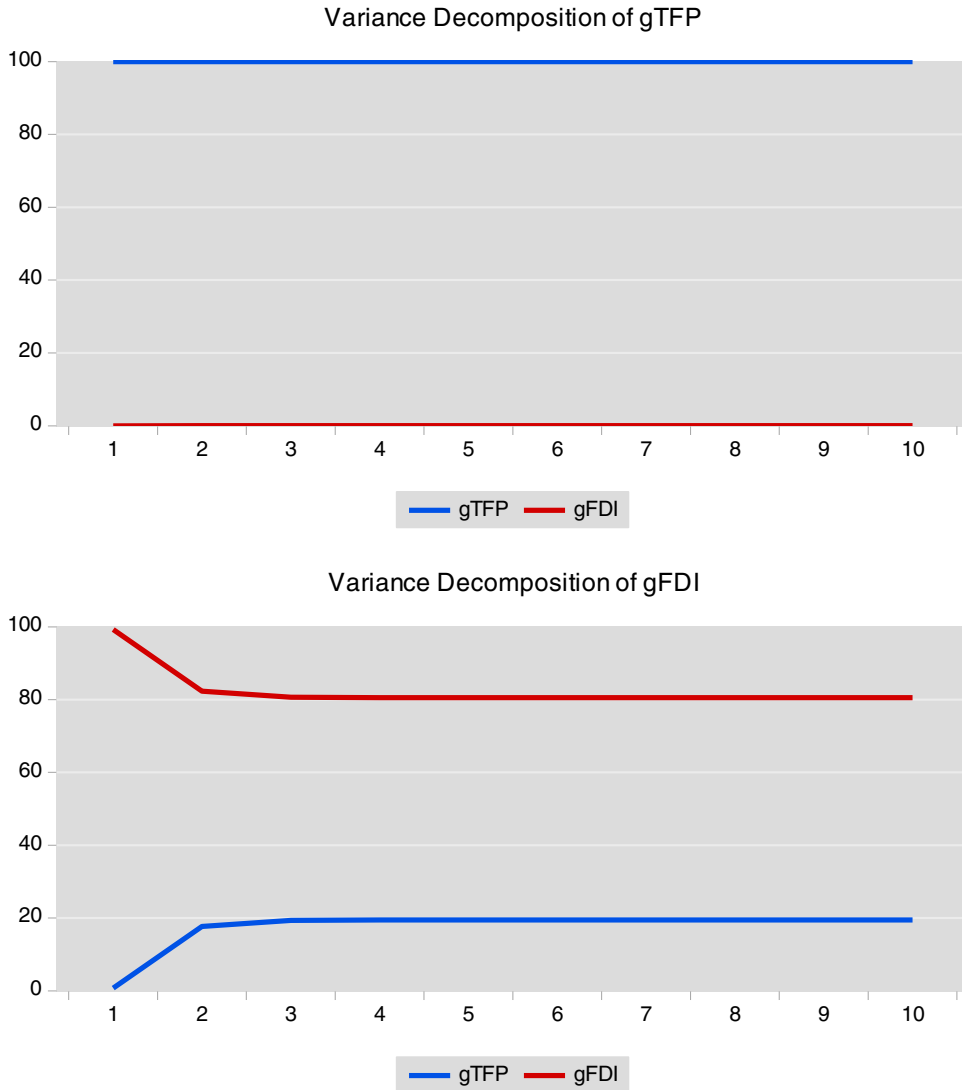


Figure 3. the Forecast Error Variance Decomposition Analysis Results

As seen in Figure 3, the forecast variance error decomposition of the series shows that growth rate of FDI inflows mainly depends on the growth rate of TFP. The result validates the accumulated impulse response analysis which is seen in Figure 2.

Table 4. Diagnostic Tests

LM Test	JB Nor. Test	White Heteros.	VAR Stability
1.58, p value=0.81	8.38, p value=0.07	$\chi^2=11.08$ p value= 0.74	Polynomial inverse roots in the unit circle, no roots outside the unit circle.

According to the diagnostic tests which are shown in Table 4, there is no autocorrelation, heteroskedasticity, instability, and normality problem in the VAR model at %5 statistical significance level.

#### 4. General Findings and Conclusion

Whether FDI contributes on innovation in the host country is still paradox in the literature. The relation between FDI and innovation is crucial for the developing countries for ameliorating their technological progress, and thus economic development. For Turkey, FDI inflows contribute very poorly innovation progress, however development of innovation attracts FDI inflows, according to the obtained findings from the VAR analysis, between 1980 and 2011.

The paper contributes on the literature with two ways. First, empirically the sensitivity and direction of FDI and innovation are tested in the emerging market after the structural transformation of Turkish economy. Second, this paper shows that the internationalization of innovation in Turkish economy does not reflect FDI-led innovation growth in the relevant literature. Turkey has not been experiencing a R&D led FDI inflows growth since the early 1980s.

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