

**DYNAMIC LINKAGES AMONG FOREIGN DIRECT INVESTMENT, PUBLIC INVESTMENT AND PRIVATE INVESTMENT: EVIDENCE FROM TURKEY**

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**Abstract**

This study seeks to provide evidence on the dynamic interactions among foreign direct investment (FDI), private domestic investment and public domestic investment in Turkey for the period 1970-2009 using a multivariate VAR framework. Our findings indicate that there is no long-run relationship between FDI, public investment and private investment, indicating the poor contribution of FDI to the Turkish investment path. The lack of interaction between FDI and domestic investment, which impedes the contribution of FDI to economic growth from capital accumulation channel, questions the benefits of FDI. These results suggest that special emphasis should be given to improving investment climate.

**Key words:** foreign direct investment, private investment, public investment.

**JEL code:** F20, F23

**1. Introduction**

In the last twenty years, many developing countries have undertaken fiscal and financial reforms to encourage the inflow of foreign direct investment (FDI), expecting FDI flows to bring new technology, know-how and managerial skills. The amount of FDI flows to developing countries grew steadily in the 1990s and reached \$583 billion in 2009 in current US dollars (World Bank, 2009). The increasing importance of FDI flows as a source of external funding for recipient countries has encouraged research into the channels through which FDI might be expected to promote economic growth. Because the link between foreign and domestic investment constitutes the key point in evaluating the FDI-growth nexus, a number of studies have emerged to investigate whether FDI and domestic investment are complements or substitutes in the recipient countries. The findings point out that the effects of FDI on domestic capital accumulation may vary from country to country depending on the domestic policies, degree of financial development (Alfaro et al., 2004), educational level (Borenzstein et al., 1998), the size of the technological gap between multinational and domestic firms (De Mello, 1999), the types of FDI that a country receives and the sectoral distribution of FDI. The positive impact of FDI on domestic investment is realized when FDI introduces new industries to the host country (Lipsey, 2002), provides new investment opportunities for local firms through the provision of machinery and technology (Sun, 1998), and creates new demand for local inputs (Cardoso and Dornbusch, 1989)<sup>1</sup>. On the other hand, foreign and domestic investments are likely to be substitutes if foreign firms compete with domestic firms for the use of domestic resources and eliminate investment opportunities for the domestic

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<sup>1</sup> The empirical evidence that FDI complements domestic investment is supported by Ndikumana and Verick (2008) for Sub-Saharan Africa, Luo (2007) for China, Tang et al. (2008) for China, Arndt et al. (2007) for Malaysia and, Misun and Tomsik (2002) for Hungary and Czech Republic.

investors (Fry, 1992; Jansen, 1995; Agosin and Mayer, 2000)<sup>2</sup>. In this case, the effect of FDI on economic growth can be dampened and the role of FDI on the economies of recipient countries can be questionable.

In analyzing the relationship between FDI and domestic investment, it is important to consider the linkages among FDI, public investment, and private investment so that necessary policy implications can be drawn to maximize the gains from FDI. These variables are related over time and in a dynamic relationship, where causality can run from both directions. While a strong private investment climate acting as a signal of high returns to capital, as well as an improved public infrastructure through public investment reducing cost of doing business are important in attracting foreign capital, it is also possible that FDI may complement or substitute different types of domestic investment. Despite its significance, the empirical evidence on this issue is scarce. Ndikumana and Verick (2008) consider the case of Sub-Saharan African countries and find a two-way relation between FDI and private investment, while they note that public investment is not a driver of FDI. Ang (2009) point out that both public investment and FDI are complementary with private investment in Malaysia.

Our goal in this paper is to examine the possible interactions among foreign direct investment, private domestic investment and public domestic investment by considering the case of Turkey. Turkey is a promising candidate for a study of the relation between FDI, private investment and public investment. Similar to many other developing countries, Turkey has gone through a substantial process of liberalization with macroeconomic instability and high inflation rates and has experienced a number of financial crisis, threatening the overall business climate. In this respect, to meet its financial needs, Turkey has been building up new rules and regulations in the hope of attracting FDI since the 1980s. As a result, Turkey has experienced a substantial increase in the amount of FDI flows in recent years. While the FDI flows to Turkey was \$684 million in 1990, it amounted to \$982 million in 2000 and \$7.6 billion in 2009, respectively. Yet, the question remains as to the possible effects of foreign investment on domestic investment. Some studies find a positive association between FDI and domestic investment, (Eroglu and Hudson, 1997; Insel and Sungur, 2003; Kara and Kar, 2005), whereas some conclude that FDI negatively affects domestic investment (Güven, 2001).

This paper differs from the previous studies in two ways. First, this study focuses on the dynamic interactions among the variables by using a multivariate VAR framework. To the best of our knowledge, this is the first study that employs time series techniques to examine the linkages between FDI, private investment and public investment in Turkey. Second, the earlier studies focus on the broad relationship between total domestic investment and FDI overlooking the dynamic interlinkages between public and private investment. Also, they mainly deal with the macroeconomic effects of FDI by using simple estimation methods, such as Ordinary Least Squares (OLS). Therefore, the issues of stationarity and the endogeneity of the variables are generally not addressed.

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<sup>2</sup> Agosin and Machado (2005) for Latin America and Misun and Tomsik (2002) for Poland find that FDI crowds out domestic investment.

To fill this gap in the literature, we empirically investigate the effects of FDI on domestic capital accumulation and the main branches of it, namely private and public investment in Turkey, offering insights into extensively disputed FDI investment relationship. In particular, we investigate the following hypotheses: i) whether public investment, private investment and FDI are cointegrated, ii) whether FDI complements or substitutes public investment and private investment, iii) whether public investment and private investment act as a determinants of FDI. In our empirical analysis, we apply Johansen cointegration methodology to test the existence of a long-run relationship among the variables and multivariate VAR model to capture the dynamic relationship between these variables. Our empirical results indicate that there is no long-run relationship between FDI, public investment and private investment, suggesting that FDI flows, private and public investments are independent, which indicates the poor contribution of FDI to the Turkish investment path. FDI does not complement neither private investment nor public investment. This may be related with the fact that FDI to Turkey has been mostly in terms of acquisitions, and has mainly in finance and telecommunications sector, which have limited positive spillover effects. Moreover, we do not find any evidence regarding the complementary effect of public investment on private investment, reflecting the weak public infrastructure in Turkey. In the light of our findings, a number of strategies are needed to improve the overall investment climate. In this context, sound macroeconomic environment, well-functioning financial sector and improvement in rules and regulations and efficient infrastructure are required to increase the amount of investment.

The rest of the paper is organized as follows: Section 2 sets the stage by briefly describing FDI and investment trends in Turkey since 1980. Section 3 describes the methodology and the data, and presents our empirical results. Finally, Section 4 concludes discussing some of the policy implications of our findings.

## **2. An Overview of the FDI Inflows and Investment in Turkey**

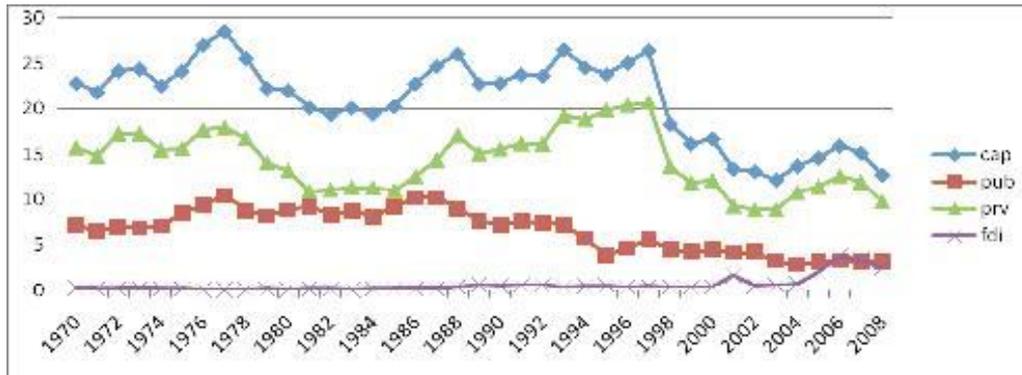
Turkey liberalized its capital account in 1989 and began to enjoy a considerable amount of capital inflows. Although most of this capital inflow is mostly in terms of portfolio flows, there has been a significant increase in the amount of FDI flows to Turkey, especially in recent years. Table 1 traces the path of FDI in Turkey between 1970 and 2009. FDI inflows to Turkey were very low prior to 1980 because of the inward oriented economic policies characterized by high tariff rates, quantitative restrictions, overvalued exchange rates, and rationing on foreign exchange. In the 1970-1980 period, total FDI flows to Turkey was \$567 million. In 1980, Turkey implemented a new stabilization program, which comprised the liberalization of interest rates and foreign investments. After the adoption of liberal policies in 1980, Turkey began to attract FDI flows; however, as can be seen in Table 1, the major increases in FDI occurred in the late 1980s. FDI inflows amounted to \$684 million in 1990. The European Union's decision in 2004 to begin membership negotiations with Turkey and new rules and regulations regarding to the FDI inflows in 2003 marked the turning point in FDI flows to Turkey. FDI inflows reached to \$10 billion in 2005. FDI inflows continued to increase further to \$20 and \$22 billion in 2006 and 2007 respectively mostly due to the acquisitions in telecommunications and financial sectors. However, FDI flows to Turkey began to decrease again after 2007 as a result of the slow down in the world economy.

Table 1: FDI Flows to Turkey (million \$)

	1970-1980	1990	1995	2000	2005	2006	2007	2008	2009
FDI inflows	567	684	885	982	10031	20185	22046	18269	7625

Source: Central Bank of Turkey, 2010.

Figure 1: Evolution of FDI, Private and Public Investment, 1970-2008

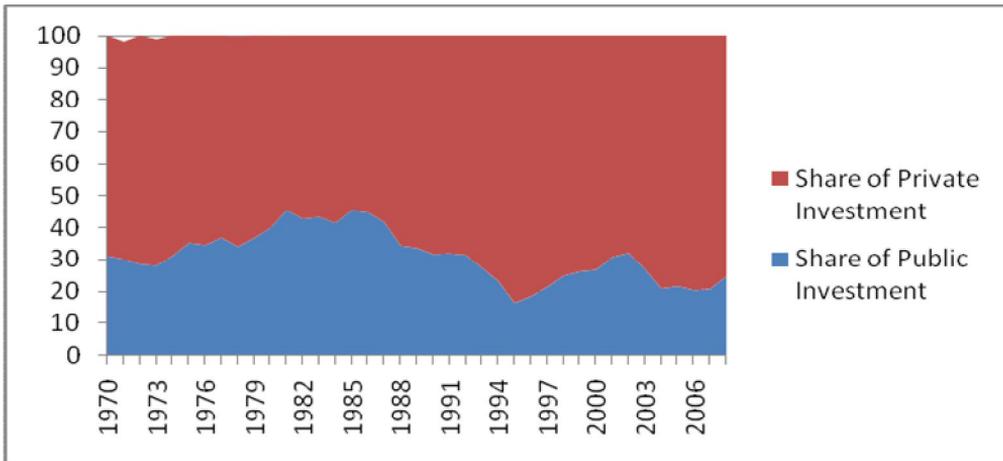


Source: Central Bank of Turkey, 2010.

Figure 1 presents the time series plots of private investment, public investment, FDI and total investment as a share of GDP in Turkey between 1970 and 2009. During the macroeconomic turmoil of the 1978-1980 period, total investment in Turkey fell as it was the case in many developing countries. With the stabilization program launched in 1980, steps were taken toward financial liberalization. Interest rates were liberalised to attract domestic savings into the formal banking system and new financial instruments and institutions (such as the Istanbul Stock Exchange and the Capital Market Board) were introduced to reduce the stringency of credit rationing in the corporate sector (Guncavdi et al. ,1998). Despite these attempts, private investment as a share of GDP fell sharply in 1981 due to macroeconomic and political uncertainties in the country. After 1988, the share of private investment increased and reached its peak in 1997. The upward trend in private investment could be attributed to liberalization of foreign trade and macroeconomic reforms undertaken in this period. In 1997, private investment decreased significantly because of Asian financial crisis, and its downward trend continued until 2002 when it began to increase once again with the improvements in the macroeconomic environment. Meanwhile, public investment has been falling continuously since 1997 because of the fiscal stress that accompanied debt problems and restructuring.

Figure 2 reflects the shares of public and private investment in total investment. Private investment accounted for more than 60 % of total investment between 1970 and 1980. It is evident from the graph that it is the private investment that dominates investment behavior in Turkey, the share being almost 80 % in recent years. The share of public investment has been falling continuously because the government has cut public sector investment to reduce budget deficits and rising interest payments.

Figure 2: Composition of Total Investment in Turkey, 1970-2008



Source: State Planning Organization of Turkey, 2010.

### 3. Data and Methodology

We use annual data between the period 1970-2009. Total investment (INV), private investment (PRV) and public investment (PUB) are measured by gross fixed capital formation, gross fixed private capital formation and gross fixed public capital formation respectively. The data on public and private investment is compiled from the State Planning Organization of Turkey, while the data on FDI is obtained from the Central Bank of Turkey. All data is deflated using Consumer Price Index and are expressed in logarithms. We also use three dummy variables to account for the financial crisis in 1980, 1994 and 2001.

Since we are interested in examining the dynamic interactions between private investment, public investment and FDI, we rely on a vector autoregressive model (VAR) and innovation accounting (variance decomposition and impulse response function) for our empirical analysis<sup>3</sup>. This approach has also been used by Kim and Seo (2003), and Tang et al. (2008) to examine the relationship between FDI and investment in Korea and China respectively. VAR model has certain advantages in that in a VAR model, dependent variables are expressed as functions of their own and each other's lagged values and all the variables are allowed to affect each other (Enders, 2004). We use a general unrestricted pth order VAR model as follows:

$$Y_t = \alpha + \sum_{l=1}^m \alpha_l Y_{t-l} + \varepsilon_t$$

<sup>3</sup> In examining the effect of foreign direct investment on economic performance, this method is frequently utilized in the literature (e.g. Ang, 2009, Lee, 2010)

Here,  $Y_t$  refers to investment measures (total investment, private investment, public investment and FDI),  $t$  ( $t = 1, \dots, T$ ) refers to the time period, and  $l$  refers to the lag number.  $\varepsilon_t$  is error term.

We first conduct Dickey Fuller (1979) tests to test the stationarity of all variables. Table 2 reports the results of Augmented Dickey-Fuller (ADF) unit root tests of domestic capital formation, private domestic investment, public domestic investment and FDI (Dickey and Fuller, 1979). It is seen in the table that the null hypothesis of a unit root is accepted for the level series but rejected for the first differenced data, indicating that all series are nonstationary in their levels but become stationary after taking the first difference.

**Table 2: Augmented Dickey Fuller Test Results**

Variables	Constant	Constant and Trend
1. ADF Test for unit root on the level series		
INV	-1.97	-2.08
PRV	-1.55	-2.60
PUB	-2.58	-2.19
FDI	-0.03	-3.87
2. ADF Test for unit root on the first differenced series		
INV	-6.52*	-6.68*
PRV	-6.10*	-6.11*
PUB	-5.82*	-6.09*
FDI	-5.42*	-5.55*

**Note:** \* indicates that variable is stationary at the 5% level. The critical value for the ADF test is -2.94 and -3.53 for constant, and the constant and trend, respectively.

Engle and Granger (1987) states that a linear combination of two or more non-stationary series may be stationary and in this case these nonstationary time series are said to be cointegrated. The stationary linear combination can be interpreted as a long-run relationship among the variables. Therefore, after confirming that INV, PRV, PUB and FDI are all I(1), we continue with testing long-run cointegration relationship between the variables using Johansen cointegration technique. Since the Johansen approach is sensitive to the lag length chosen, we conduct a series of tests to determine the optimal lag length and choose a model with lag length 1<sup>4</sup>. In testing cointegration, two tests are used: the trace test and maximum eigenvalue test to determine the cointegration rank. In Table 3, we present Johansen Cointegration test results considering two models. In the first model, we try to identify if there is a long-run relationship between total domestic investment and FDI, while in model 2 we examine if public investment, private investment, and FDI are cointegrated. In both models, we do not reject the null hypothesis

<sup>4</sup> In the VAR models, impulse response functions and variance decomposition is very sensitive to lag length chosen. The lag length is selected as one given by the Akaike's information criterion (AIC) and it leads no serial correlation and allows for normality of the residuals. VAR model diagnostics are available upon request.

that there is no cointegrating vector. Thus, we conclude that there is no long-run relationship between public investment, private investment and FDI, suggesting that public investment and FDI are neither complements nor substitutes for private domestic investment in Turkey. This may be related with the fact that FDI to Turkey has been mostly in terms of acquisitions, and has mainly in finance and telecommunications sector, which have limited positive spillover effects.

**Table 3: Johansen Cointegration Test Results**

	Hypothesized Number of Cointegrated Equations	Eigenvalue	Trace Test	5% Critical Value
Model 1 ( <i>inv, fdi</i> )	None*	0.21	8.77	15.4
	At most 1	0.0009	0.033	3.8
Model 2 ( <i>fdi, prv, pub</i> )	None*	0.27	17.71	29.7
	At most 1	0.16	7.20	15.4
	At most 2	0.08	0.31	3.8

Note: \* indicates the existence of no cointegrating relationship at the 5 percent significance level.

We now utilize innovation accounting, i.e. variance decomposition and impulse response function to examine the relationship between the variables. The first differences of the variables will be employed since the variables are neither stationary nor cointegrated. The VAR model we estimate is ordered using Cholesky decomposition as FDI, PUB, and PRV. Since the results of VAR can be very sensitive to the ordering of the variables, we tested other possible orderings and find that our results do not differ when the the ordering of the variables is changed.

The variance decomposition allows us to make inference over the proportion of movements in a time series due to its own shocks versus shocks to other variables in the system (Enders 1995:311). The variance decomposition results reported within a 10-year horizon are presented in Table 4.

**Table 4: Variance Decomposition percentage of ten-year error variance**

	Typical Shock in		
	FDI	PRV	PUB
Percent of forecast error variance in:			
FDI	91	2.8	6.05
PRV	0.45	92	7.34
PUB	2.02	48	49

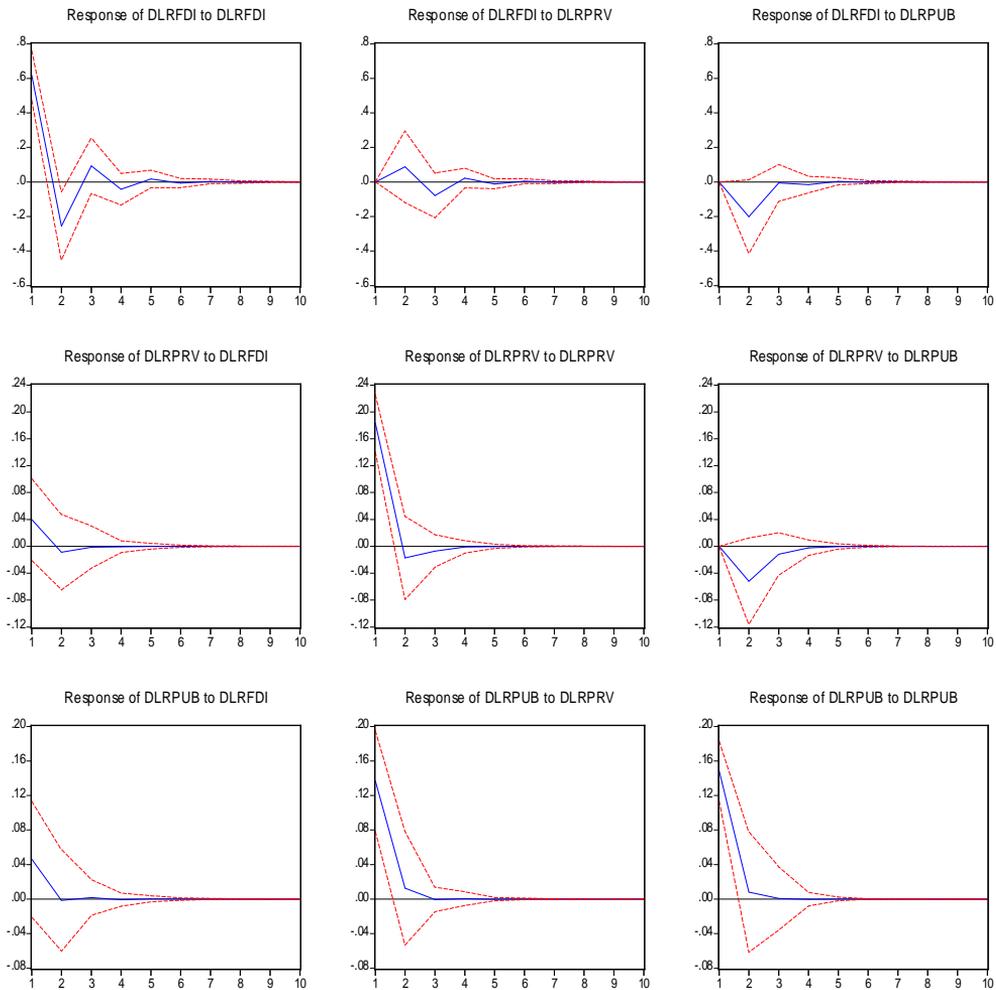
The results show that the 91 percent of the innovations in FDI are explained by its own past values, while 2.8 percent of the innovations is due to private domestic investment and 6.05 percent is due to public investment. The forecast error variance of Turkish private domestic investment is largely explained by its own past values (92 percent), while only 0.45 percent of the variaton is caused by FDI and 7 percent of the variation is caused by public investment. 49 percent of the innovations in public investment is caused by its own past values followed by private investment (48 percent) and FDI (2.02 per

cent). These results indicate that FDI does not have a strong influence on Turkey’s private and public domestic investment. Moreover, the influence of public investment on private domestic investment seems to be greater than that of FDI.

We now utilize impulse response function to examine the dynamic causal relationship between FDI, private and public domestic investment. The impulse response function traces the effect of a one time shock to one of the innovations on current and future values of endogenous variables. Figure 3 presents impulse responses to a shock in FDI.

**Figure 3: Impulse Response Functions**

Response to Cholesky One S.D. Innovations  $\pm 2$  S.E.



The accumulated impulse responses are plotted in Figure 3 and the dynamic responses are obtained from a time interval with ten periods. The main findings could be summarized as follows:

1. There is no significant long-run linkages among private domestic investment, public domestic investment and FDI.
2. Impulse response analysis reveals that the response of FDI to the shock in private investment is positive in spite of being insignificant.

Even though private investment known as a important determinant of FDI flows in many developing countries reflecting the overall investment climate (Ndikumana and Verick, 2008), impulse response analysis reveal that private investment is not a significant determinant of FDI in Turkey. Actually, the determinants of FDI in Turkey are mainly known as market size, openness and infrastructure, where the infrastructure is proxied by share of transportation, energy and communication expenditures in GDP (Erdal and Tatoglu, 2002).

The response of public and private investment to a shock in FDI is positive in the short run without being significant

While some of the studies support that FDI complements domestic investment for Canada (van Loo, 1977), for Thailand (Jansen, 1995), for Chine (Sun, 1998) and for Hungary and Czech Republic (Misun and Tomsik, 2002), the negative results arise for Poland (Misun and Tomsik, 2002), and for Latin America (Agosin and Mayer, 2005). Yet, our empirical framework does not yield any significant effects of FDI on both types of investment.

3. The response of public investment to a shock in private investment is positive and significant for the first two periods. On the other hand, the response of private investment to a shock in public investment is negative, yet it is not significant.

Even though the literature demonstrates that efficient infrastructure in terms of public investment in basic infrastructure, such as roads, ports and telecommunications may contribute to private sector investments, our econometric evidence finds no positive and significant contribution of public investment on private investment. This could be explained by the fact that the public investment, which has experienced a declining trend particularly after the mid 1980s, is losing ground in Turkey and this creates an inadequate and inefficient public investment, which is independent from private investment and FDI. Since public investment has been declining over the past two decades, it is inevitable to obtain the negative and insignificant results on public investment. The poor performance of public investment is also observed by Karagöl (2004), underlying the negative impact of public investment on private investment through the existence of heavily subsidized inefficient state-owned-enterprises.

### 3. Conclusion

An important channel of the effects of FDI on development in the host economies is through the interactions between FDI and domestic public and private investment. This study seeks to provide evidence on these linkages to maximize the benefits of FDI. The findings of the paper have important policy implications both to encourage FDI and to get the maximum benefit from the interaction of domestic and foreign investment. To this aim, we investigate the relationship between FDI, private investment and public investment in Turkey for the period between 1970-2009 using a multivariate VAR model. Results imply that there is no long-run relationship between FDI, public and private investment, suggesting that there is no interaction among public, private and foreign investments in the long run.

As there is no long run relationship between different types of investment indicating low and insufficient amount of investment, more and deeper actions are required to improve the investment climate in Turkey. Inadequate public infrastructure in terms of public investment may present as an obstacle for doing business. In addition, high inflation, fiscal deficiencies with macroeconomic and political instability in Turkey disturb the business climate and Turkey can not achieve to attract and utilize sufficient amount of investment and efficient amount of interaction among different types of investment. Yet, to attract FDI and to maximize the gains from FDI one needs to give special emphasis to private investment in the short run in addition to the measures on improvement in the business climate in the long run. In this context, a number of measures should be taken which could be through two cases; creation of stable macroeconomic environment and improvement in microeconomic incentives. Sound macroeconomic fundamentals and healthy and competitive domestic financial system which can promote savings and channell investable resources into the most productive sectors are required to improve business climate which can boost up both domestic and foreign investment. Microeconomic incentives, rules and regulations and well-developed institutions also play a significant role in attracting foreign capital and improving domestic investment. The rules and regulations governing both domestic and foreign investors` operations should be stable and predictable and there should be no uncertainty in implementation and enforcement of those rules and regulations.

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