LOCATIONAL DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN TURKEY: A TIME SERIES ANALYSIS

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ABSTRACT

Foreign direct investment (FDI) is probably one of the most significant factors leading to the globalisation of the international economy. FDI flowing to developing countries increased remarkably in the 1990s and now accounts for about 40 per cent of global FDI. Similar trends have also been observed in Turkey. This paper deals with the location-related determinants of FDI. This is undertaken by means of a time series analysis of major locational factors impacting upon the level of FDI inflows for the period of 1980-1998. The results indicated the existence of a linear relationship between the FDI and the size of domestic market, openness of the economy to foreign trade, infrastructure of the host country, attractiveness of the domestic market, external and internal economic stability.

1. Introduction

Foreign direct investment (FDI) is probably one of the most significant factors leading to the globalisation of the international economy. FDI flowing to developing countries increased remarkably in the 1990s and now accounts for about 40 per cent of global FDI. Similar trends have also been observed in Turkey. Foreign direct investment in Turkey has expanded rapidly following the liberalization programme initiated in the early 1980s. The import substitution (IS) strategy of development pursued until the early 1980s was one of the primary cause of the low levels of FDI in Turkey (Balasubramanyam, 1994). The major policy shift from the IS strategy towards a more outward oriented economy led by export development has attracted the interest of foreign investors in Turkey. Figure 1 shows this trend in the level of annual inflows of both actual and authorised FDI for the period 1980-1999. As of August 1999, the number of foreign equity venture formations reached a total of 4,817 with the amount of cumulative foreign capital inflows totalling $12,085 million. The authorisations for FDI during this period accumulated to $25,050 million (GDFI, 1999).

Figure 1: Actual and Authorised Stock of FDI to Turkey (as of August 1999)

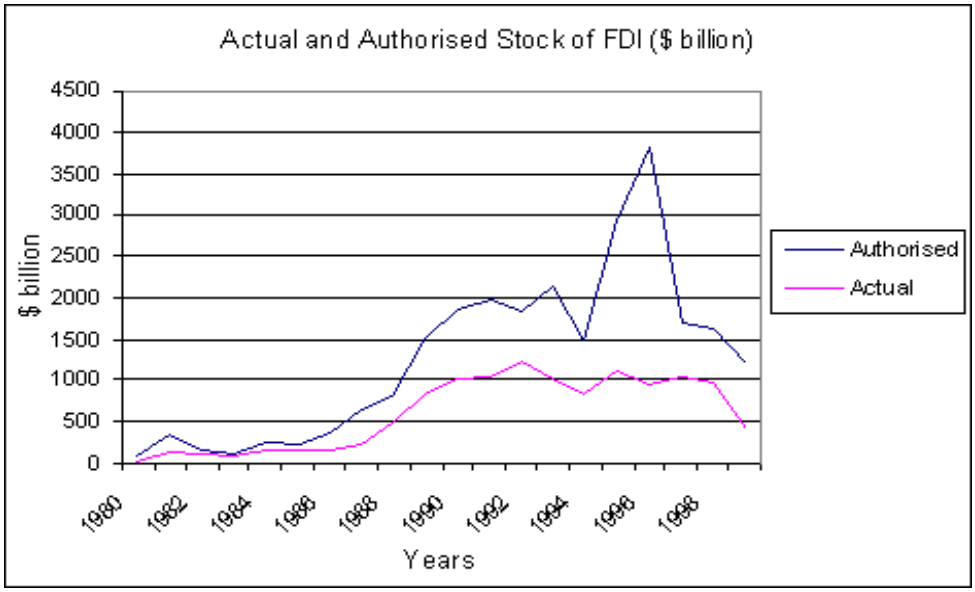

Table 1 shows the distribution of cumulative authorised FDI by country of origin. As is reflected in Table 1, European countries take the lead by accounting for over two-third of the total value of FDI. Following the European countries are the USA and Far Eastern countries with having shares of 12.0% and 6.4%, respectively. Turkey seems a quite attractive location to many foreign multinational enterprises (MNEs) due to favourable factors such as high economic growth, fast growing population and its strategic location between the European, Central Asian and Middle Eastern markets.

Table 1:

Country	**Total ($ billion)**	**%**
European Countries	**17.126,93**	**68,37**
France	5.268,00	21,03
Germany	2.973,02	11,86
Netherlands	2.902,03	11,58
Switzerland	1.953,49	7,79
U.K.	1.790,10	7,14
Italy	1.542,29	6,15
Other European Countries	698,00	2,78
U.S.A.	**3.004,37**	**11,99**
Far Eastern Countries	**1.614,94**	**6,44**
Japan	1.280,44	5,11
South Korea	206,00	0,82
Singapore	128,50	0,51
Middle East Countries	**669,77**	**2,67**
Saudi Arabia	289,27	1,15
Bahrain	165,00	0,65
Iran	108,00	0,43
Other Middle Eastern	107,50	0,43
Other Countries	**2.632,00**	**10,51**
TOTAL	**25.050,04**	**100,00**

To date there have been relatively few empirical studies which have examined location decisions of MNEs choosing Turkey as an investment location. Previous studies have relied more on collection of primary data using managerial perceptions for measuring the explanatory factors (Erdilek, 1982; Tatoglu and Glaister, 1998), with no studies hitherto been recorded drawing on econometric approaches using secondary data. Given the rapid growth of FDI and its increasing importance, it is critical for both the public and private sectors to have as complete an understanding of the macroeconomic determinants of this phenomenon as possible. Building on the prior literature the focus of this paper is on the location-related determinants of FDI. This is undertaken by means of a time series analysis of major locational factors impacting upon the level of FDI inflows for the period of 1980-1998.

2. Locational determinants of foreign direct investment

Foreign direct investment is conventionally defined as a form of inter-firm co-operation that involves a significant equity stake in, or effective management control of foreign enterprises (Mello, 1997). FDI has innumerable effects on the economy of a host country. It influences the production, employment, income, prices, exports, imports, economic growth, balance of payments, and general welfare of the recipient country. Literature on the determinants of FDI are based on three approaches including micro-oriented econometric studies, survey data analyses, and aggregate economic analyses with each approach having its limitations and advantages (Jun and Singh, 1996).

While the literature postulates a long list of demand and supply determinants of FDI, this study focuses on host country-related location motives. The elements of host country location motives can be broadly classified into two types: First, there are Ricardian-type endowments, which mainly comprise natural resources, most kinds of labour, and proximity to markets. Second, there exists a range of environmental variables that act as a function of political, economic, legal, and infra-structural factors of a host country. Both types of factors play a crucial role in a firm's decision to enter a host country (Kobrin, 1976; Maclayton, Smith, and Hair, 1980). The sub-themes dealing with host country location factors can be summarised as market size and economic growth (Aharoni, 1966; Kobrin, 1979; Davidson, 1980; Buckley and Mathew, 1980; Root, 1987; Young, Hamill, Wheeler, and Davies, 1989; Sabi, 1988), raw materials and labour supply (Moxon, 1975; Buckley and Casson, 1985), political and legal environment (Kobrin, 1979), host government policies (Davidson and McFetridge, 1985; Goodnow, 1985), level of industry competition in the host country market (Goodnow, 1985), geographical proximity and transportation costs (Goodnow and Hansz, 1972; Davidson and McFetridge, 1985), and host country infrastructure (Dunning and Kundu, 1995; Ulgado, 1996).

3. The model and the variables

While previous literature on the subject has suggested several possible explanatory variables (see for example Dunning (1993)), it is not possible to include all of them. The main criteria for reducing the number of variables are as follows: (i) relation and importance of the variable for Turkey, (ii) availability of data; (iii) concern about degrees of freedom; (iv) obvious similarity between variables. The economic model is specified as:

$$FDI = f(Y, X/M, I, DY, DE, R) \quad (1)$$

which states that foreign direct investment (FDI) is influenced by the size of domestic market (Y), openness of the economy to foreign trade (X/M), infrastructure of the host country (I), attractiveness of the domestic market (DY), external economic stability (DE) and internal economic stability (R).

The economic theory suggests a positive relationship between FDI and Y, X/M, I and DY, while a negative relationship is expected between FDI and DE and R.

The larger the market size, the more demand for the products or services to be provided by the FDI. Moreover, large markets are assumed to be more cost-effective bringing more profits for investments. The attractiveness of the domestic market is also positively related to FDI. An economy with free of restrictions on trade would attract more foreign investors to the country. In an open economy, it is easier to import raw materials or some capital goods which are necessary for the investment and also to export the finished goods. Thus the openness of the economy is expected to influence the FDI positively. Similarly, a foreign investor would prefer a country with well-infrastructured, which will facilitate communication, transportation and distribution. On the other hand, external and internal economic instability would affect the FDI negatively as businesses require, first of all, a safe and reliable environment to invest.

4. Data analysis and the estimation technique

Having specified the main determinants of FDI stocks, we come to the measurement of these variables and estimation of the equation. One of the main difficulties faced in empirical studies is to find the empirical counterparts of the variables in required frequency and quality. Applied economists approach to this issue by using proxy variables when necessary. In this study, the above variables are measured as follows:

The actual inflow of foreign direct investment to Turkey is used for FDI. The market size (Y) is measured by gross domestic product (GDP). Openness of the economy to foreign trade (X/M) is measured by the ratio of exports to imports. Infrastructure of the host country (I) is approximated by share of energy, transportation and communication expenditures in GDP. Growth rate of real GDP proxies the attractiveness of the domestic market (DY). Appreciation or depreciation of the local currency is used as an indicator of external economic stability (DE). For that purpose, we use percentage change in a foreign exchange basket, based on a trade-weighted average of five major currencies ($, £, DM, Fr, Lt), of which the main trading partners of Turkey. Finally, real interest rate on commercial sight deposits is used to approximate the internal economic stability (R).

All variables except DY and R are expressed in logarithms. They are deflated by the consumer price index. Data are compiled from the sources of Central Bank of Turkey and State Institute of Statistics on annual basis, from 1980 to 1998.

Stationarity tests

Existence of a common trend between any two data series does not always imply that there is a meaningful economic relationship between them. If the series are not *stationary* (i.e. their means, variance and auto-covariances are *not* independent of time), the regressions involving these series can falsely imply the existence of a relationship. This is called as *spurious regression* by Granger and Newbold (1974). Ignoring this fact and estimating a regression model containing non-stationary variables might lead to insensible results. Moreover such a regression ignores important information about the underlying statistical and

economic processes generating the data. Therefore, it is important to test the presence of unit roots and if they are present, to use appropriate modelling. Simply differencing the data might eliminate the non-stationary trend in the data, but at the cost of removing any long-run information. In modelling time series, one needs to ensure that the long-run relationship reflects the co-movements of variables due to underlying equilibrium tendencies of economic forces, rather than common, but unrelated, time trends in the data (Harris, 1995).

The Dickey-Fuller (DF) test or Augmented Dickey-Fuller (ADF) test is widely used in testing whether a data series has a unit root (i.e. stationary). The main equation which is estimated for each variables in order to test if they are stationary is:

$$Dy_t = a_0 + a_1 t + g y_{t-1} + e_t \quad (2)$$

and the test parameter is if $g = 0$ which means y_t contains a unit root. This equation can be augmented with a sufficient number of lags of the dependent variable in order to remove auto-correlation among the residuals. The t-statistics should be compared with the critical values given in the tables in Dickey and Fuller (1979). The following table, Table 2, presents the unit root tests results:

Table 2: Unit root tests

	Levels[1]	First differences[2]
L(FDI)	-2.607	-6.209
L(Y)	-2.578	-2.727
DY	-4.779	-
L(DE)	-7.778	-
L(I)	-1.814	-5.587
L(X/M)	-4.189	-
R	-4.799	-

Notes: [1] Critical values: -3.735 (5%) and -4.671 (1%)
[2] Critical values: -1.963 (5%) and -2.716 (1%)

As indicated, the variables DY, DE, X/M and R are stationary in levels, but FDI, Y and I becomes stationary after having differenced once, at 5% significance level.

Estimation method

We mentioned the importance of distinguishing between stationary and non-stationary variables in long run economic analysis earlier. Failure to do so can lead to a problem of spurious regression and apparently statistically significant long run relationships between the variables in a regression model resulting from random correlations.

However, this does not necessitate us to ignore the non-stationary series such as FDI, Y and I, completely. Engle and Granger (1987) states that if two or more series are linked to form an equilibrium relationship, even though the series themselves may contain stochastic trends (i.e. being non-stationary), they will move closely together over time and the difference between them will be stationary. This is called *cointegration* in econometric literature. The most commonly used methods of cointegration tests are Engle and Granger method (single-equation) and the Johansen method (multi-equation). The latter technique is used in this study.

The Johansen method (Johansen, 1988) relies on maximum likelihood estimation of co-integrating vectors in a system of equations, assuming initially that all the variables are endogenous. This technique can be implemented in several steps as testing the order of integration, estimating and evaluating vector auto-regression (VAR) models, determining the rank of co-integration matrix (i.e. testing for co-integration), testing restrictions on a matrix (i.e. testing for weak exogeneity) and finally testing restrictions on b matrix (i.e. coefficients significance tests).

As three of the variables (Y, I, X/M) become stationary when differenced once, it is said that the order of integration is one. The second step is based on estimation of a vector auto-regression (VAR) model of the following type:

$$X_t = m + A_1X_{t-1} + ... + A_kX_{t-k} + jZ_t + u_t t = 1, ... T \quad (3)$$

where k is the number of lags, and X_t is a vector comprising the non-stationary variables; FDI, Y, I and X/M, and Z is a vector consisting of stationary variables, DY, DE and R, and m is a constant vector.

5. Empirical results and discussion

The model is first estimated in an unrestricted form by assuming all variables can be endogeneous. However, due to the small sample size, some diagnostic statistics which are used to evaluate the statistical validity of the model, cannot be computed. Thus we assume by making use of economic theory that interest rates, change in exchange rates and growth rate of the economy are exogeneous to the system and one does not need to estimate individual equations for them. Table 3 presents both conditional and unconditional estimation results.

The model seems to improve significantly when conditioned on DY, R and DE although there is not much change in the coefficients. The model (the second one, conditional model, from now on) passes a series of diagnostic tests such as serial auto-correlation, conditional heteroscedasticity, functional form and normality, both in individual equations and in the vector as a whole. The likelihood ratio (LR) significance tests are also reported in the Table 3, suggesting that all variables except interest rates are significantly different from zero.

Table 3: Estimation results

Unconditional Model (Dependent variable is LFDI)							
	Constant	L(Y)	DY	L(DE)	L(I)	L(X/M)	R
Coefficient	-60.440	5.088	0.949	-2.246	4.252	2.730	0.030
LR tests[1]	130.130	136.520	88.040	108.970	129.360	49.740	13.590
Diagnostic vector tests[2]							
F_{AC} = NA; $c^2_{NORM}(14) = 21.75$*; c^2_{HET} = NA; $R^2(LM) = 0.59$							
Conditional Model[3] (Dependent variable is LFDI)							
	Constant	L(Y)	DY	L(DE)	L(I)	L(X/M)	R
Coefficient	-22.970	2.182	1.343	-0.453	1.461	1.724	0.024
LR tests[1]	104.740	127.230	123.590	49.180	79.660	21.220	9.700

Diagnostic tests							
	L(FDI)	L(Y)	L(I)	L(X/M)			
F_{AC} (1,9)	0.002	0.012	0.713	0.090			
F_{ARCH} (1,8)	0.198	0.140	0.246	0.506			
c^2_{NORM} (2)	0.281	0.882	2.895	1.448			
Vector tests F_{AC} (16,9) = 1.63; c^2_{NORM}(8) =1.46; c^2_{HET} = NA; R^2(LM) = 0.88; F(32,27) =.521.78**							

Notes: [1] Critical values for LR significance tests: $c^2(7)$ = 18.475 (1%) and $c^2(7)$ = 14.067(5%).
[2] F_{AC} stands for Breusch-Godfrey serial correlation test, F_{ARCH} for autoregressive conditional heteroscedasticity test, c^2_{HET} for White's functional form/heteroscedasticity test and c^2_{NORM} for White's normality test. The diagnostic tests for the individual equations are given for the conditioned model only.
[3] Conditioned model on DY, R, and L(DE).

The next step of the Johansen method involves the testing for co-integration. Testing for co-integration requires testing for the reduced rank or the number of co-integrating vectors. The rank of the matrix can be determined by testing whether or not its eigenvalues (l) are statistically different from zero. There are two test statistics to be used for that purpose: Trace statistic and maximal eigenvalue statistic. The eigenvalues obtained from the VAR models, test statistics and critical values are presented in Table 4. It also shows Reimers' adjusted test statistics for small sample bias. Reimers (1992) suggests taking account of the number of parameters to be estimated in the model and making an adjustment for the degrees of freedom.

Table 4: Test for number of cointegrating vectors (r)

H_0 : rank = p	***l-max***	**Reimers**	**CV_{lmax}**	***Trace***	**Reimers**	**CV_{trace}**
p = 0	139.80	108.70	28.10	225.00	175.00	53.10
p Ł 1	58.82	45.75	22.00	85.24	66.29	34.90
p Ł 2	20.62	16.04	15.70	26.42	20.55	20.00
p Ł 3	5.79	4.51	9.20	5.79	4.51	9.20

Notes: Critical values (CV) are taken from Osterwald-Lenum (1992) and at 5% level. Reimers' statistics show the adjusted *l-max* maximal eigenvalue statistics and *trace* statistics for small sample bias.

The co-integration test indicates that there are at least three linear relationship between the variables in question. Both the trace and l–max statistics as well as their adjusted statistics (Reimers') for the degrees of freedom support that. We are rather interested in the equation which explains the changes in the foreign direct investment and the first vector seems to explain the factors affecting the FDI. This vector, the coefficients and the related statistics are reported in Table 4. First of all, the coefficients are of reasonable magnitudes and of expected signs except R. The Likelihood Ratio (LR) tests indicate that they are all significantly different from zero with an exception of R.

Finally, the weak exogeneity could be rejected for the variables FDI, Y, I and X/M, suggesting that these variables are not exogeneous to the system and need to be modelled explicitly. Placing the variable FDI on the left-hand-side of the equation (as dependent variable) in the FDI equation is also justified by this test, presented in Table 5.

Table 5: Weak exogeneity tests

Variable	L(FDI)	L(Y)	L(I)	L(X/M)
LR test[1]	14.340	122.440	17.930	43.530

Notes: [1] Critical values : $c^2(3) = 11.345$ (1%) and $c^2(3) = 7.815$ (5%).

As far as the economic interpretation of the model is concerned, the size of the domestic market is positively related to foreign direct investment. The greater the market, the more customers and the more opportunities to invest. Since FDI is mostly in the form of physical investment, investors would prefer the markets with better infrastructure. This explains the positive sign for the variable L(I). The attractiveness of the host market also affects the FDI positively and significantly. More liberal economies would attract more foreign investments. As openness of the economy to free trade requires removing or decreasing the barriers to exports and imports, this would facilitate the imports of raw materials or intermediate goods as well as the exports of finished goods. External economic stability, measured by appreciation/depreciation of the local currency, seems to have a negative impact on FDI. Namely, an increase in DE which means depreciation of the exchange rate might discourage the foreign investors to invest in Turkey. Finally, the empirical results suggest no significant effect on FDI of internal economic stability, as measured by interest rate.

Most of the studies cited in the literature suggest a positive and significant relationship between foreign direct investment and the market size of the host country. However they usually fails to establish a statistical relationship between FDI and the other variables such as external and internal economic stability, infrastructure of the host country, and the openness of the economy. Many factors affect that including data and data process, estimation technique, sample chosen, and country's own characteristics. Unlike the other works which use cross-sectional data, using time series data for a single country might have captured these relationships. Owing to the fact that the sample size is relatively small in this study, the results should be interpreted with caution. However, failing to reject the hypothesis of no cointegration in the system, and also the significance tests for the variables justify the existence of a statistically significant relationship between FDI and the related variables. Thus the results, at least, can be used to establish the fact that these factors might influence investors' decisions in choosing a location in the estimated directions.

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