

**AN ANALYSIS OF FOREIGN INVESTMENT IN TURKEY**

**A Thesis**

**Submitted to The Department of Economics  
and the Institute of Economics and Social Sciences  
of Bilkent University**

**In partial fulfillment of The Requirements  
for The Degree of**

**MASTER OF ARTS IN ECONOMICS**

**By**

**Ali Nihat DILEK**

**October, 1993**

Thesis  
HG  
5706.5  
.A3  
D55  
1993

AN ANALYSIS OF FOREIGN INVESTMENT IN TURKEY

A Thesis

Submitted to The Department of Economics  
and the Institute of Economics and Social Sciences  
of Bilkent University

In Partial Fulfillment of The Requirements  
for The Degree of

MASTER OF ARTS IN ECONOMICS

Ali Nihat DİLEK  
tarafından hazırlanmıştır.

By

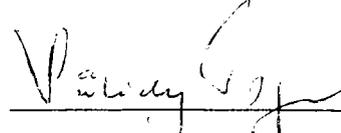
Ali Nihat DİLEK

October, 1993

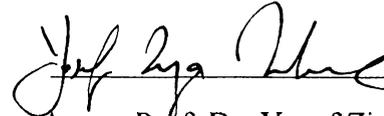
HG  
E306.E  
-A2  
L35  
1993

B008571

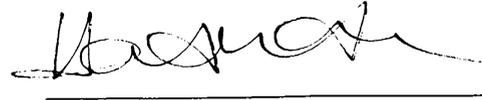
I certify that I have read this thesis and in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

  
Prof. Dr. Sübidey Togan

I certify that I have read this thesis and in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

  
Assoc. Prof. Dr. Yusuf Ziya İRBEÇ

I certify that I have read this thesis and in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

  
Assist. Prof. Dr. Haluk AKDOĞAN

Approved by the Institute of Social and Economics Sciences

Director :



## **ABSTRACT**

### **AN ANALYSIS OF FOREIGN INVESTMENT IN TURKEY**

Ali Nihat DİLEK

M.A. in Economics

Supervisor: Assoc. Prof. Dr. Yusuf Ziya İRBEÇ

October 1993, 69 pages

This study attempts to clarify two important subjects on foreign capital in Turkey. First one is a comparison of the performance of firms with foreign capital and firms with domestic capital. And second one is trend and distribution of foreign capital entry. Four different point of view are considered, namely historical development of foreign capital in Turkey, distribution of foreign capital between sectors and countries, comparison of performance of foreign and domestic owned firms, finally determination of labor productivity differences between foreign and Turkish owned firms.

An increasing trend in the annual entries of foreign capital is reported in this study. Moreover it is found out that tourism, basic chemicals, petroleum, rubber, iron and steel, mining and metal goods are highly preferred sectors.

In addition, it is seen that foreign owned firms have higher performance than their domestic rivals. Six economic parameters namely labor productivity, capital-labor ratio, wage level, wage share of value added, profitability and value added-capital ratio are used in this comparison. Most of the selected samples are indicating a higher performance by the foreign owned firms than their domestic rivals.

## ÖZET

### TÜRKİYE'DEKİ YABANCI SERMAYE ÜZERİNE BİR ANALİZ

Ali Nihat DİLEK

Yüksek Lisans Tezi, Ekonomik ve Sosyal Bilimler Enstitüsü

Tez Yöneticisi: Doç. Dr. Yusuf Ziya İRBEÇ

Ekim 1993, 69 sayfa

Bu çalışma Türkiye'deki yabancı sermaye hakkında iki önemli konuyu açıklamayı amaçlamıştır. Bunlardan ilki Türkiye 'deki yabancı sermayeli ve yerli sermayeli şirketlerin performanslarının karşılaştırılmasıdır. İkincisi ise yabancı sermayedeki eğilim ve bunun sektörlerle ve ülkelere göre dağılımıdır. Dört değişik bakış açısı gözden geçirilmiştir, bunlar isim olarak Türkiye'deki yabancı sermayenin tarihsel gelişimi, yabancı sermayenin sektörlerle ve ülkelere göre dağılımı, bu şirketlerin performanslarının karşılaştırılması, son olarak da işçi üretkenliğindeki farklılığın belirlenmesidir.

Bu çalışma sonucunda, yabancı sermaye girişlerinde yıllık artış trendi açıkça görülmüştür. İlaveten turizm, temel kimya, petrol, lastik, demir çelik, madencilik ve metal eşya sektörlerinin tercih edilen sektörler olduğu belirlenmiştir.

Ayrıca, tespit edilen diğer bir önemli sonuç ise yabancı sermayeli şirketlerin performanslarının yerli şirketlerden daha yüksek olmasıdır. Bu karşılaştırmada altı ekonomik değişken kullanılmıştır. Bunlar işçi üretkenliği, sermaye-işgücü oranı, ücret seviyesi, katma değerdeki ücret payı, karlılık ve katma değer-sermaye oranıdır. Seçilen örneklerin büyük bir çoğunluğu yabancı sermayeli şirketlerin yerli rakiplerinden daha yüksek performans gösterdiği sonucunu vermiştir.

## **ACKNOWLEDGEMENTS**

I would like to express my appreciation to my supervisor Assoc. Prof. Dr. Yusuf Ziya İRBEÇ for his supervision, support and helpful comments on preparation of this thesis.

I also wish to thank Prof. Dr. Sübidey TOGAN and Assist. Prof. Dr. Haluk AKDOĞAN for their guidance for the preparation of this study.

My thanks are also due my family and my friends E. Yeşim ÇETİN and S. Koray EKEN for their support and understanding.

## **0. TABLE OF CONTENTS:**

COVER PAGE	i
APPROVAL PAGE	ii
ABSTRACT	iii
ÖZET	iv
ACKNOWLEDGEMENTS	v
0. TABLE OF CONTENTS	1
I. INTRODUCTION	2
II. BACKGROUND TO THE STUDY	4
III. THE DATA	19
IV. EMPRICAL STUDY	22
SECTION 1	22
SECTION 2	24
SECTION 3	27
SECTION 4	30
V. CONCLUSION	36
VI. REFERENCES	39
VII. APPENDIX (Graphs, Tables, Figures)	41
LIST OF TABLES AND GRAPHS	42
TABLES	44-51
GRAPHS	52-64

## I. INTRODUCTION

It is a fact that structural changes in the Turkish economy, privatization and increasing geographical importance of Turkey in this rapidly changing world, affects the intentions of foreign investors who want to invest in the country. Annual entry of foreign capital into the Turkish market in 1991 increased by 26 times with respect to 1980.<sup>1</sup> All these facts motivate this study, since it is clear that reaction starts and surely, will continue.

This study attempts to make a comparison of the performance of firms with foreign capital and firms with domestic capital in Turkey. Six different economic parameters, that is, labor productivity, capital - labor ratio, wage level, wage share of value added, profitability and value added - capital ratio are used for this comparison.

It has often been suggested that host countries gain technological benefits through productivity spillovers from foreign direct investment. Such spillovers may occur in different overlapping ways. Firms with foreign capital may increase competition in host country markets and in that way force existing domestic firms to adopt more efficient methods. Foreign firms may stimulate domestic firms to a more rapid rate of adoption of some specific technology, either because domestic firms have previously not been aware of the existence of it, or because it has not been considered profitable to acquire the technology. The industrial training provided by the firms with foreign capital is another potential source of gain. If the turnover of trained workers and managers is high, other firms may gain from this training. Considering the fact

---

<sup>1</sup>Data are supplied from 1992 Annual report of HDTM.

that the components of spillovers are both diverse and difficult to measure, it is not surprising that there exist few empirical tests of such effects<sup>2</sup> .

The point of departure of the study is an examination of technological differences between firms with foreign capital and firms with domestic capital. An attempt is then made to ascertain whether variations in technical efficiency between host country firms and foreign firms depend to some degree on the ownership.

In this study, the empirical evidence is explained with the help of the data on the major 500 industrial concerns in Turkey in 1990. Clearly after this time, privatization and entry of foreign capital continues, so it is possible to observe more obvious results for 1993. However as far as the results of this study are concerned, it is believed that some empirical and analytical contributions to the analysis of foreign investment in Turkey are supplied, since it is aimed to provide concrete results for comparing public, private and foreign enterprises in Turkey.

---

<sup>2</sup>In this study I observed that, effects of turnovers pronounced in many studies but as far as my background research concerned, there is no attempt to measure the degree of these effects.

## **II. BACKGROUND TO THE STUDY (LITERATURE SURVEY)**

It is widely believed that technological change plays an important role in any development process. According to common belief, the generation of new technology occurs only in developed countries. Recent research, however, has also reported considerable technological activities in the third world. Technology creation in developing countries typically implies the adoption of existing technology to a developmental context (for example, to smaller production scales and different input qualities and prices). Through successive adaptation of 'developed' technologies to local conditions, new technologies have gradually emerged. In this way, several developing countries have even become exporters of technology. This type of export is dominated by domestic firms and its destination has often been restricted to other less developed countries that is, to countries with similar economic structures.

The generation of technology by domestic firms in developing countries has raised new questions concerning the role of technology imports in general, and of direct investment of multinational foreign firms in particular. The reason for this is that the multinational foreign firm is the most important actor in the generation, application and international transfer of modern technology. Thus, the potential importance of the foreign firm as a key to promote the industrialization in host country becomes clear.

In the development literature, developing countries are often assumed to be totally dependent on foreign investment for their technology. Naturally, the confirmation of this statement depends on the country itself. In this study, it is aimed to analyze the differences between the efficiency of enterprises with public, private

and foreign capital. By doing so, it is tried to get an overview on the usefulness of foreign investment.

Economic theory provides us with two approaches to study the effects of foreign direct investment on home countries' economies. One is rooted in the standard theory of international trade and dates back to MacDougall [14]. This is a partial equilibrium comparative static approach intended to show how the gains from marginal increments in investment from abroad are distributed. MacDougall's major findings can be summarized as follows: an inflow of foreign capital increases total real wages of labor<sup>3</sup>. Most of labor's gain, however, is merely a redistribution from domestic owners of capital, and hence the profit rate, falls as a result of the inflow of foreign capital. In relation to the profits accruing to the foreign capital, the host country's gain from the capital inflow is relatively small. According to MacDougall, however, there are other, potentially important, benefits that may be obtained by the host country.

The most important direct gains from foreign investment can be listed as follows:

- (1) Higher tax revenue is obtained from foreign profit (Only if higher investment is not induced by lower tax rates).
- (2) Domestic firms acquire 'know-how'.
- (3) Domestic firms are forced to adopt more efficient methods.

The other approach departs from the theory of industrial organization. This approach was pioneered by Hymer[8] and has been developed by Caves [2], Dunning [6], Kindleberger [9], and Vernon [18] among others. The starting point here is the question why firms, on the whole, undertake investment abroad to produce the same goods as they produce inside the country. The answer has been formulated as follows:

---

<sup>3</sup>According to MacDougall; an inflow of foreign capital increases the GNP of that country thus total real wages of labor also increases.

For direct investment to take place there must be some imperfection in markets for goods or factors, including among the latter technology, or some interference in competition by government or by firms, which separates markets. Thus, to be able to make production investment in foreign markets, a firm must possess some assets in the form of knowledge of a public-good character.

Thus, a firm investing abroad, represents a distinctive kind of enterprise and, according to the industrial organization approach, the distinctive characteristics are pivotal when analyzing the impact of foreign direct investment on host countries. Foreign firm entry represents something more than a simple import of capital into a host country, which is generally how the matter is treated in models rooted in traditional trade theory. This consideration is of importance, particularly for less developed economies, since such economies have a very different structure from the capital exporting ones. In many developing countries, the domestic enterprises are relatively small, weak and technologically backward. These countries also differ from the developed ones in such aspects as market size, degree of protection, and availability of skills. The entry of foreign investment subsidiaries into developing countries may therefore have effects, both positive and negative, which are substantially different from the effects to which entries into developed countries give rise.

Although the traditional trade theory approach and the industrial organization approach are not mutually exclusive, they have so far generally emphasized different aspects of capital movements. Trade theorists have mainly been interested in the direct effects of foreign investment, while those following the industrial organization approach have put more emphasis on indirect effects or externalities. Of those subscribing to the latter view, some have been interested in what technological benefits the host country

might gain from foreign direct investment, while others have emphasized the role of foreign investment in employment or export generation.

## DETERMINANTS OF FOREIGN DIRECT INVESTMENTS AND ITS EFFECTS ON HOST COUNTRIES' ECONOMIES

Firstly in this part, the effects of real wages and labor productivity on foreign direct investment in a model country is investigated.

The volume of foreign direct investment in the world has grown rapidly in the past several decades. Theoretically, labor costs in both source and host countries could be important determinants of these flows. In this part, both source and host country real wages and labor productivity are theoretically investigated since they can be used as explanatory variables in foreign direct investments.

Neoclassical investment theory provides a point of departure for many studies of foreign direct investment. In a two-input model, the demand for capital, that is investment flows, is influenced by labor costs. For example, Stevens [17], Kwack [11], Boatwright and Renton [1] and Cushman [3] all include wage rates in their theoretical equations for firm profitability; but in none of these equations, the effects of wage changes are explicitly discussed. However, surveying a large number of other authors reveals the general belief that foreign direct investment will flow from high labor cost to low labor cost areas. But in these studies, explicit theoretical models are not presented.

For foreign direct investment flows among industrialized countries, consistent significant labor cost effects have not been reported. For example, Caves [2] finds that the proportion of sales by foreign owned firms seems to be related to low relative labor costs in these two host countries, but the coefficients are never significant. Meredith [15] also studies on this subject for different data, but again there exists no significant effects.

Kravis and Lipsey [10] report a relationship by using a cross-sectional data (proportion of exports produced by foreign-owned firms) between wage levels and foreign direct investment.

They state that low-wage home country firms choose high-wage countries and high-wage home country firms choose low-wage countries as production locations. However, when foreign wages are adjusted for labor productivity, regressions show that export production of these firms is negatively related to high adjusted wages across several foreign countries. But again, the regression coefficients are never statistically significant.

On the other hand, Dunning [6], analyzing the proportion of output produced by U.S. enterprises (more than 10% share is enough to choose) in seven foreign countries, reports a negative impact of a high relative U.S. wage and a positive impact of a high host country wage. These results are again not statistically significant, but contradict with his own expectations.

Finally, Little [12] has reported a significant negative relationship between wage levels and the location of foreign direct investment by foreigners in the U.S. by using cross-sectional data. But it can not be generalized over all.

As one may see, these various cross-sectional studies are not consistent with labor cost effect on profit. At this point, there exists a possible explanation for this inconsistency. Labor wage is a proxy for other important variables related to the production location. Therefore, taking these factors constant, we can better detect the pure effects of wage changes. Indeed there exist some empirical studies which analyse less developed countries' data and give significant negative relationship between wages and foreign direct investments. That is to say, in industrialized countries, this relation

may be positive or negative. But in less developed countries, it is more commonly negative.

In Cushman's [4] paper, a two-input model which examines the effects of wage levels and labor productivity on foreign direct investments is provided. Here, a brief summary of this model and findings are presented. In the model, there exists a firm in the home country which both produces for export in its country and produces in foreign country by making direct investment. In both of these production process, domestic capital is used. Then its total real profit of both these investments will be:

$$\text{profit} = [P^*(Q+Q^*) - iP_K^*K^* - W^*L^*]R - iP_K K - WL \quad (1)$$

In the above equation all variables are in real terms and,

$P^*$  : foreign price of output,

$i$  : home interest rate,

$W, W^*$  : home and foreign wage rates,

$L, L^*$  : home and foreign labor input,

$K, K^*$  : home and foreign capital input,

$Q, Q^*$  : home production for export and foreign production,

$R$  : real price of foreign currency,

$P_K, P_K^*$  : home and foreign capital prices.

In this model, profit is defined as total revenues minus total costs in foreign currency and total costs in home currency. As stated before, all capital is supplied by domestic sources (it is proposed to be a simplifying assumption which does not disturb the effects of wage level and labor productivity in the paper). The following first order conditions are required for profit maximization;

$$U_L \quad W = RP^* n^* Q_L \quad (2)$$

$$U_K \quad iP_K = RP^* n^* Q_K \quad (3)$$

$$U_L^* \quad W^* = P^* n^* Q_L^* \quad (4)$$

$$U_K^* \quad iP_K^* = P^* n^* Q_K^* \quad (5)$$

where

$$n^* = 1 - 1 / (\text{foreign demand elasticity})$$

As one may see, these are well-known equalities between marginal revenue product and input price. Now it is easy to examine the effects of changes in  $W^*$  and  $W$ . If  $W^*$  (foreign real wage) rises, foreign labor usage falls which lowers foreign capital's productivity. Then foreign output falls under constant returns to scale production function, therefore, output prices rise offsetting the fall in capital's productivity. Thus, it is expected that the demand for capital will fall. Now let's consider a rise in  $W$  (home real wage), in this case we have two adjustment processes. First domestic production and hence volume of exports falls which increases the  $P^*$  (foreign output price). This increases the demand for  $K^*$  (foreign capital). In the second process two assumptions are required: (1) There exists a linkage between domestic and foreign capital. (2) Domestic firms have some monopsony power in financial markets at home which means  $i$  is an increasing function of  $(K+K^*)$ . The factor costs in equations (3) and (5) become marginal factor costs  $iP_K^e$  and  $iP_K^{*e}$  where  $e = 1 + 1 / (\text{domestic supply of funds elasticity})$ . If the rise in  $W$  causes a fall in domestic capital, then the fall in the home cost of borrowing ( $i$ ) increases the demand for foreign capital ( $K^*$ ). But if the home substitution effect is strong, then  $K$  increases and  $K^*$  falls.

As a summary, a rise in the foreign wage level discourages direct investment unless the foreign capital-labor substitution effect is strong. And a rise in the home wage level encourages direct investment unless the substitution effect between domestic labor and capital is strong.

These above analysis have focused on labor wage-levels, but exogeneous changes in labor's marginal productivity will have similar but opposite effects. Thus, a rise in foreign productivity is likely to raise foreign direct investment while a rise in home productivity will lower foreign direct investment. Again the strong substitution effects can reverse these effects.

Finally, according to Cushman's paper although it is commonly believed that labor costs should be important determinants of direct investment flows, there is a little empirical support for flows among industrialized countries. As mentioned before, his study shows, in a neoclassical framework, that a rise in the host country wage or fall in the source country wage discourages foreign direct investment unless a strong capital-labor substitution effect occurs. Labor productivity effects are the opposite. And his empirical results generally support these above theoretical findings.

In the second part of this section, relationship between production cost differentials and foreign direct investment is also investigated. In the Maki and Meredith's [13] paper the applicability of two different models to the explanation of the foreign direct investment is tested. In this study, more than forty-one manufacturing industries in USA and Canada are searched and the following result is obtained; high production costs in Canada relative to USA have not been a factor preventing the entry of US multinationals. On the contrary, the differences appear to act as an attraction to American firms.

In the literature, there exist many researches which concern the comparative advantages of the multinational enterprise over host country producers. Much of these studies have been studied on technological comparative advantages. That is to say, supply side efficiency investigations are more common. But nowadays the argument which concerns the demand side hypothesis (technological advantage is directed to the

new products which attract consumers) is more popular. The technological advantage can also result in supply side efficiencies such as product and process innovations that provide the multinational enterprises with production cost advantages relative to host country firms. In the Maki and Meredith's study this latter approach is presented.

In their study, two alternative models are stated as follows;

(i) The nonportable technology model:

In this model, there exists a home country firm which decides to enter to a foreign market. This firm has two ways (strategies) to achieve its aim. It may export its products to a foreign country or it may set up a production facility in a foreign country which is nothing but foreign direct investment. In this model, it is assumed that the choice of these two ways depend on profit maximization criteria. And as one may easily guess, its production technology advantages are not portable in this case. That is to say, if this firm chooses the second way, it is assumed that it will face the same per unit production costs as existing foreign country firms. This model can be expressed as follows;

$$\text{profit}_{\text{Exp}} = Q(1 - T)P - C \quad (6)$$

$$\text{profit}_{\text{FDI}} = QP - C_{\text{for}} \quad (7)$$

where

- Q : quantity sold in the foreign market,
- T : nominal rate of tariffs,
- P : selling price of a unit of the product,
- C : production cost in home country,
- C<sub>for</sub> : production cost in foreign country,

Exp and FDI are subscripts which denote the availability ways. In the above equations it is assumed that Q and P terms do not vary between strategies. And it is also

assumed that tariff is entirely applied to the producer. According to profit maximization goal, the foreign direct investment strategy is chosen if and only if  $\text{profit}_{\text{Exp}} > \text{profit}_{\text{FDI}}$  or equivalently,

$$(T + C / QP - C_{\text{for}} / QP) > 0 \quad (8)$$

Thus the model predicts that foreign direct investment should be positively related to the tariff rate and the ratio of home country production costs to sales revenue and negatively related to the ratio of foreign production cost to sales revenue.

(ii) The portable technology model:

This model differs from the first one in the sense that it relaxes the nonportable technology assumption. That is to say, if a home country firm decides to set up a production plant in a foreign country it can fully carry its technological advantages. Now, equations (6) and (7) become:

$$\text{profit}_{\text{Exp}} = Q(1 - T)P - C \quad (8)$$

$$\text{profit}_{\text{FDI}} = QP - \min(C, C_{\text{for}}) \quad (9)$$

As one may observe, the first equation of the model is unchanged. And it is clear that equation (8) is useless in this case. Therefore, this firm has only one determinant affecting whether to produce in foreign country or in home country. This determinant is production cost differential. In particular, if  $C_{\text{for}} > C$ , this model suggests that foreign direct investment should be positively related to the ratio of domestic production costs to sales revenue, and negatively related to the ratio of domestic production costs to sales revenue; both signs are opposite to predictions from the first model presented. The portable technology model still suggests that foreign direct investment should be positively related to tariff levels, but only for those firms for  $C_{\text{for}} < C$ . Otherwise, tariffs are irrelevant for the foreign direct investment versus export choice.

At this point we can say something about the portability assumption of the technology. If labor wage level is higher in the foreign country than domestic country, then this production cost advantage is not portable. However, if the domestic firm has lower average labor costs per man-hour than existing foreign firms because of a production technology, this technological advantage is portable. Similarly, a low cost supply of material input source is not portable. However, multinational enterprises in foreign country may supply its material input from its parent corporations by the same price. Obviously this case indicates a portable situation.

Finally, in Maki and Meredith's study, these following interpretations and conclusions are reported. As mentioned before, high production costs in foreign country have not been a factor preventing entry of multinational enterprises for several reasons. On the contrary, these production cost differentials have been a source of attraction for foreign direct investment. And they also report that tariff levels are not an important determinants of foreign direct investment, given production cost differentials.

Under the portable technology assumption, trade protectionists may successfully argue that unrestricted multinational enterprises' penetration could make the foreign firms' productions difficult. On the other hand, the study of Globerman [7] suggests that real technological spillover benefits to foreign firms can be generated by the unrestricted foreign direct investment.

Clearly, it is also stated that the definition and measurement portable technology should be refined. Since it is really difficult to distinguish them.

In the third part of this section, the relationship between exchange rate uncertainty and foreign direct investment is investigated. Cushman's [3] paper is searched for this purpose. According to him, the theoretical and empirical effects of exchange rate uncertainty on international trade flows are frequently analyzed, but effects of exchange

rate uncertainty on foreign direct investment are less often investigated. Therefore in his study, he emphasizes more on this subject.

In Cushman's study the following models are used;

There exists a firm which experiences considerable uncertainty over the future profits. Some part of this uncertainty comes from exchange rate uncertainty. The firm responds to its estimates of the expected value and standard deviation of the future change in the exchange rate. The model is also built on a two model framework in which an investment is made now and uncertain profits are earned in the future. Assuming real profit maximization and uncertain future exchange rates, domestic and foreign inflation rates, the random variable becomes the future change in the real exchange rate.

Production processes are assumed to use two inputs, capital and labor, and can be done at home and abroad. All capital, domestic or foreign, is financed at home. All output is final output. He analyzes the effects of exchange rate uncertainty on foreign direct investment by using several structures. First, he considers the simplest: Foreign production with output sold abroad. The future real profits will be:

$$\text{profit}_{FDI} = [P^*Q^* - W^*L^* + (1-d)P_k^*K^*]R\theta^*R - (1+i)P_k^*R \quad (10)$$

where

P, P\*: domestic and foreign real price of output,

Q, Q\*: domestic and foreign output,

K, K\*: domestic and foreign capital stock,

L, L\*: domestic and foreign labor input,

$P_k, P_k^*$ : domestic and foreign real capital price,

W, W\*: domestic and foreign real wage rate,

i, i\*: domestic and foreign real interest rate,

n, n\*: 1-(1/output price elasticity of demand),

d: capital depreciation rate,

R: real price of foreign exchange,

$\theta$ :  $R_{t+1}/R_t$ ,

Z: exports to the foreign country (or if Z is negative, imports from the foreign subsidiary)

The first term gives future revenue, the second gives future labor cost, the third gives the future value of the capital asset and the fourth gives the future capital liability, all in future home currency. The uncertain variable is  $\theta$ , the future change of exchange rate. The utility function of the firm is expressed as follows;

$$U = E(\text{profit}_{FDI}) - \phi \sigma \text{profit}_{FDI} \quad (11)$$

where

E: expected value,

$\sigma$ : standard deviation,

and  $\phi > 0$  implies risk aversion case.

It is assumed in the model that, homogenous decreasing returns to scale production exists. Then maximization of utility with respect to  $K^*$  and  $L^*$  gives the following first order conditions;

$$U_{K^*}: P^* n^* Q^*_K = [(1+i)P_k^* / (E\theta - \phi \sigma \theta)] - (1-d)P_k^* \quad (12)$$

$$U_{L^*}: p^* n^* Q^*_L = W^* \quad (13)$$

The current level of exchange rate, R, has no effect on optimal  $K^*$  because it affects all revenues and costs proportionately the same. But an expected appreciation of foreign currency (rise in  $E\theta$ ) lowers the cost of capital, increasing  $K^*$ , while an increase in the exchange risk (rise in  $\sigma\theta$ ) increases the cost of capital, lowering  $K^*$ .

Besides these, let us suppose that the firm also supplies the foreign market by exporting. Export profit will be;

$$\text{profit}_{\text{Exp}} = P^*QR\theta - WL - (d+i)P_kK \quad (14)$$

Then in addition to (12) and (13), we get

$$U_k : p^*n^*Q_k = (d+i)P_kK / [R(E\theta - \sigma\phi\theta)] \quad (15)$$

$$U_L : p^*n^*Q_L = W / [R(E\theta - \sigma\phi\theta)] \quad (16)$$

A rise in  $R$  can now affect direct investment,  $K^*$ , indirectly through its effect on exports. The proportional rise in  $K$ ,  $L$  and  $Q$  in (15) and (16) will lower  $P^*$ , discouraging the use of  $K^*$  (and  $L^*$ ) in (12) and (13). A rise in  $E\theta$  or reduction in  $\sigma\phi$  will have the same effect. Thus an expected appreciation of foreign currency may reduce direct investment as firms prepare to increase exports. A rise in risk may encourage the use of direct investment as a partial substitute for reduced exports. In the Cushman's study, the most general case is also considered. In this model we assume that output can be produced and sold in both locations. This case is interesting because Siegel [16] highlights a situation under this structure where the capital investment is completely unaffected by exchange risk.

Then the real profit function becomes;

$$\text{profit} = P(Q-Z) + [P^*(Q^*+Z) - W^*L^* + (1-d)P_k^*K^*]R\theta - WL - (d+i)P_kK - (1+i)P_k^*K^*R \quad (17)$$

Then the following first order conditions are derived in addition to (12) and (13)

$$U_K : P_n Q_k = (d+i)P_k \quad (18)$$

$$U_L : P_n Q_k = W \quad (19)$$

$$U_Z : P_n = P^*n^*R(E\theta - \sigma\phi\theta) \quad (20)$$

A rise in  $R$  or  $E\theta$  will cause the following adjustments. An increase in foreign sales and reduction in domestic sales through a fall in  $P^*$  and rise in  $P$ . Besides a rise in  $E\theta$  additionally lowers the cost of  $K^*$ . Thus foreign direct investment reduced because foreign output falls, unless, in the case of  $E\theta$ , the capital cost effect is strong. A rise in risk has an effect opposite to that for  $E\theta$  and, therefore encourages foreign direct

investment unless the capital cost effect is strong. As a summary, all the above models show a negative R effect.

In this study, Cushman has attempted to clarify the effects of exchange rate uncertainty on foreign direct investment. Such uncertainty gives rise to both expectational and risk effects. These depend on both the specific structure of the multinational firm and the relative importance of capital versus labor cost effects and output price effects.

### III. THE DATA

In this study, two different kinds of data are collected. In the first group, all foreign firms investing in Turkey are investigated. However it was not possible to find detailed data about them. In this group, more than 1,500 firms are searched and the greatest 357 of them are used for analysis<sup>4</sup>. All country and sector based results depend on this data. In the second group<sup>5</sup>, 500 greatest firms in Turkey are used for comparison purposes. Empirical investigations to be conducted in section 3 and 4 of part IV are all based on this data set.

The selection of these firms depends on several reasons. Firstly, in these 500 firms, there exists enough number of foreign firms to make a comparison.

Turkey is a fairly industrialized country where both foreign and domestic rivals exist. The entry of foreign capital into Turkey began between 1980-1981 when military administration was in charge. Although during the last decade, foreign capital increased by 26 times, it has not played an important role. Nevertheless, it can be proposed that foreign influence on the Turkish economy will be considerable in the next decade, unless the trend of the foreign capital entry is reversed.

Secondly, these 500 firms represent all sectors of the Turkish industry and so supply a good proxy for the whole industry. Moreover, an important portion of the production and value added in Turkey are done by these firms.

Thirdly, these firms can provide comprehensive statistics on the activities of foreign owned or shared companies. The data used in this study cover nearly the entire industry which is divided into twelve broad industry groups. The lack of sufficiently

---

<sup>4</sup>Data are supplied from 1987-1990 Foreign Investment Report of HDTM. And these 357 firms are extracted according to a threshold.

<sup>5</sup>Data are supplied from 1990 Annual Report of ISO.

rigorous studies of the performance of foreign and domestic firms in Turkey can be explained by data shortages. No institution provides detailed data specified by ownership, value added, wages, size of firms and number of employees for the entire industry. Therefore in the beginning of this study, it is decided to use the data of 500 largest companies of Turkey in 1990. Due to lack of information, 12 of these firms had to be discarded. The remaining 488 largest companies' data are used throughout the study. It is relatively easy to find employment, production, amount of capital, value added, wage data for these largest companies of Turkey. However, wage data is collected from a different source and its structure is completely different from the first source. In order to carry out the present investigation, therefore, these two sources of statistical information have to be combined. However this combination process requires an assumption; that is, wage level is approximately constant in each group in a given sector. I divide all firms into four groups: the first group is, profitable domestic firms, the second group is, profitable foreign firms, the third group is, loss making domestic firms, the fourth group is, loss making foreign firms. By this approach, total 488 firms are divided into 48 different groups.<sup>6</sup>

It is true that, this grouping method decreases the accuracy of the data. Any way, it is a good approximation and does not that much influence the accuracy of the results.

The variables in which I am interested are the following: employment, wage, assets, production, value added, ownership. They are provided by ISO ( İstanbul Sanayi Odası), HDTM ( Hazine ve Dış Ticaret Müsteşarlığı) and YASED ( Yabancı Sermaye Derneği) for 1990.

---

<sup>6</sup>12 different sectors times 4 different situations.

The data cover three categories of ownership: foreign, private domestic and state owned. Of the total 488 firms investigated, 70 are foreign subsidiaries<sup>7</sup>, 89 are owned by state and the remaining 328 are owned privately. For a plant to be treated as foreign, at least 10 per cent of its shares must be foreign owned. If the Turkish state owns a minimum of 50 per cent of a plant, it is defined as a public enterprise(PE), even if foreigners hold more than 10 per cent of the shares.

---

<sup>7</sup>10 % foreign share is enough to consider a firm as a foreign subsidiary.

#### **IV. EMPIRICAL STUDY**

This part of the study can be divided into four sections.

In the first section, a general evaluation is provided and the last decade of foreign capital in Turkey is investigated in a detailed sense; that is, sectoral distribution is supplied.

In the second section, sectoral and country specific results are tried to be derived. By doing so, characteristic preferences of countries are supplied.

In the third section, the performance of foreign and domestic firms are compared. Differences in labor productivity, capital-labor ratio, wage level, wage share in value added, profitability and value added-capital ratio are examined.

In the fourth section, a more detailed analysis of the differences in labor productivity, by comparing labor productivity functions for foreign and domestical owned firms is provided.

##### **SECTION 1**

At the end of May 1992, the amount of foreign capital stock permitted to invest in Turkey reached to 8,770 millions of US dollars. The total number of foreign firms that invest is 2122, and their total recorded capital is 16,447 billions of Turkish Liras.

In the base of given permission to foreign capital, there is a 27 per cent increase in May 1992 with respect to the same month of the previous year.

As mentioned before, cumulative sum of foreign capital reached to 8,770 millions of US dollars. This amount of capital can be classified in to four main sectors, namely manufacturing, services, mining and agriculture. The share of manufacturing is 61 per

cent of the total investment. And the other three sectors are 36, 2, 2 per cent of the total, respectively.

Moreover, the sectoral distribution of total recorded capital is as follows; 56 per cent for manufacturing, 40 per cent for services. In this case, the shares of mining and agriculture are not significant.

Finally 80.7 per cent of this recorded capital is provided by OECD countries and 10.7 per cent by Islamic countries. Other countries' share is 8.6 per cent.

#### PROGRESS OF FOREIGN INVESTMENT IN 1992

In 1992, until the end of May, 671 million US dollars of foreign capital has taken permission to make investment in Turkey. The distribution of foreign capital in sectoral basis is more explanatory. Therefore the following data is provided from HDTM (Hazine ve Dış Ticaret Müsteşarlığı). During this period, 63.9 per cent of permission is given to the manufacturing sector and a considerable amount of this permission is as portfolio and expansionary investments. 33.4 per cent of this permission is in the service sector. It is classified as new and expansionary investments.

OECD countries provide 82.6 per cent of all these foreign investments. The share of European community countries is 83.6 per cent of OECD's.

Finally, 12.8 per cent is made by Islamic countries.

#### PROGRESS OF FOREIGN INVESTMENT IN THE LAST DECADE

In this section, two explanatory tables are supplied. The first table consists of the sectoral distribution of foreign capital in annual basis (table 1 and graph 1). The second table indicates a comparison between real entries and permissions (table 2 and graph 2).

## SECTION 2: DISTRIBUTION OF FOREIGN INVESTMENTS BETWEEN SECTORS AND COUNTRIES

In this section, it is aimed to reach significant figures which show preferences of countries. Clearly there exist two points of view describing the existing situation. First is sector shares of each country and second is country shares of each sector. And following points define the data:

- \* more than 1500 foreign firms are investigated,
- \* greatest 357 of them are chosen,
- \* these 357 firms represent 82% of the total foreign investment in Turkey,
- \* these firms are divided into 12 different sectors (see list 1 for definitions of sectors),

- \* these firms belong to 12 countries and 3 country groups (see list 2 for the contents of groups),

- \* the data cover cumulative foreign investments in Turkey up to the end of 1990.

After all data processings and calculations, the following two tables are obtained (table 3 and 4). And these tables indicate that, in Turkey in 1992:

- \* Switzerland has the greatest portion of cumulative foreign investments,
- \* UK, Germany, USA and Netherlands follow Switzerland,
- \* Sector XII (Tourism) is the most preferred sector,
- \* Sector IV (basic chemicals, other chemicals, petroleum, rubber, glass) and Sector V (mining, basic chemicals, iron and steel, metal goods) are also highly preferred,
- \* Arabic countries highly preferred Sector IX (Banking, gold and other financial activities),

- \* Some neighbour countries (Iran, Syria) have many number of firms that are investing in Turkey. But their total amount of foreign capital is not much. This indicates

that they only invest to get working and living permission in Turkey. That is to say these investments are generally small sized, and they have no contribution to employment in Turkey,

\* UK has a significant portion of the foreign investment. But nearly one fourth of this investment is Asil Nadir originated,

\* More recent data may indicate more obvious results since foreign investments grow continuously.

All of the results of this section are shown by graphs in appendix.

#### LIST 1: SECTOR DEFINITIONS

Sector I: Food industries, beverages (alcoholic and non-alcoholic), tobacco processing.

Sector II: Textiles, leather processing and the manufacture of goods made from fur and leather substitutes, wooden furniture and forestry.

Sector III: Paper and paper products, printing.

Sector IV: Basic chemicals, other chemicals (paints, pharmaceuticals, soaps and detergents, other chemical products), petroleum products, petroleum and coal derivatives, rubber products, plastics, pottery, tiles, porcelain, glass and glassware.

Sector V: Mining, basic metals, iron and steel, non-ferrous, metal goods.

Sector VI: Machinery, electrical machinery, tools and devices, professional scientific and health-related equipment and supplies.

Sector VII: Transport vehicles.

Sector VIII: Other manufacturing.

Sector IX: Banking, gold, and other financial activities.

Sector X: Services (construction, insurance, national defence, health).

Sector XI: Trade.

Sector XII: Tourism.

LIST 2: COUNTRIES

- (1) Switzerland,
- (2) United Kingdom,
- (3) Germany,
- (4) United States of America,
- (5) Netherlands,
- (6) Saudi Arabia,
- (7) Italy,
- (8) Japan,
- (9) Canada,
- (10) France,
- (11) Belgium,
- (12) Luxemburg,
- (13) Other Arabic countries: United Arabic Emirates, Syria, Bahrein, Lebanon, Qatar, Jordan, Algeria,
- (14) Other European countries: Austria, Island, Finland, Yugoslavia, Greece, Liechtenstain, Bulgaria, Spain , Russia , Sweden, Denmark,
- (15) Other countries: Cayman Island, Israel, Hong Kong, South Korea, North Cyprus Turkish Republic, Pakistan, Panama, Singapore.

### SECTION 3: PERFORMANCE OF FOREIGN AND DOMESTIC FIRMS

In the industrial organization literature, there are several characteristics which may be considered as a measure of performance. In this study, the focus is on labor productivity, capital-labor ratio, wage level, wage share of value added, profitability and value added-capital ratio. I also group the firms into 12 different sectors; namely, mining and quarrying, food, beverages and tobacco, textiles, garments, leather and footwear, timber and furniture, paper, paper products and printing, chemicals, petroleum products, rubber and plastics, non-metallic minerals, basic metals, metal goods, machinery and equipment, professional and scientific, automotives, other manufacturing, electricity.

The following notations are used:

V=Value Added,

L=Number of Employees,

K=Total Assets,

W=Wages,

P=Profit, calculated as  $\frac{V - W \times L}{K}$

$$(1) \text{ Labor Productivity} = \frac{V}{L} \quad (21)$$

$$(2) \text{ Capital-Labor Ratio} = \frac{K}{L} \quad (22)$$

$$(3) \text{ Wage Level} = W \quad (23)$$

$$(4) \text{ Wage Share of Value Added} = \frac{W \times L}{V} \quad (24)$$

$$(5) \text{ Profitability} = \frac{V - W \times L}{K} \quad (25)$$

$$(6) \text{ The Value Added-Capital Ratio} = \frac{V}{K} \quad (26)$$

The results are summarized in Table 5 and 6.

### LABOR PRODUCTIVITY

Labor productivity is measured by value added over employment. In 77 per cent of the foreign firms, they showed higher labor productivity than average labor productivity of production units operating under domestic ownership. The divergence in labor productivity between sectors has a mean value of 9.5. The differences are largest for food, beverages and tobacco, paper, paper products, printing, chemicals, petroleum and non-metallic minerals.

### THE CAPITAL-LABOR RATIO

The capital-labor ratio is defined as the ratio of total assets to total number of employees. 72 per cent of the foreign firms show higher ratios than the average of domestic ones. The domestic firms show, on the average, a 54.4 per cent lower capital-labor ratio than foreign owned firms. Looking at different types of sectors, the following picture emerges. The differences in ratios are greatest in food, beverages and tobacco, paper, paper products and printing, chemicals, petroleum products, rubber and plastics, basic metals sectors.

### WAGE LEVELS AND WAGE SHARE OF VALUE ADDED

In 69 per cent of the foreign firms, their enterprises pay higher wages to their employees than their Turkish competitors. The relative divergence has a mean value of 261,375. The differences are greatest in the non-metallic minerals, basic metals and paper, paper products and printing.

## PROFITABILITY

Profit is defined as value added minus wages per unit of capital. Almost 55 per cent of the firms which are foreign owned are more profitable than their domestic rivals. Thus, on the average, the level of profit is higher in foreign firms, but not as high as expected.

## THE VALUE ADDED - CAPITAL RATIO

As the name implies, this ratio is defined as value added over capital. On the average, domestic firms and foreign firms have approximately equal ratios. There exist only small differences. Foreign firms have the highest value added-capital ratio, state owned ones have the smallest and private firms are in between.

## SOME COMMENTS AND TEST OF SIGNIFICANCE

As one may observe, the above comparison indicates that foreign subsidiaries in general, exhibit higher labor productivity and greater capital intensity than their Turkish rivals. Foreign firms also seem to pay higher wages. On the other hand, the share of labor cost in value added is lower in the foreign subsidiaries. This comparison also indicates that foreign firms have higher profitability than their Turkish competitors. Therefore, labor productivity differences seem to be related to differences in capital intensity and labor quality. The profit figures may be explained by a transfer pricing concept. If all the firms face equal capital prices, current findings may indicate that undeclared profits of foreign subsidiaries are remitted abroad by transfer pricing. At this point, limitations of the data restrict further investigation.

A t-test may be used to determine whether the average of the differences for all the performance measures analyzed in this section are significantly different from zero.

Although these results indicate differences in performance between foreign and domestic firms, it is difficult to show that these differences are significantly different from zero. The above results also indicate that there exists a large variance in each performance measure. In such a case, two different hypothesis can be acceptable. One of them is, that labor productivity of foreign firms are two times higher than Turkish firms. The second one is, that the productivity level for Turkish and foreign firms is equal. I will attempt to test the second hypothesis in the next section for one of the performance measures, namely labor productivity, by comparing labor productivity function of foreign and domestic firms in Turkey.

#### SECTION 4: LABOR PRODUCTIVITY DIFFERENCES BETWEEN FOREIGN AND TURKISH FIRMS

In this section, labor productivity functions for domestically owned and foreign plants in Turkey are compared in order to find out whether foreign firms have some advantageous that are specific to that type of ownership. The labor productivity is related to their respective capital intensity, scale of production and market structure. The market structure in different industries is represented by a concentration index. This concentration index shows the proportion of the firm's employment accounted for by the average of three largest firms in each sector. The empirical test in this section is again based on the data from 500 largest firms in Turkey in 1990. For these firms, the following information was used for foreign and Turkish firms, separately: employment, wage, assets, gross production and value added.

## THE EMPIRICAL TEST AND MODEL

There are 328 privately owned Turkish firms among all of the 488 greatest firms for which data are available, but only 70 of them are foreign firms. The remaining 89 firms are owned by the state. The statistical model<sup>8</sup> for the Turkish firms may be written as:

$$Y_i^d = \alpha_1 + \alpha_2 K L_i^d + \alpha_3 SCALE_i^d + \alpha_4 CR_i + \varepsilon_i \quad i=1,2,\dots,328 \quad (27)$$

and the model for the foreign-owned as:

$$Y_j^f = \beta_1 + \beta_2 KL_j^f + \beta_3 SCALE_j^f + \beta_4 CR_j + \varepsilon_j \quad j=1,2,\dots,70 \quad (28)$$

where

Y=Value added divided by the total number of employees as a measure of labor productivity.

KL=The ratio of total assets to total number of employees as a measure of capital intensity.

SCALE=The ratio of average gross production in a firm to the average gross production of the largest firm within each industry as a measure of scale.

CR=An absolute concentration index which shows the proportion of a firm's employment to the average of the largest three firms as a measure of market structure.

The superscripts f and d denote foreign and domestic firms, respectively. The subscripts i and j denote the name of the firm.

---

<sup>8</sup>In this statistical model the following three assumptions are made:

- (1) linear relationship between value added and capital,
- (2) linear relationship between value added and labor,
- (3) linear relationship between labor productivity and scale of production.

Departing from the first assumption one can express that labor productivity (value added / number of employee) is linearly related to capital intensity (capital / number of employee) so Y is linearly related with KL.

Again from the second assumption, one can assume that a linear relationship between labor productivity and concentration index exists. Therefore Y is linearly related to CR.

Finally a direct consequence of the third assumption is the linear relationship between labor productivity and scale of production.

First, it can be tested that whether labor productivity in both foreign and Turkish firms can be described in one single linear regression model by using a Chow-test. Therefore, here the null hypothesis is that the two sets of observations can be regarded as belonging to the same regression model. The null hypothesis will be;

$$H_0: \alpha_1 = \beta_1, \alpha_2 = \beta_2, \alpha_3 = \beta_3, \alpha_4 = \beta_4. \quad (29)$$

This is to be tested against the hypothesis that  $H_0$  is not true. To do that, I first apply the least-squares estimation method to the data on Turkish firms ( $i=1,2,\dots,328$ ), then to the data on foreign firms ( $j=1,2,\dots,70$ ), and finally, to the two sets of data combined ( $i=1,2,\dots,398$ ). At this point, I do not use the firms which are owned by state, since in the first trial of this study I have used both state-owned and private domestic firms as domestic firms. But in that case results are not explanatory since there are also great differences between private domestic and state owned firms. Therefore in this section, I only use private domestic firms and its foreign rivals. Then I calculate the sum of the square of errors (SSE) from each these estimations.

$SSE_1$  = Sum of the squares of errors in the estimation of foreign firms,

$SSE_2$  = Sum of the squares of errors in the estimation of domestic firms,

$SSE_c$  = Sum of the squares of errors in the estimation of combined data.

Under the null hypothesis, both groups of observations belong to the same regression model, the ratio

$$\frac{\frac{SSE_c - SSE_1 - SSE_2}{K}}{\frac{SSE_1 + SSE_2}{n + m - 2K}} \quad (30)$$

will be distributed as  $F(K, n-K+m-K)$

where

$K$  = Number of parameters ( $K-1$  coefficients plus one intercept),

n= Number of observations in the first set of data,

m= Number of observations in the second set of data.

The results from the least squares estimations are (standard errors in parentheses):

$$Y_i^d = 23.99 + 0.21KL_i^d + 25.32SCALE_i^d - 11.38CR_i^d \quad (31)$$

(2.76)      (0.01)      (8.25)      (3.34)

$$R^2 = 0.48$$

$$Y_j^f = 52.45 + 0.08KL_j^f + 22.73SCALE_j^f - 3.41CR_j^f \quad (32)$$

(7.35)      (0.02)      (25.01)      (9.70)

$$R^2 = 0.27$$

$$Y_i^{combined} = 30.87 + 0.16KL_i + 16.88SCALE_i - 10.80CR_i \quad (33)$$

(2.66)      (0.01)      (8.31)      (3.32)

$$R^2 = 0.39$$

$$SSE_1 = 70,535$$

$$SSE_2 = 217,359$$

$$SSE_c = 317,977$$

The ratio (30) is 10.19. In order to interpret the two sets of observations as coming from the same structure, at 1 per cent level of significance, this ratio should be less than 3.36 [F(4.390)=3.36] Thus, we have to reject the null hypothesis.

In order to examine the labor productivity differences between foreign and domestic firms, the residuals from the estimation of the combined data set were plotted. As the graph 3 and 4 indicate, the residuals from the data on Turkish firms have a tendency to be negative, while foreign firms have the opposite tendency. In other words, foreign enterprises seem to be more productive than their Turkish rivals. Therefore one can conclude that foreign firms have some advantages due to ownership.

Finally, it is doubtful that foreign and domestic firms, in general, perform very differently. In this section, it has been tried to make an empirical contribution to this field of research by analyzing the sources of labor productivity differences between foreign and domestic firms in Turkey. Considering differences in capital intensity and scale of production and concentration, it is found that foreign firms are significantly better than their Turkish rivals. This suggests that foreign firms have advantages other than these explanatory variables. But here limitations of data restrict us study on more detailed analysis of these advantages.

Generally, economists state that technological advantages allow foreign firms compete successfully in other countries where local firms have advantages of more information about factor markets and consumers. Local firms also have other advantages that are preferred by consumers and local governments. In this study, technological superiority of foreign firms is not considered. But technological superiorities are not the only differences between domestic and foreign firms. Larger foreign firms may have higher managerial efficiency and better capacity utilization. Therefore there exists an open area to further study on the subject of this paper. But as mentioned before, data collection problems may limit the success of this further study, as some new variables which may not be measurable, such as preference of consumers or managerial efficiency, may be necessary to be used.

#### FOREIGN CAPITAL POLICY (FROM THE SIXTH FIVE YEAR LONG PLAN)

- In the subject of foreign capital, government will continue to apply existing liberal policies.

- Foreign capital regulations will be updated in order to cover all movements of that capital.

- Government will continue to use subsidiaries to encourage foreign capital entry into the country.

- Government will try to use foreign capital as much as possible in large infrastructural investments by using proper financial models (e.g. yap-işlet-devret).

- Government will continue to make agreement with several countries so as to avoid double taxation and to go on mutual investments.

- Government will take some steps to introduce possibilities of investment to foreign capital in Turkey.

- Government will do the necessary arrangements to preserve copy right.

- In order to encourage the entry of foreign capital, government will continue the application of privatization and free zone policies.

## V. CONCLUSION

During the last decade, an increasing trend in the entry of foreign capital is observed. Specially, annual entry of foreign capital is increased by 26 times in 1991 with respect to 1980. Naturally, there must be some logical reasons for this fast increase. If we investigate the economical structure of Turkey, the following three main reasons are observed:

(1) Turkey is a growing and developing country. Population is about 60 millions. Moreover income per capita increases permanently. This situation indicates that Turkey has a rich internal market, the volume of which continuously increases. Therefore making investment in Turkey should be logical even in the short run.

(2) Turkey has a considerable geographical and political importance in the Middle East and South Eastern Europe. Turkey has strong relations with the new Turkish Republics in the Central Asia, Islamic countries in the Middle East, Eastern European countries and European Community countries. This geographical and political situation in Turkey indicates that there exists huge opportunities for firms established in Turkey. Thus investment in Turkey should be profitable in the long run.

(3) Turkey has a rich and qualified labor force, which is one of the main components of industrialization. Moreover, Turkey nearly completed its main infrastructural investments in the last two decades. Its transportational, communicational and industrial infrastructures are highly developed. Naturally, Turkey has some important economical problems, since it has not completed its development (e.g. high inflation, unequal income distribution). However, Turkey's future seems to be undeniably bright.

Under the above conditions, I believe that making comparisons between Turkish and foreign firms would be beneficial. In this study, the data of 500 greatest companies

are used. Trying to collect more wider data in Turkey is really difficult and may be incorrect.

Moreover, I believe that this sampling is satisfactory in explaining the questioned relation between foreign and Turkish firms. In the literature survey of this study, I am faced with nearly the same results as the other studies carried out in different developing countries. Therefore, one may conclude that these 500 greatest firms<sup>9</sup> supply a good proxy for the whole Turkish industry. In this data set, I had to discard 12 firms due to the lack of data. And according to the prespecified classification, I have found that there exist 70 firms which are owned by foreigners. 89 firms are owned by the state and are called public firms. The remaining 328 firms are privately owned. I also make a sectoral classification for this data set. By doing so, more specific results about sectors are obtained.

The aim of this study is to determine the differences between foreign and Turkish firms; since no one can comment on the usefulness of foreign investment only by looking at the statistics about the amount of it. This fact motivates the study. The empirical part of this study consists of four sections.

In the first section, the amount of foreign capital entry and its annual and sectoral distribution is investigated.

In the second section, country-based and sector-based distribution of foreign firms are supplied to clarify the preferences of each country.

In the third section, a comparison is made for Turkish and foreign firms by using six economical parameters, namely labor productivity, capital intensity, wage level, wage

---

<sup>9</sup> In this study, I observed that it is difficult to find the detailed data about the whole firms with foreign capital. Therefore I should restrict this study to 500 greatest firms.

share of value added, profitability and value added-capital ratio. The following results are obtained:

- Foreign firms have more labor productivity, capital intensity, wage level, profitability and value added-capital ratio but less wage share of value added.

- Sectoral differences are also obtained. Shortly and roughly; food, beverages and tobacco, paper, paper products, printing, chemical, petroleum and basic metals industries reflect the above conclusions more generally than the others.

Finally in the last section, a regression analysis is provided to explain the differences in labor productivity between foreign and domestic firms. The result is that; capital intensity, scale of production and concentration index are not the only causes of these differences. It can be proposed that managerial efficiency, level of capacity utilization and technological superiority of foreign firms are also different from their Turkish rivals. However the analysis of these three parameters requires much more detailed data which are not available at the time. Therefore further studies on this subject are left open for a while in the future.

Finally, I want to mention something about the future projection of foreign capital in Turkey. As stated in the sixth five years long plan of Turkish government, there will be more foreign investment in Turkey in the next decade. Unless the trend changes, we may expect yearly 2-3 billions of US dollars entry in the forthcoming years. Therefore further studies on this subject are required, which will help Turkey acquire its pivotal situation in this rapidly changing world.

## VI. REFERENCES

1. Boatwright, B.D., and G.A. Renton, "An analysis of United Kingdom Inflows and Outflows of Direct Foreign Investment." Review of Economics and Statistics, 1975.
2. Caves, Richard E. "Causes of Direct Investment: Foreign Firms Share in Canadian and United Kingdom Manufacturing Industries", Review of Economics and Statistics, 1974.
3. Cushman, David O. "Real Exchange Risk, Expectations, and the Level of Direct Investment.", Review of Economics and Statistics, 1985.
4. Cushman, David O. "Exchange Rate Uncertainty and Foreign Direct Investment in the United States.", Weltwirtschaftliches Archiv Bd. CXXIV, 1986.
5. Cushman, David O. "The Effects of Real Wages and Labor Productivity on Foreign Direct Investment.", Quarterly Journal of Economics 1985.
6. Dunning, John H. "Explaining Changing Patterns of International Production." Oxford Bulletin of Economics and Statistics, 1979.
7. Globerman, S. " Foreign Direct Investment and 'Spillover' Efficiency benefits in Canadian Manufacturing Industries.", Quarterly Journal of Economics 1979.
8. Hymer, S " The International Operation of National Firms: A Study of Direct Investment " International Economic Review 28(1): 190-21 (1960).
9. Kindleberger, C.P. American Business Abroad, New Haven, CT: Yale University Press, (1969).
10. Kravis, Irving B., Robert E. Lipsey, "The Location of Overseas Production and Production for Export by U.S. Multinational Firms." Journal of International Economics, 1982.

11. Kwack, Sung Y., "A Model of U.S. Direct Investment Abroad: A Neoclassical Approach.", Western Economic Journal, 1972.
12. Little, Jane S. "Location Decisions of Foreign Direct Investors in the U.S.", New England Economic Review, 1978.
13. Dennis R. Maki and Lindsay N. Meredith, " Production Cost Differentials and Foreign Direct Investment: A Test of Two Models.", Applied Economics, 1986.
14. MacDougall ,G. D. A. "The benefits and costs of private investment from abroad: a theoretical approach", Economic Record 27: 13-35 (1960).
15. Meredith, Lindsay, "U.S. Multinational Investment in Canadian Manufacturing Ind.", Review of Economics and Statistics, 1985.
16. Siegel, Michael H. "Foreign Exchange Risk and Direct Foreign Investment.",Quarterly Journal of Economics 1983.
17. Stevens, Guy V.G. "Capital Mobility and International Firm", National Bureau of Economic Research, 1972.
18. Vernon, R. "International investment and international trade in product cycle", Quarterly Journal of Economics 80: 190-207 (1966).

**VII. APPENDIX**  
**(Tables, Graphs)**

## **LIST OF TABLES AND GRAPHS:**

Table 1: Distribution of Foreign Investment among sectors in annual basis

Table 2: Foreign Investment in Turkey in annual basis

Table 3: Percent shares of Foreign Country Investment in 12 different sectors

Table 4: Distribution of each Foreign Country Investment over 12 different sectors

Table 5: The comparative performance of Foreign and Domestic Firms in Turkey in 1990 (sector-based)

Table 6: The comparative performance of Foreign and Domestic Firms in Turkey in 1990 (summary)

Graph 1: Distribution of Foreign Investment among sectors in annual basis

Graph 2: Foreign Investment in Turkey in annual basis

Graph 3: Labor productivity

Graph 4: Residuals from the estimation

Graph 5: Percent shares of Foreign Country Investment in 12 different sectors

Graph 6: Percent shares of Foreign Country Investment in 12 different sectors (Switzerland, United Kingdom, Germany, USA)

Graph 7: Percent shares of Foreign Country Investment in 12 different sectors (Netherlands, Saudi Arabia, Italy, Japan)

Graph 8: Percent shares of Foreign Country Investment in 12 different sectors (Canada, France, Belgium, Luxemburg)

Graph 9: Percent shares of Foreign Country Investment in 12 different sectors  
(Other Arabic Countries, Other Countries, Other European Countries)

Graph 10: Percent shares of countries in total Foreign Investment of Turkey

Graph 11: Percent shares of countries in total Foreign Investment of Turkey (In  
sector I - IV)

Graph 12: Percent shares of countries in total Foreign Investment of Turkey (In  
sector V - VIII)

Graph 13: Percent shares of countries in total Foreign Investment of Turkey (In  
sector IX - XII)

### Distribution of Foreign Investments Between Sectors in Annual Basis

	Manufacturing	Agriculture	Mining	Service	Total	Entry
1980	88,76	0,00	0,00	8,24	97,00	35,00
1981	246,54	0,86	0,98	89,13	337,51	141,00
1982	98,54	1,06	1,97	65,43	167,00	103,00
1983	88,93	0,03	0,02	13,76	102,74	87,00
1984	185,92	5,93	0,25	79,26	271,36	162,00
1985	142,89	6,37	4,26	80,97	234,49	158,00
1986	193,47	16,86	0,86	152,81	364,00	170,00
1987	273,75	6,69	6,86	249,18	536,48	171,00
1988	484,14	27,32	5,18	307,83	824,47	406,00
1989	900,99	9,80	10,63	549,04	1.470,46	738,00
1990	1.143,12	65,08	45,46	530,62	1.784,28	789,00
1991	1.053,59	20,88	37,73	797,23	1.909,43	910,00
1992	429,02	12,99	4,80	224,18	670,99	132,00
<b>TOTAL</b>	<b>5.329,66</b>	<b>173,87</b>	<b>119,00</b>	<b>3.147,68</b>	<b>8.770,21</b>	<b>4.002,00</b>

\* Data from HDTM

\*\* In millions of US \$

\*\*\* 1992 data cover first 5 months.

**TABLE 1**

### Foreign Investments In Turkey In Annual Basis

	Foreign Investment (Permission) **	Real Entry **	Number of Firms
1980	97	35	100
1981	338	141	127
1982	167	109	170
1983	103	87	185
1984	271	162	267
1985	234	158	421
1986	364	170	610
1987	536	171	839
1988	824	406	1109
1989	1.470	738	1542
1990	1.784	789	1813
1991	1.909	910	2040
1992	722	132	2122
<b>Toplam</b>	<b>8.822</b>	<b>4.008</b>	

\* Data from HDTM

\*\* In millions of US \$

\*\*\* 1992 data cover first 5 months.

TABLE 2

PERCENT SHARES OF FOREIGN COUNTRY INVESTMENTS IN 12 DIFFERENT SECTORS

COUNT. \ SECTORS	SWISS	UK	GER	USA	NETH	SAUDI A.	ITALY	JAPAN	CAN	FRA	BELG	LUX	O.AR C.	O.C.	O. EU. C.	SUM
SECTOR I	8,90%	15,46%	20,38%	8,67%	21,39%		2,82%	5,63%					5,83%	0,83%	10,09%	100,00%
SECTOR II	64,55%	2,06%	3,88%	0,99%		1,81%	7,08%		0,88%			2,26%	14,60%	1,89%		100,00%
SECTOR III	10,46%	39,23%			43,59%	1,36%								1,18%	4,18%	100,00%
SECTOR IV	7,85%	20,48%	5,11%	28,94%			5,01%	12,09%		1,73%	0,56%	1,80%	11,58%	1,18%	3,66%	100,00%
SECTOR V	43,04%	5,39%	2,26%	0,75%	1,98%	26,96%	7,19%			0,36%	5,39%		4,49%		2,19%	100,00%
SECTOR VI	9,59%	28,62%	18,11%	6,91%	6,59%	1,27%	3,96%		4,52%	4,74%	6,66%	0,42%	1,03%	2,12%	5,46%	100,00%
SECTOR VII	0,55%	7,22%	43,60%	17,58%			17,82%	1,69%	0,48%	11,05%						100,00%
SECTOR VIII	10,22%	8,52%	38,33%	28,45%								14,48%				100,00%
SECTOR IX	19,21%	8,23%		18,76%	4,01%	15,16%	0,79%	0,92%		7,77%		0,47%	18,18%	3,38%	3,12%	100,00%
SECTOR X	0,81%	14,49%	28,01%	19,82%	1,61%		4,71%	4,19%		6,90%			19,02%	0,44%		100,00%
SECTOR XI	10,44%	25,61%	4,14%	1,73%	40,98%	0,75%	3,77%	6,83%		1,57%	0,96%	0,72%		1,26%	1,26%	100,00%
SECTOR XII	18,14%	10,15%	11,61%	7,96%	1,73%	0,21%		8,09%	16,81%	0,72%		2,93%	1,47%	18,55%	1,62%	100,00%

\* See list 1 for the definition of sectors.

\*\* See list 2 for other country definitions.

\*\*\* Table is based on 1990 data and largest 357 firms are used for calculations (their shares are 82% of the total foreign investments)

\*\*\*\* O.AR. C. denotes Other Arabic Countries.

O.C. denotes Other Countries.

O.EU.C. denotes Other European Countries.

**DISTRIBUTION OF EACH FOREIGN COUNTRY CAPITAL OVER 12 DIFFERENT SECTORS**

COUNTRIES \ SECTORS	# of Firms	Total	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	SUM
SWITZERLAND	42	117	2,60%	11,66%	1,78%	6,51%	35,58%	5,04%	0,34%	0,18%	11,89%	0,30%	2,47%	21,65%	100,00%
UK	38	131	5,56%	0,46%	8,22%	20,91%	5,48%	18,50%	5,48%	0,18%	6,26%	6,58%	7,46%	14,90%	100,00%
GERMANY	66	248	7,94%	0,93%		5,65%	2,49%	12,68%	35,85%	0,89%			13,78%	1,31%	18,47%
USA	43	130	3,56%	0,25%		33,75%	0,87%	5,10%	15,25%	0,70%	16,31%	10,28%	0,57%	13,36%	100,00%
NETHERLANDS	25	60	18,60%		22,10%		4,86%	10,31%			7,38%	1,77%	28,86%	6,14%	100,00%
SAUDI ARABIA	10	42		0,98%	0,69%		66,88%	2,01%			28,13%		0,54%	0,77%	100,00%
ITALY	21	44	2,90%	4,50%		14,65%	20,93%	7,32%	38,71%		1,73%	6,12%	3,14%		100,00%
JAPAN	11	25	6,31%			38,42%			3,98%		2,17%	5,92%	6,20%	37,00%	100,00%
CANADA	4	7		0,69%				10,38%	1,30%					87,62%	100,00%
FRANCE	20	54				7,33%	1,51%	12,68%	34,74%		24,49%	12,98%	1,89%	4,39%	100,00%
BELGIUM	6	20				5,33%	51,55%	40,49%					2,63%		100,00%
LUXEMBURG	8	12		6,45%		23,62%		3,52%		3,98%	4,57%		2,67%	55,20%	100,00%
OTHER ARAP CO.	33	160	4,46%	6,90%		25,15%	9,72%	1,42%			29,42%	18,36%		4,58%	100,00%
OTHER CO.	13	47	0,88%	1,24%	0,73%	3,55%		4,04%			7,58%	0,59%	1,08%	80,31%	100,00%
OTHER EUROPEAN CO.	17	84	18,97%		4,59%	19,56%	11,65%	18,46%			12,43%		1,91%	12,43%	100,00%
<b>TOTAL</b>	<b>357</b>	<b>1181</b>	4,97%	3,07%	2,90%	14,12%	14,07%	8,94%	10,50%	0,30%	10,52%	6,28%	4,03%	20,30%	

\* See list 1 for the definition of sectors.

\*\* See list 2 for other country definitions.

\*\*\* Table is based on 1990 data and largest 357 firms are used for calculations (their shares are 82% of the total foreign investments)

The Comparative Performance of Foreign and Domestic Firms in Turkey in 1990 (sector-based)

	OWNERSHIP	LABOR PRODUCTIVITY	K/L RATIO	WAGE LEVEL	WAGE SHARE OF V.A. ADDED	PROFITABILITY	V.A. ADDED/K RATIO
Mining and Quarrying	Public (mean)	56,86	125,32	10.637.502	0,33	0,37	0,49
	(st.dev.)	53,40	89,10	483.323	0,21	0,29	0,28
	Foreign (mean)	0	0	0	0	0	0
	(st.dev.)	0	0	0	0	0	0
	Private (mean)	23,10	44,74	8.860.071	0,50	0,33	0,54
	(st.dev.)	10,57	7,21	0	0,27	0,25	0,27
Food, Beverages and Tobacco	Public (mean)	15,13	42,20	9.319.335	1,54	0,05	0,38
	(st.dev.)	7,23	24,29	2.678.784	2,24	0,32	0,19
	Foreign (mean)	53,52	174,94	9.669.888	0,33	0,25	0,38
	(st.dev.)	35,47	105,33	0	0,25	0,15	0,23
	Private (mean)	40,18	108,15	9.051.111	0,28	0,29	0,43
	(st.dev.)	35,94	119,36	784.460	0,79	0,23	0,23
Textiles, Garments, Leather and Footwear	Public (mean)	18,06	50,57	12.030.527	0,77	0,16	0,57
	(st.dev.)	7,44	75,53	564.107	0,29	0,26	0,28
	Foreign (mean)	33,02	70,93	9.026.963	0,47	0,28	0,45
	(st.dev.)	28,62	35,20	0	0,27	0,24	0,21
	Private (mean)	28,98	71,77	9.094.819	0,52	0,30	0,51
	(st.dev.)	20,07	67,40	191.089	0,82	0,19	0,22
Timber and Furniture	Public (mean)	25,90	65,15	12.139.615	0,48	0,21	0,40
	(st.dev.)	3,90	7,37	0	0,07	0,04	0,02
	Foreign (mean)	0	0	0	0	0	0
	(st.dev.)	0	0	0	0	0	0
	Private (mean)	34,72	63,17	10.869.633	0,32	0,46	0,65
	(st.dev.)	5,21	23,68	0	0,05	0,22	0,28

TABLE 5

The Comparative Performance of Foreign and Domestic Firms in Turkey in 1990 (sector-based)

	OWNERSHIP	LABOR PRODUCTIVITY	K/L RATIO	WAGE LEVEL	WAGE SHARE OF V.A. ADDED	PROFITABILITY	V.A. ADDED/K RATIO
<b>Paper, Paper Products and Printing</b>	Public (mean)	41,69	104,97	11.929.920	0,33	0,32	0,49
	(st.dev.)	14,88	67,00	383.005	0,13	0,14	0,18
	Foreign (mean)	66,13	192,86	16.151.311	0,26	0,25	0,34
	(st.dev.)	18,34	32,16	0	0,07	0,05	0,04
	Private (mean)	50,31	129,38	15.933.865	0,76	0,24	0,41
	(st.dev.)	30,28	69,83	1.192.259	1,38	0,20	0,19
<b>Chemicals, Petroleum Products, Rubber and Plastics</b>	Public (mean)	51,86	199,38	8.664.584	0,24	0,22	0,31
	(st.dev.)	61,07	173,58	3.527.279	0,37	0,24	0,25
	Foreign (mean)	94,80	219,57	18.128.927	0,22	0,40	0,51
	(st.dev.)	34,09	170,57	0	0,09	0,13	0,15
	Private (mean)	73,48	164,51	18.197.493	0,35	0,37	0,56
	(st.dev.)	49,47	159,33	728.622	0,21	0,21	0,26
<b>Non-Metallic Minerals</b>	Public (mean)	34,95	92,80	10.829.894	0,17	0,37	0,56
	(st.dev.)	17,22	66,54	136.130	0,42	0,25	0,35
	Foreign (mean)	43,25	121,66	14.324.680	0,40	0,29	0,48
	(st.dev.)	19,38	103,85	1.812.595	0,17	0,17	0,23
	Private (mean)	54,31	107,55	15.143.498	0,33	0,40	0,58
	(st.dev.)	21,47	62,41	1.062.728	0,14	0,18	0,22
<b>Basic Metals</b>	Public (mean)	50,66	143,14	16.539.368	0,53	0,23	0,39
	(st.dev.)	31,28	77,61	1.570.727	0,33	0,19	0,22
	Foreign (mean)	58,73	420,43	14.966.655	0,36	0,19	0,27
	(st.dev.)	41,22	368,38	1.276.042	0,20	0,14	0,20
	Private (mean)	51,16	184,53	14.678.942	0,31	0,20	0,33
	(st.dev.)	13,70	112,77	281.202	0,62	0,15	0,10

The Comparative Performance of Foreign and Domestic Firms in Turkey in 1990 (sector-based)

	OWNERSHIP	LABOR PRODUCTIVITY	K/L RATIO	WAGE LEVEL	WAGE SHARE OF VA. ADDED	PROFITABILITY	VA. ADDED/K RATIO
<b>Metal Goods, Machinery and Equipment, Professional and Scientific</b>	Public (mean)	18,68	139,26	11.883.696	0,22	0,07	0,25
	(st.dev.)	24,17	131,26	1.915.344	0,53	0,27	0,33
	Foreign (mean)	61,41	142,37	14.292.328	0,30	0,40	0,56
	(st.dev.)	28,80	106,87	285.371	0,17	0,19	0,26
	Private (mean)	49,59	138,27	14.281.640	0,50	0,30	0,45
	(st.dev.)	33,89	105,80	127.193	1,52	0,25	0,28
<b>Automotives</b>	Public (mean)	34,98	78,60	13.516.270	1,25	0,11	0,42
	(st.dev.)	33,05	54,19	5.961.136	1,30	0,39	0,32
	Foreign (mean)	45,75	78,48	11.717.913	0,30	0,43	0,59
	(st.dev.)	15,37	19,19	0	0,13	0,17	0,16
	Private (mean)	48,22	102,88	11.717.913	0,27	0,39	0,53
	(st.dev.)	13,92	41,35	0	0,08	0,16	0,19
<b>Other Manufacturing</b>	Public (mean)	0	0	0	0	0	0
	(st.dev.)	0	0	0	0	0	0
	Foreign (mean)	0	0	0	0	0	0
	(st.dev.)	0	0	0	0	0	0
	Private (mean)	37,17	83,37	15.631.684	0,42	0,26	0,45
	(st.dev.)	0	0	0	0	0	0
<b>Electricity</b>	Public (mean)	43,67	273,37	11.662.385	0,27	0,12	0,16
	(st.dev.)	0,00	0,00	0	0,00	0,00	0,00
	Foreign (mean)	0	0	0	0	0	0
	(st.dev.)	0	0	0	0	0	0
	Private (mean)	115,51	349,11	24.634.007	0,23	0,26	0,33
	(st.dev.)	28,76	97,56	0	0,06	0,01	0,01

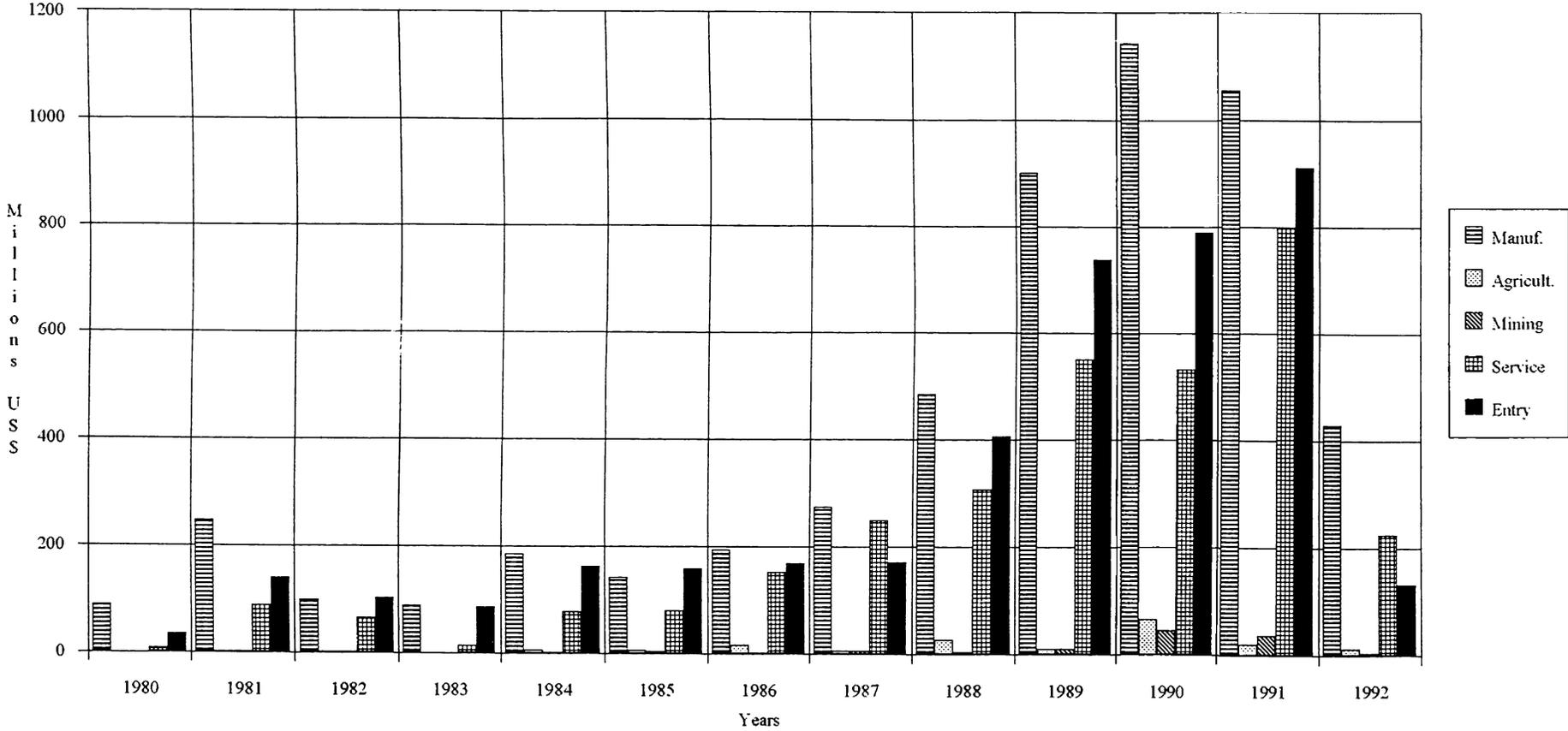
TABLE 5

**The Comparative Performance of Foreign and Domestic Firms in Turkey in 1990**

OWNERSHIP	LABOR PRODUCTIVITY	K/L RATIO	WAGE LEVEL	WAGE SHARE OF VA.ADDED	PROFITABILITY	VA.ADDED/K RATIO
<b>Public (mean)</b>	36.81	107.95	10.874.057	0,55	0,23	0,45
<b>(st.dev.)</b>	37,90	107,96	3.139.909	0,86	0,28	0,29
<b>Foreign (mean)</b>	61.53	170.50	13.292.121	0,31	0,35	0,49
<b>(st.dev.)</b>	35,92	177,88	3.112.143	0,19	0,19	0,23
<b>Private (mean)</b>	45.52	115,19	11.734.967	0,41	0,31	0,49
<b>(st.dev.)</b>	35,70	111,75	3.548.045	0,86	0,21	0,25

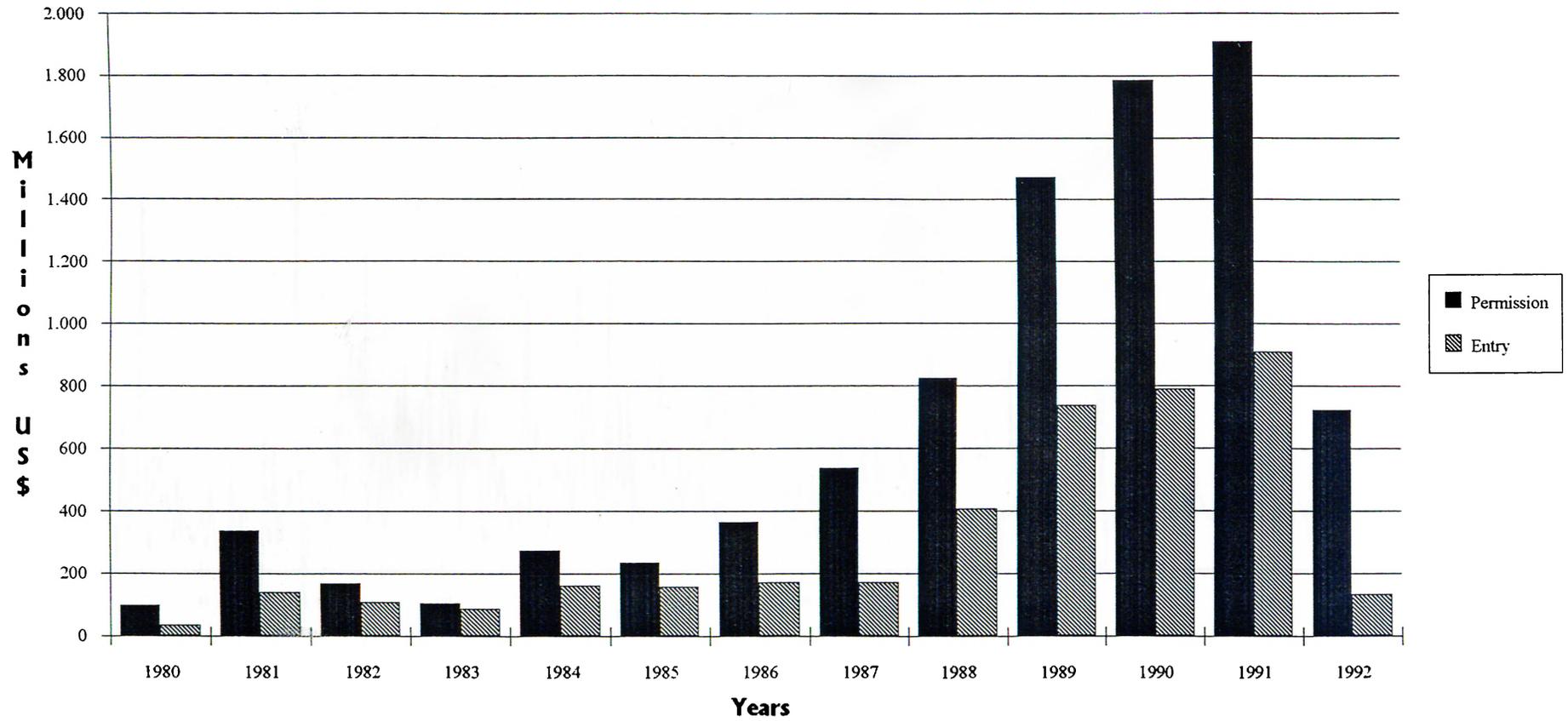
TABLE 6

**Distribution of Foreign Investments Between Sectors in Annual Basis**

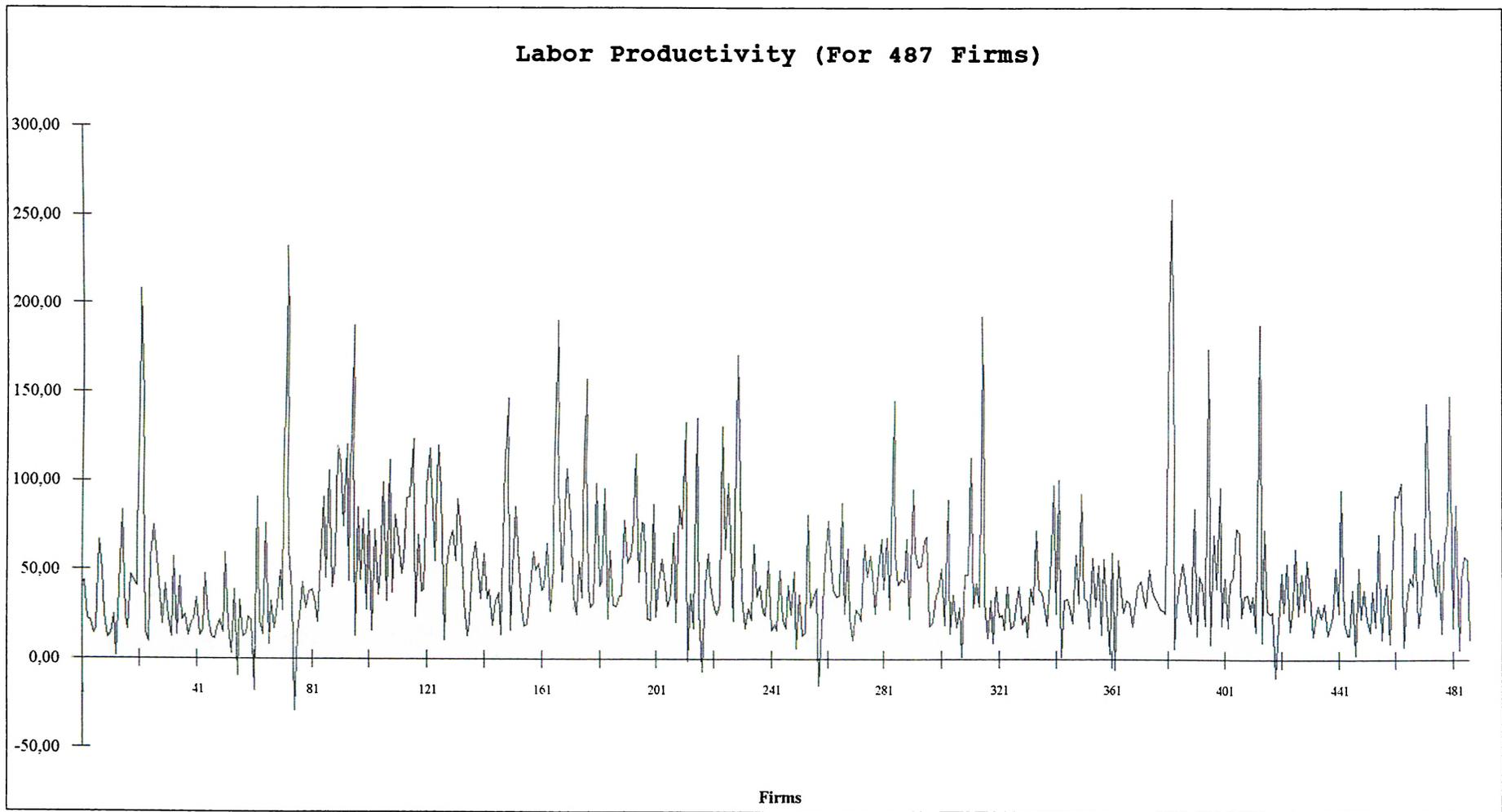


**GRAPH 1**

### Foreign Investment In Turkey In Annual Basis

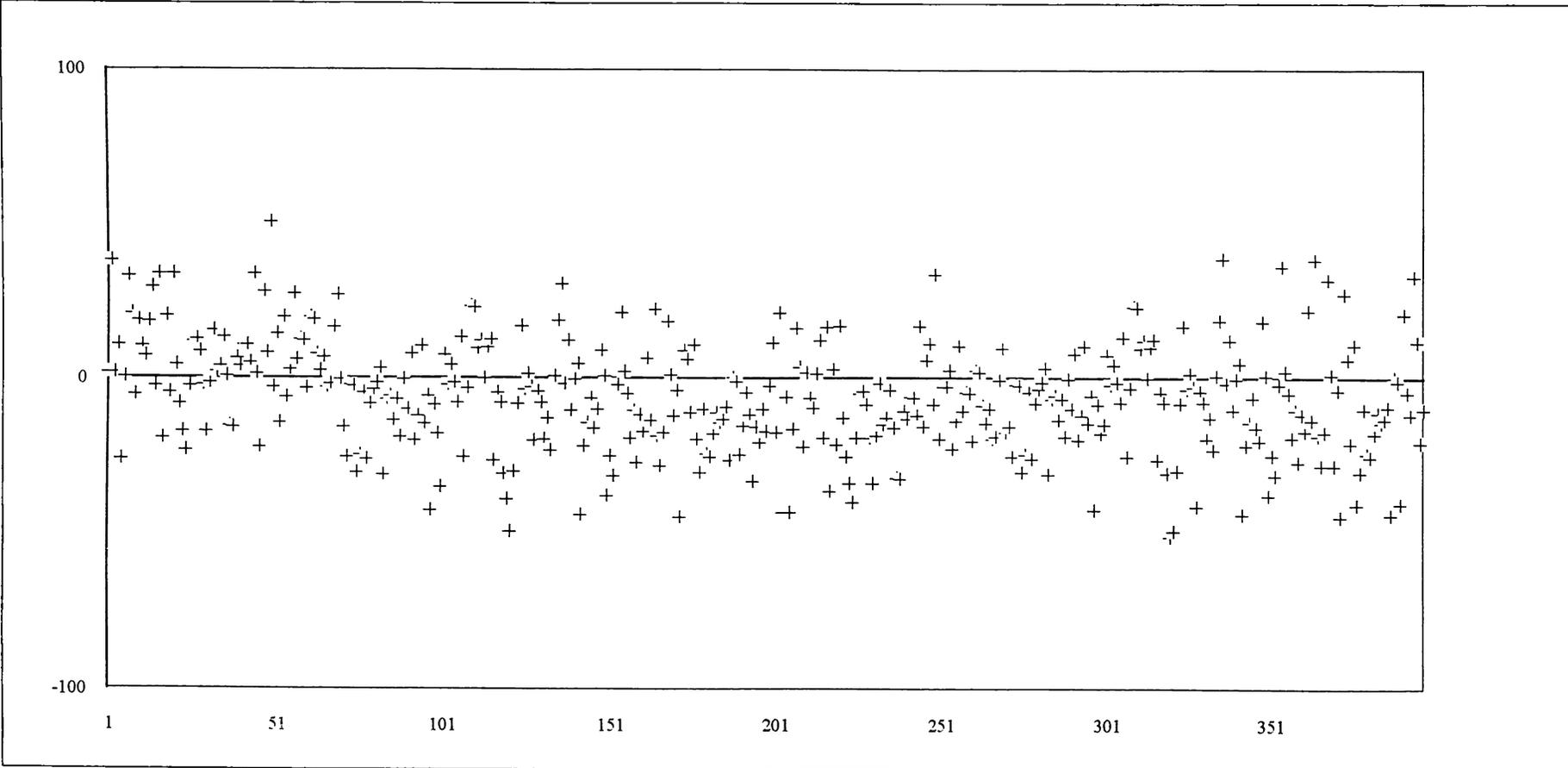


GRAPH 2

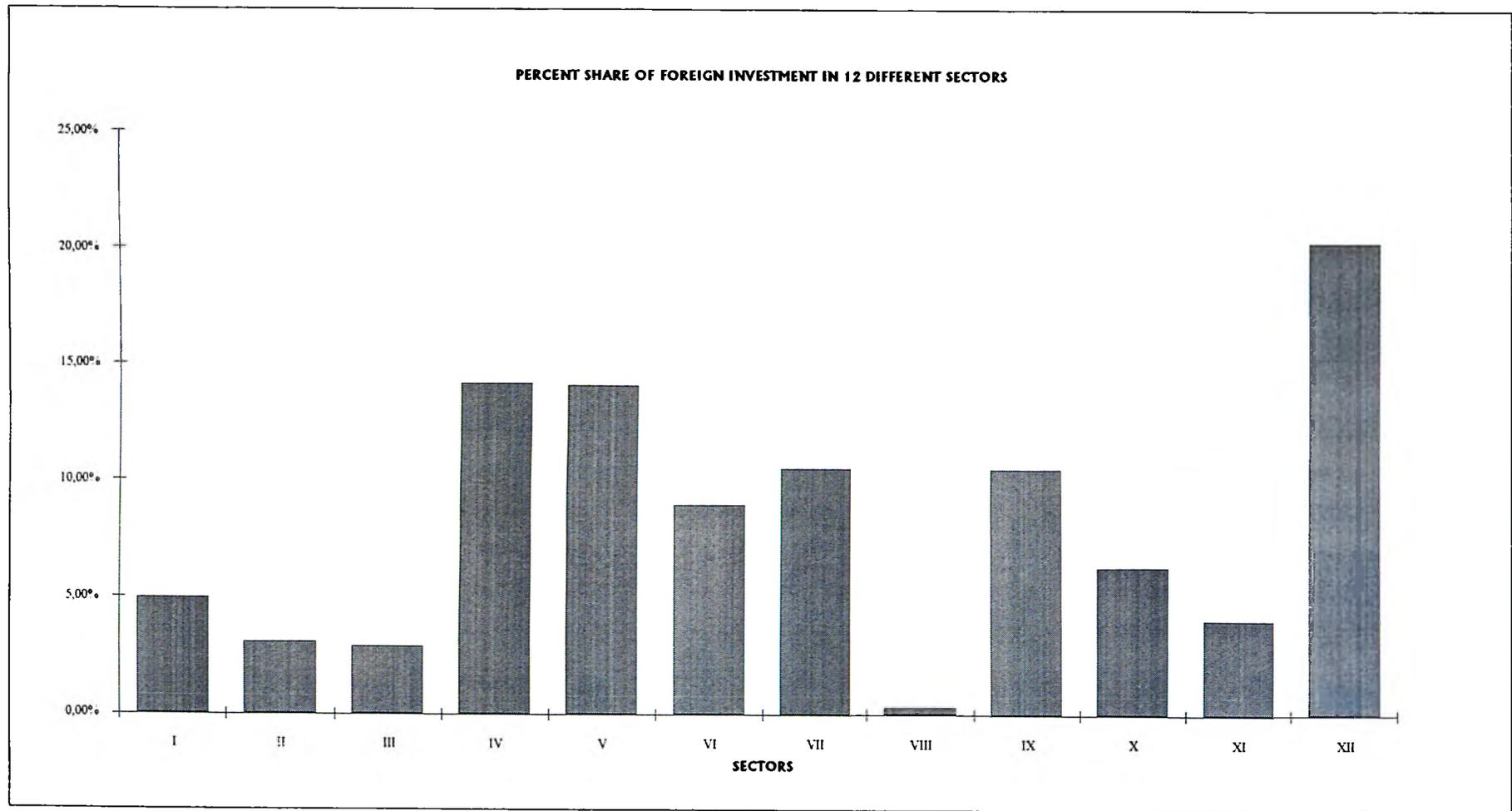


**GRAPH 3**

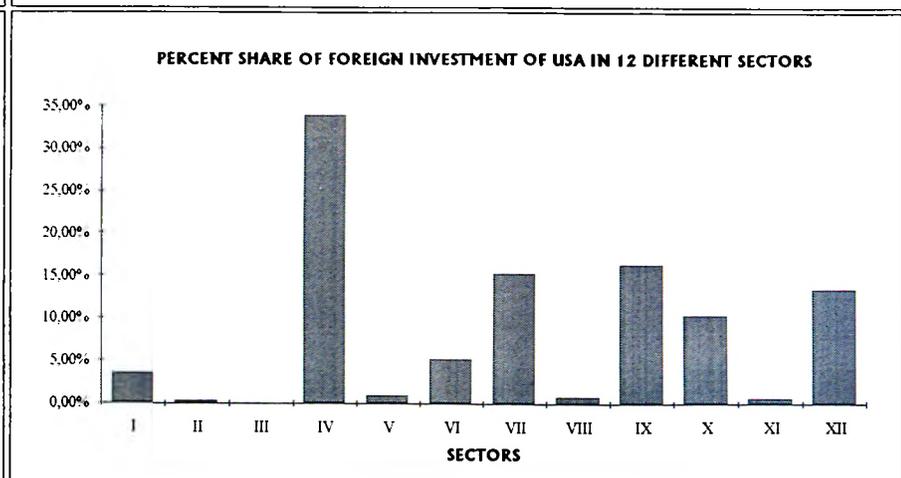
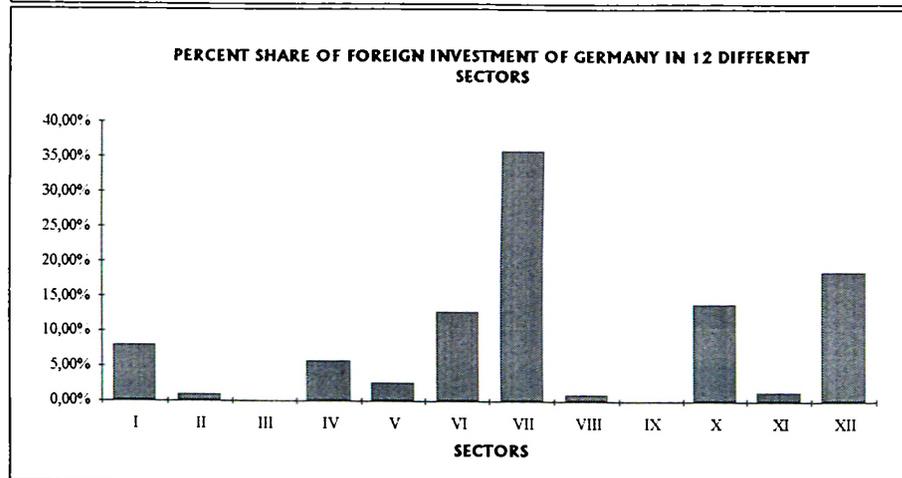
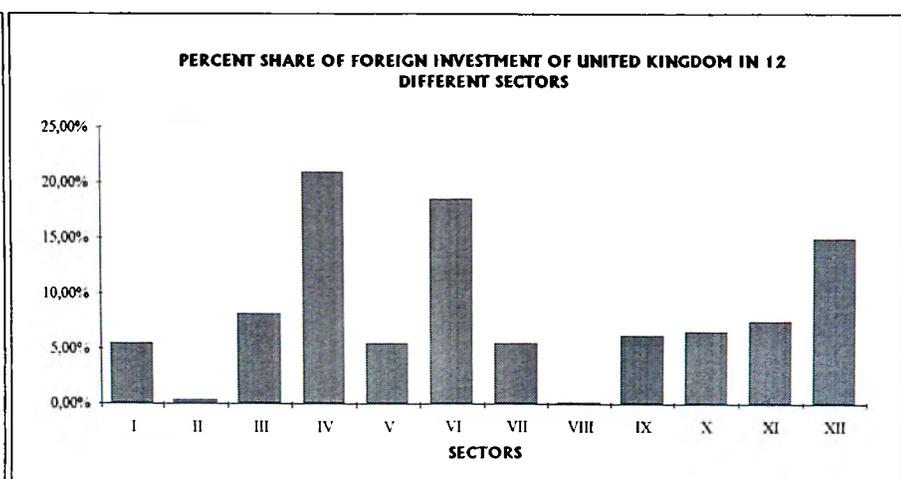
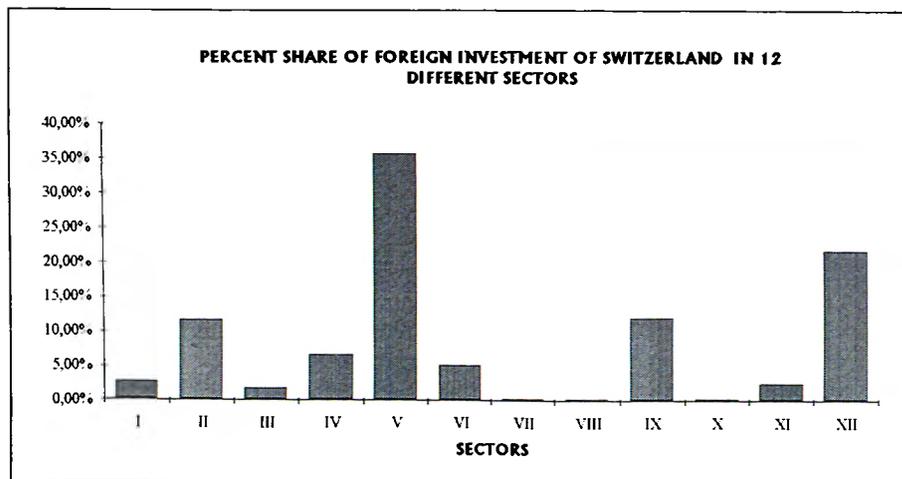
**RESIDUALS FROM THE ESTIMATION**



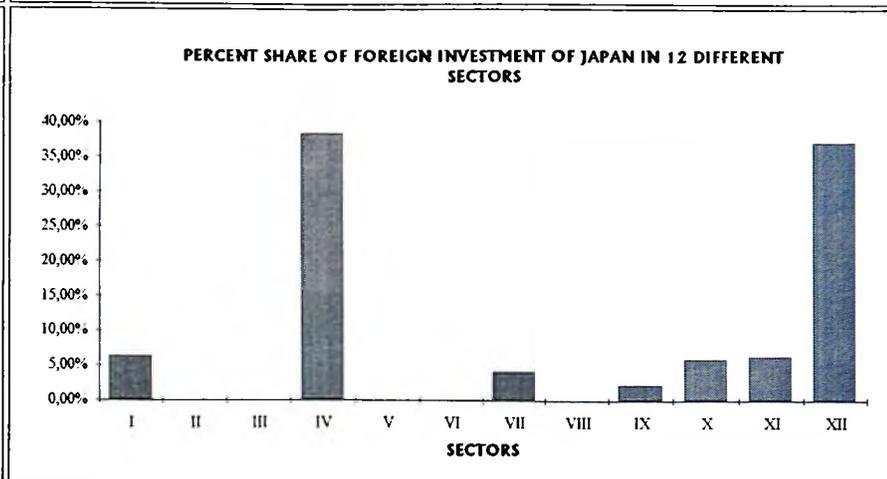
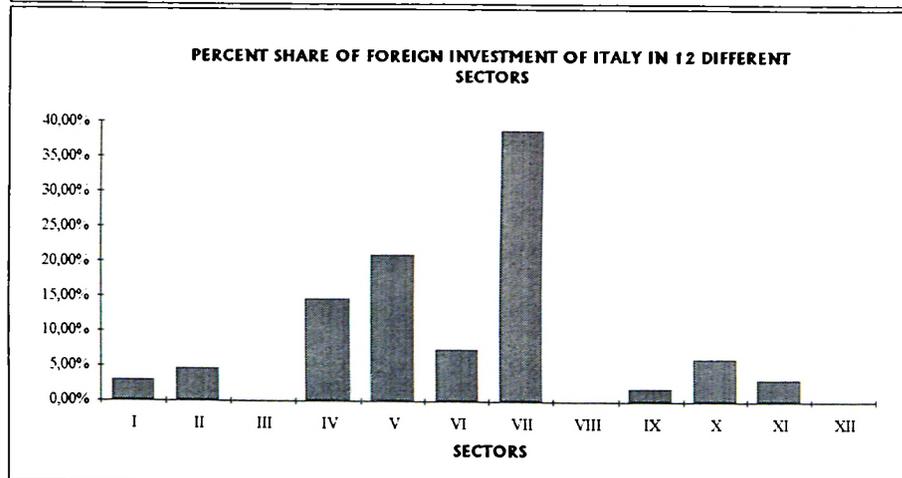
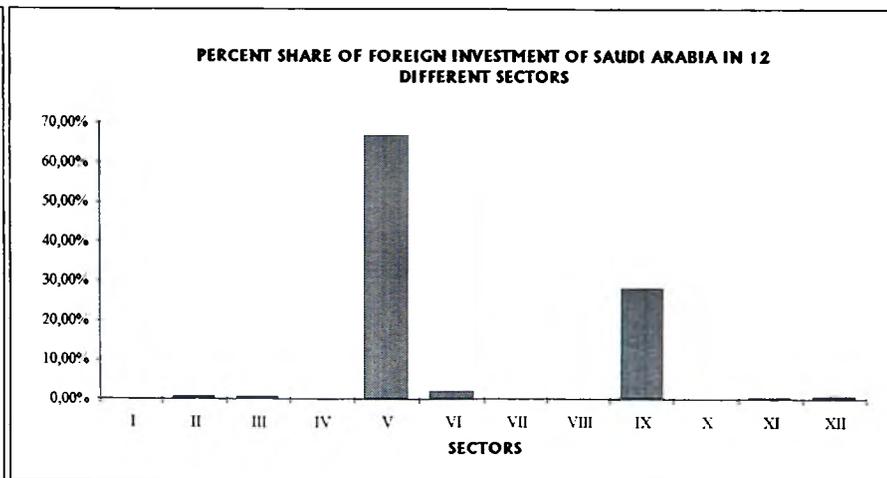
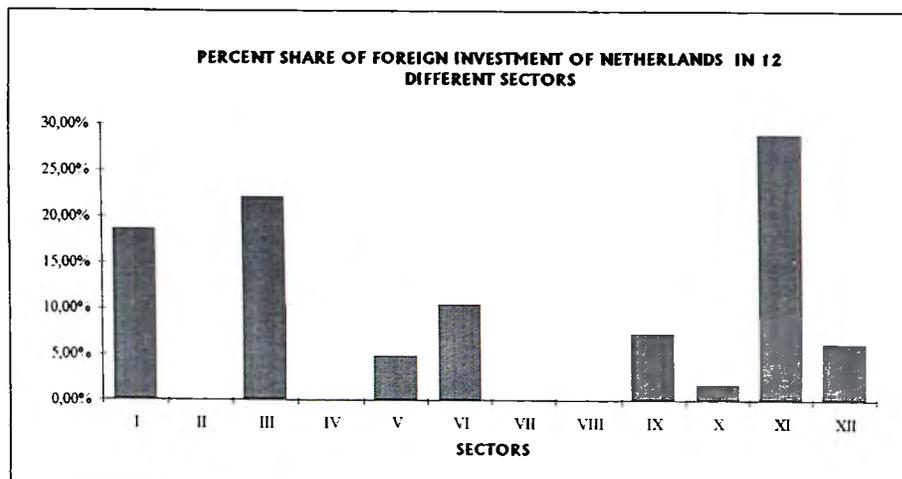
**GRAPH 4**



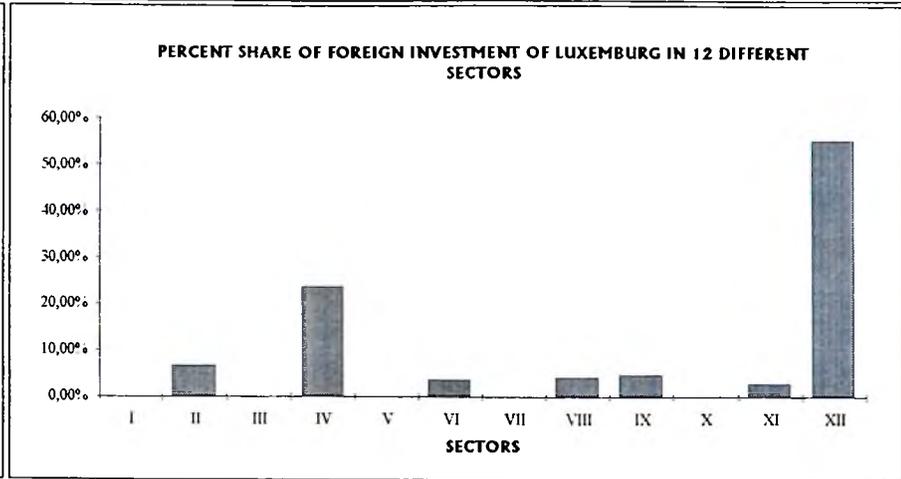
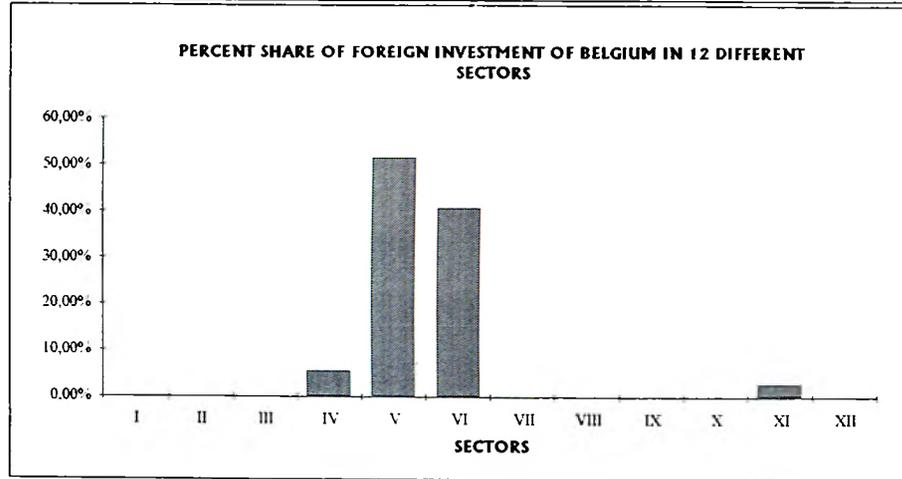
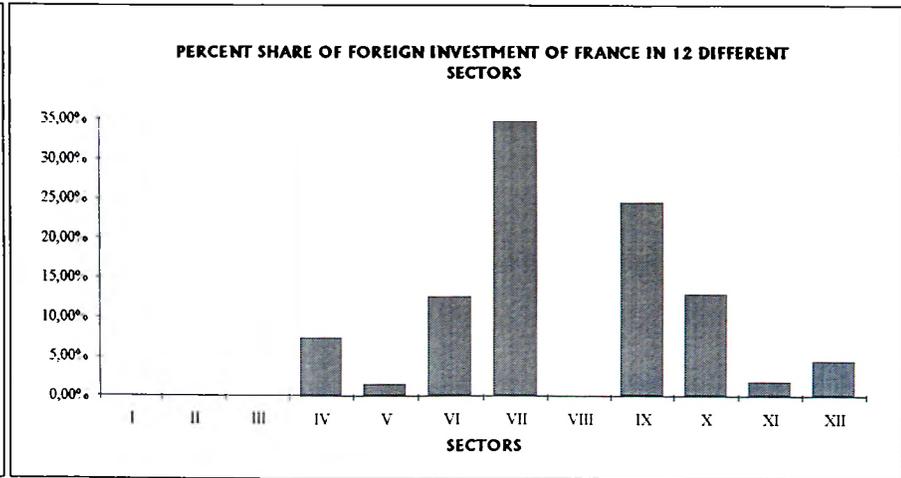
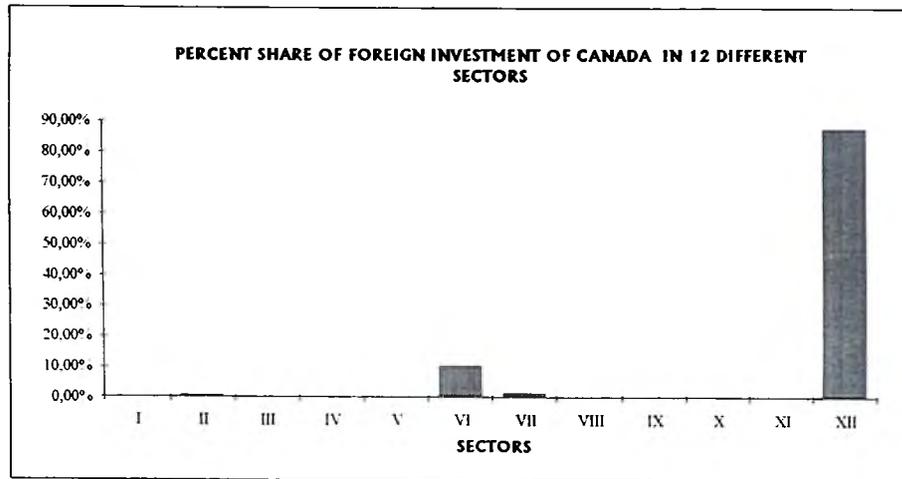
**GRAPH 5**



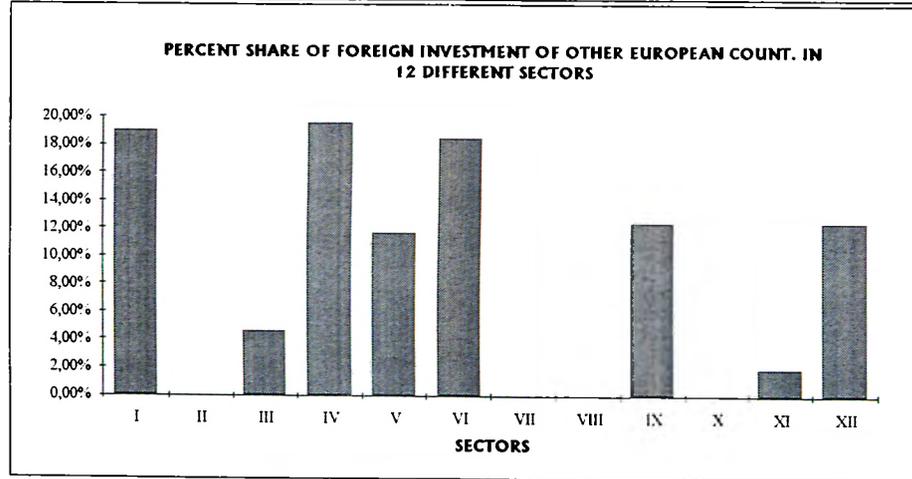
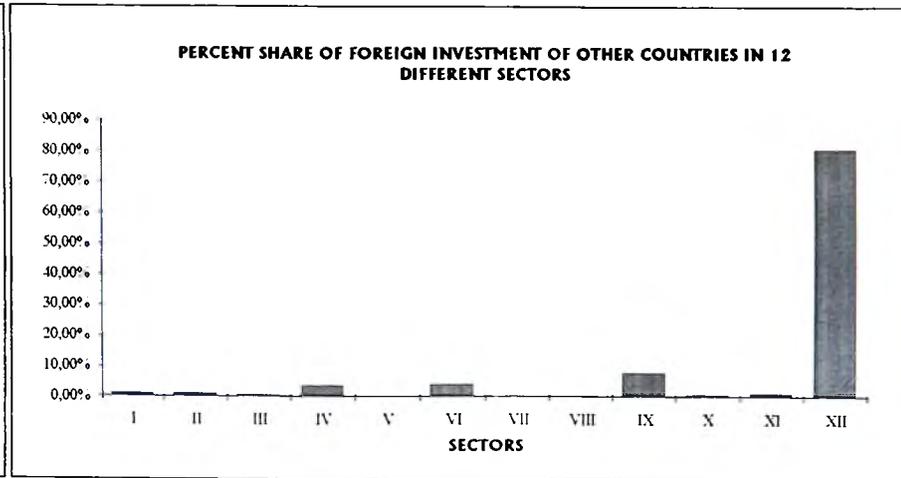
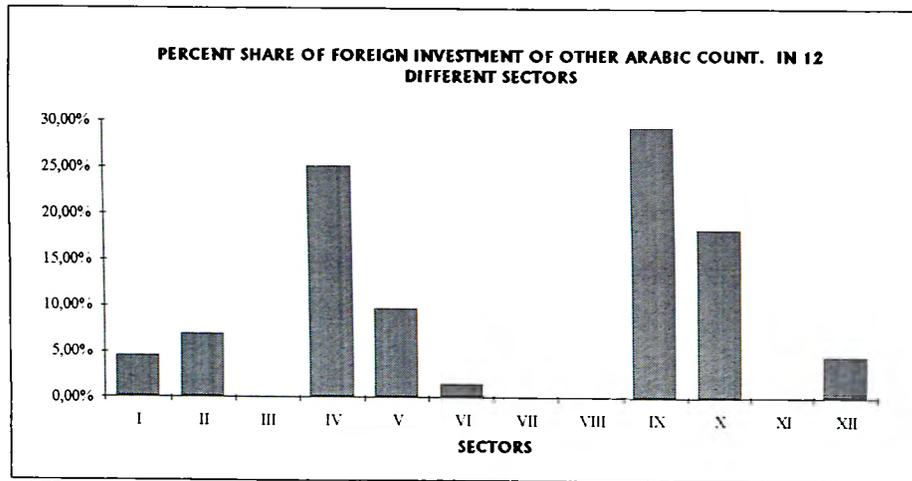
GRAPH 6



GRAPH 7

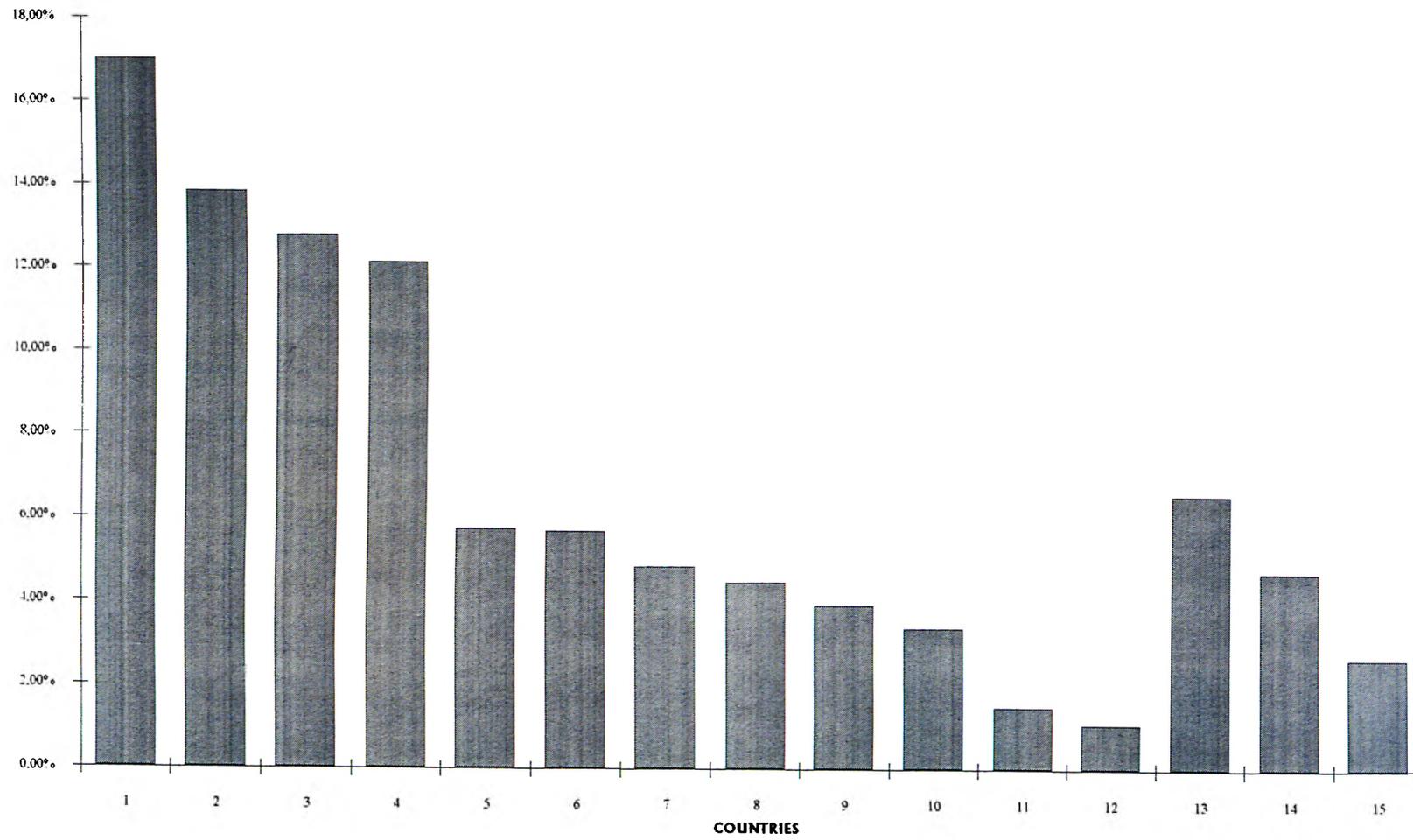


GRAPH 8

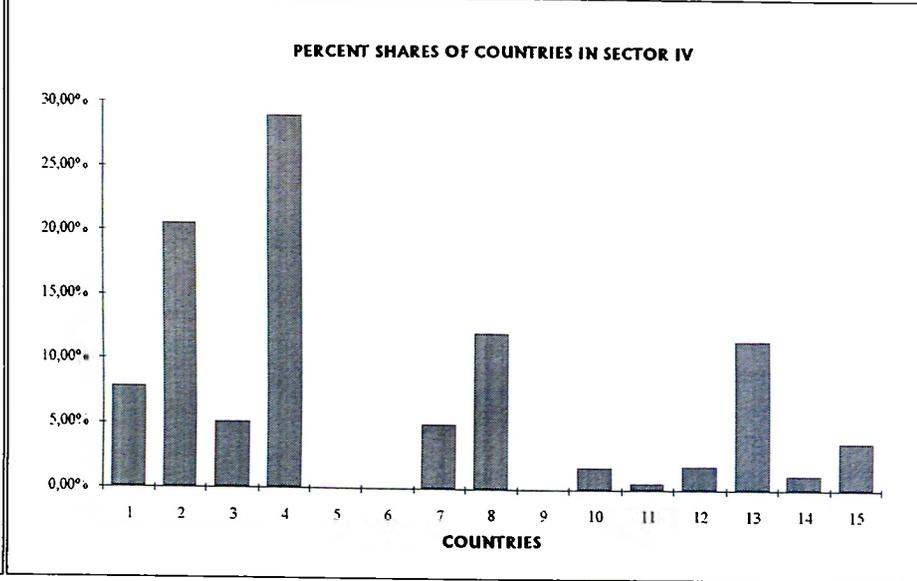
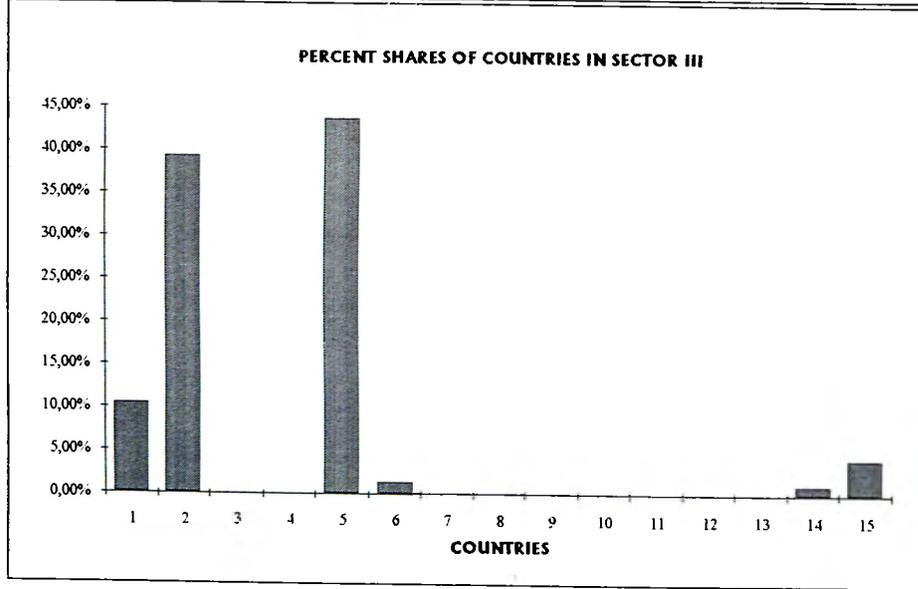
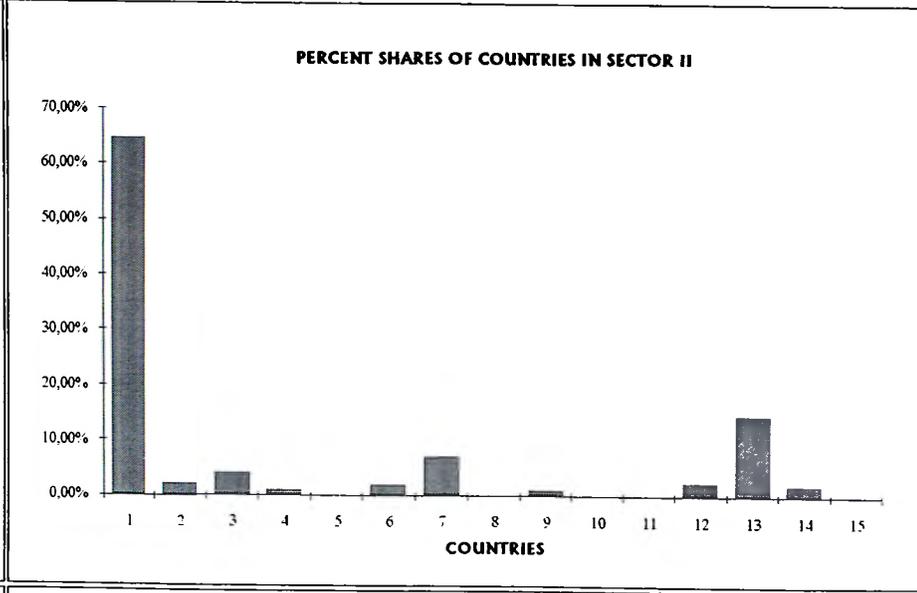
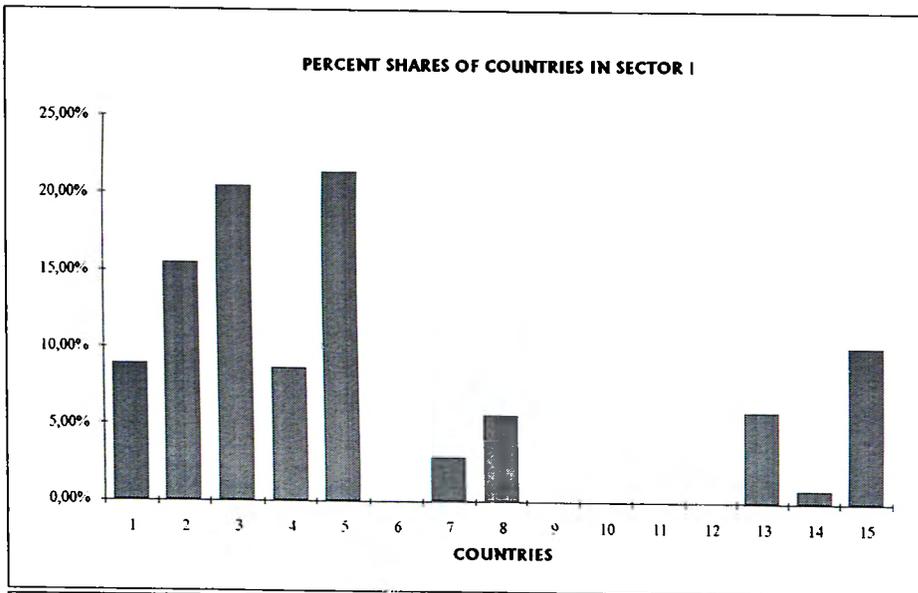


GRAPH 9

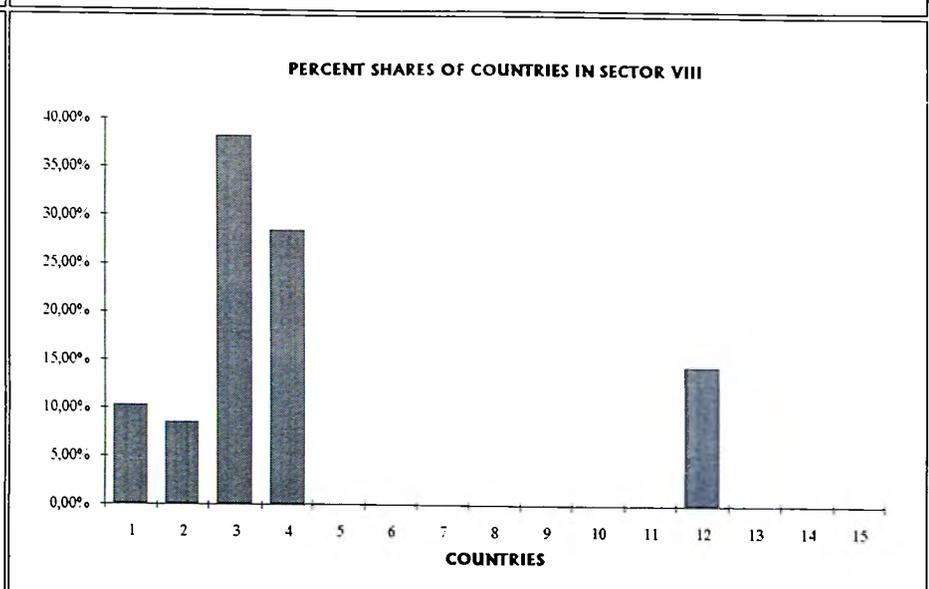
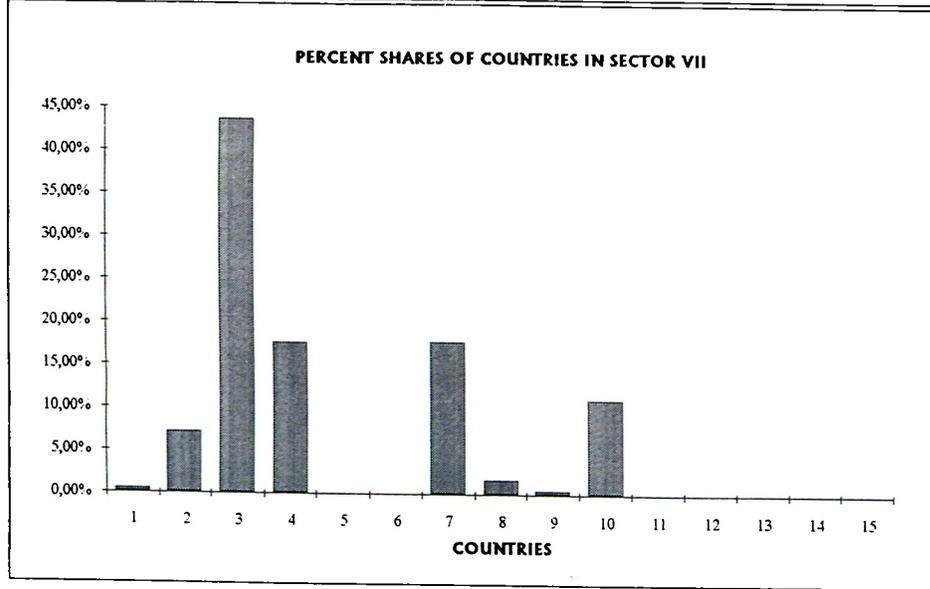
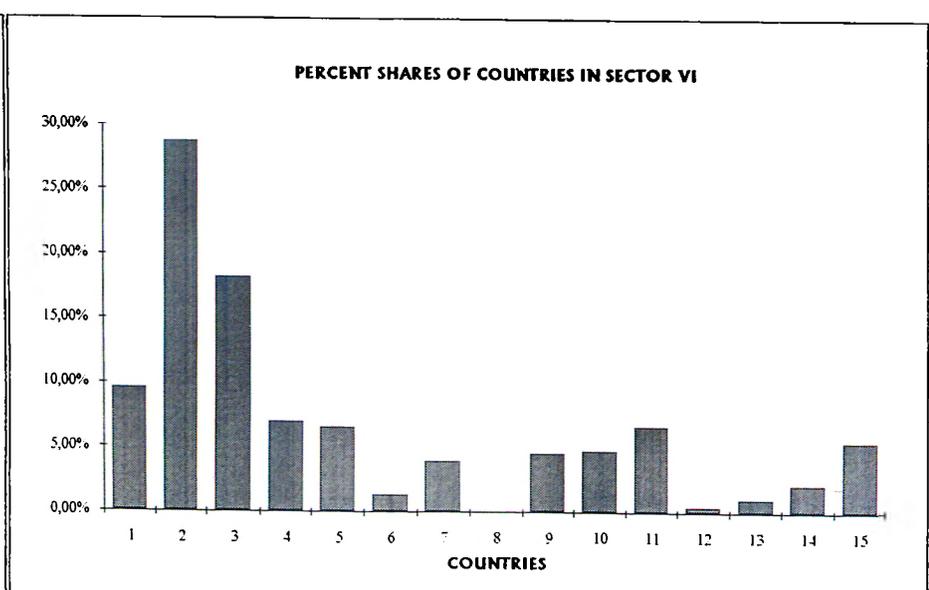
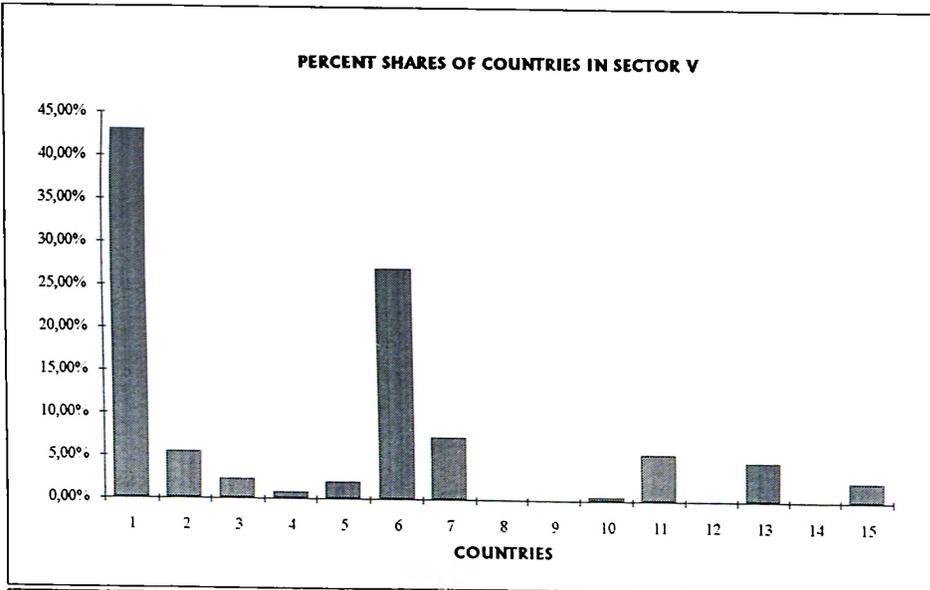
**PERCENT SHARES OF COUNTRIES**



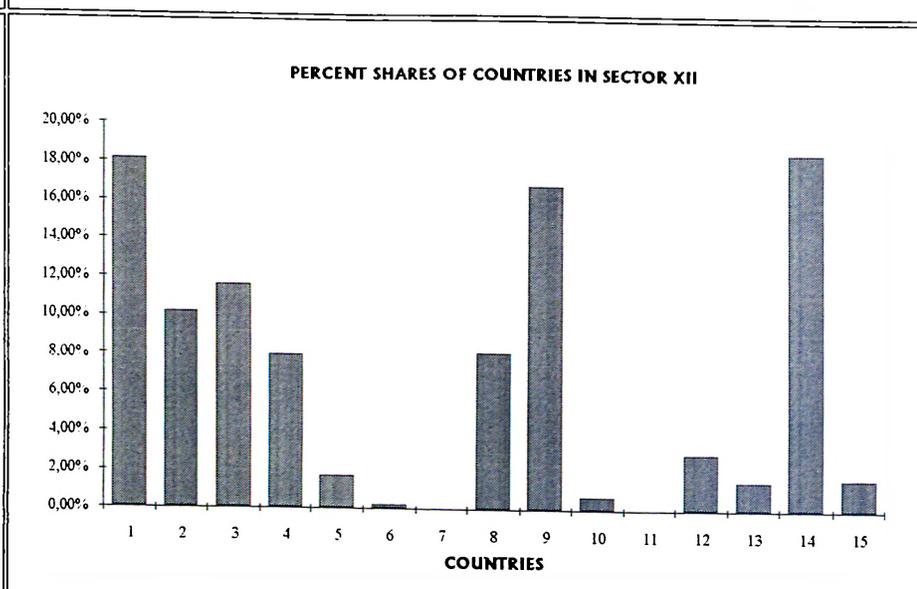
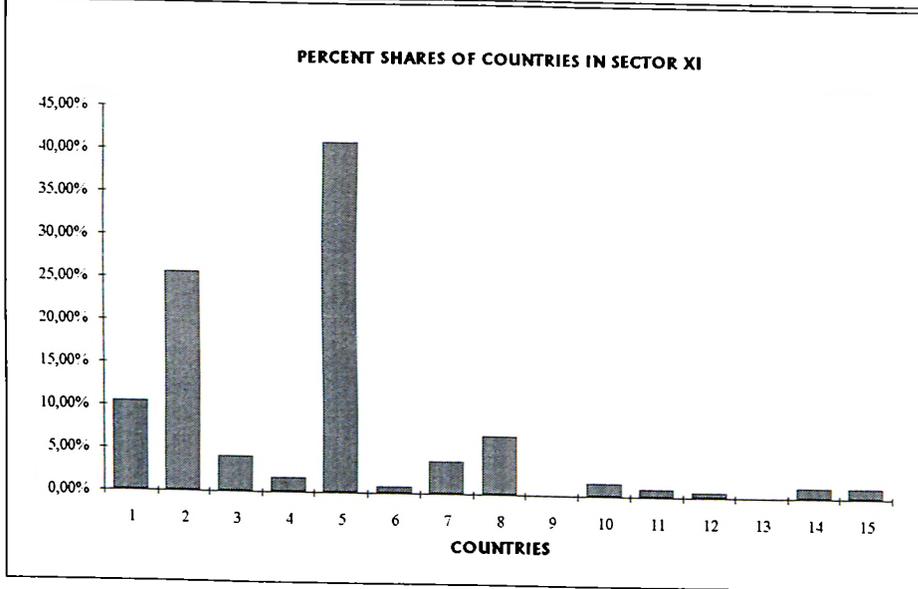
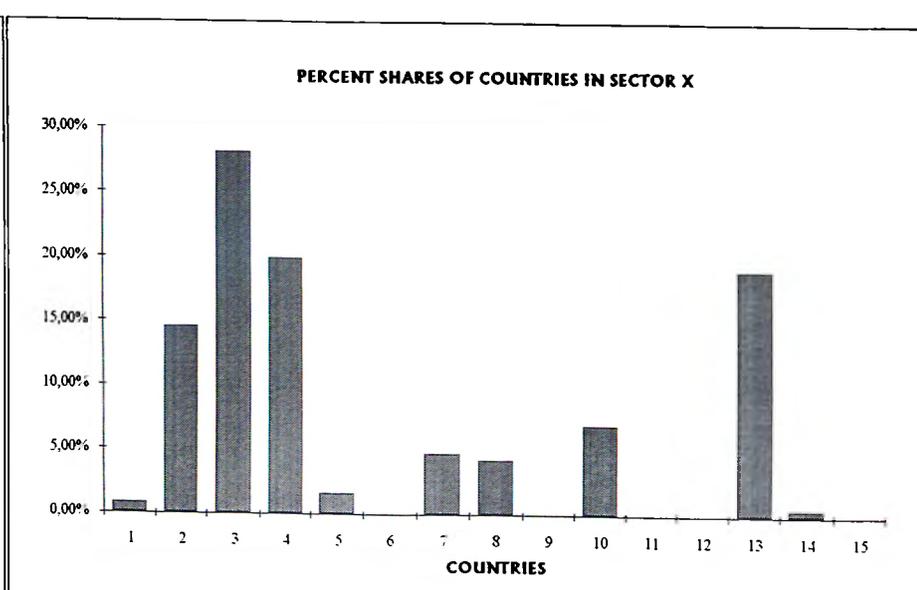
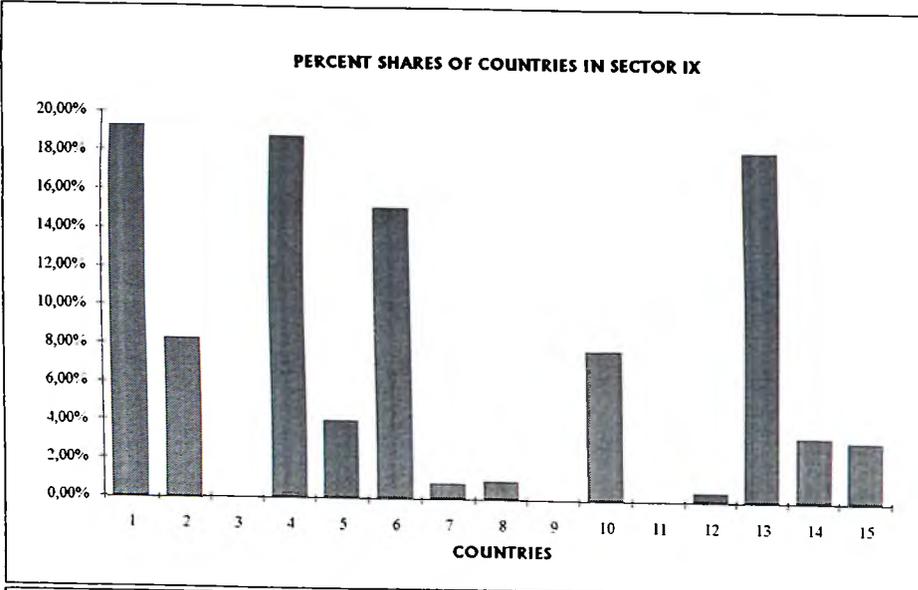
**GRAPH 10**



GRAPH 11



GRAPH 12



GRAPH 13