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THE IMPACT OF FOREIGN DIRECT INVESTMENT INFLOWS ON REGIONAL LABOUR MARKETS IN HUNGARY

KÁROLY FAZEKAS

The objective of this paper is to examine the nature and determinants of the regional distribution of foreign investment enterprise (FIE) employment in Hungary. Factors explaining the spatial concentration of foreign direct investment (FDI) inflows are investigated and the impact of regional FDI inflows on the performance of regional labour markets is measured. The main conclusion is that the regional distribution of FDI inflows is strongly influenced by the educational level of the local population, the externalities of urban agglomerations and the geographical location of regions. Additional advantages are identified in the case of those regions adjoining the Western-Slovakian, Austrian and Slovenian borders. A self-reinforcing process can be observed here: FDI is attracted to regions where unemployment is lower due to better educational levels and geographical advantages, while an increase in FDI in turn creates new job opportunities. We believe, however, that education and geographical location are in large part merely symptomatic of other, underlying factors. Uncovering these underlying factors has obvious policy implications: location as such cannot be changed, for example, but these background variables could be modified by changes in regional policy.

1. INTRODUCTION

Hungary is one of the most important Central and Eastern European (CEE) foreign direct investment (FDI) targets, with internationally significant capital inflows during the last ten years. The country has the highest per capita FDI stock in the region. In 1998 it possessed 21.9% of the total FDI stock of the 14 CEE countries (UN 1999). The ratio of FDI stock to GDP was estimated at 23.4% at the end of 1998, with stocks of 2,364 thousand million HUF (8,9 thousand million US$).

This massive inflow of foreign capital has had a remarkable impact on the Hungarian labour market over the last eight years. According to the Central Statistical Office FDI survey the number of employees within domestic firms in the corporate sector decreased by 800,000 between 1992–98. The number of employees in foreign investment enterprises (FIEs) increased by 260,000 in the same period (CSO 2000).[1] *Figure 1* shows that wholly foreign-owned firms experienced the fastest increase in manpower during these years. In 1998 about one-third of the employees in the non-financial competitive sector were employed by foreign firms (with proportions of up to 80% in some branches).[2] Although it is impossible to make a clear distinction between jobs taken over by foreign firms via privatisation and jobs created by business start-ups, most of the estimates show a positive net effect of job creation and job loss as a result of FDI inflows to Hungary.

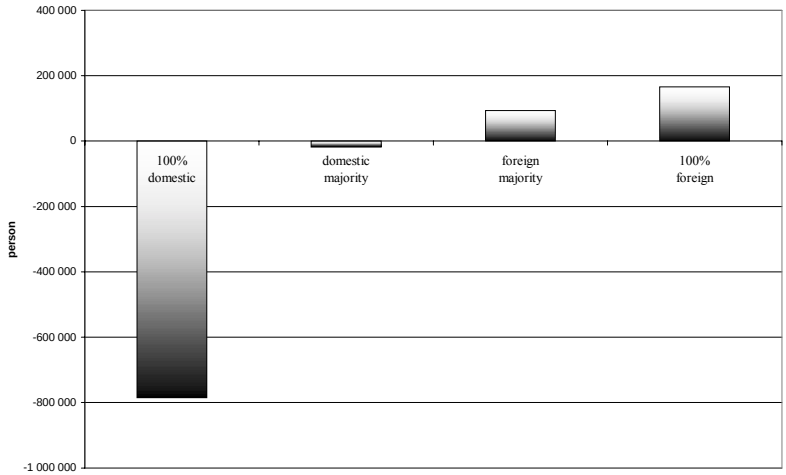
The increasing share of FIE employment has also had a crucial impact on the "price system" of the labour market. The average level of gross earnings in firms with majority foreign ownership exceeded the average gross earnings of domestic firms by 47% in 1998. We should note that substantial structural differences explain this huge disparity. FIEs are able to pay higher wages because their profitability and productivity levels are much higher than those of the domestic firms (CSO 2000).

[1] The CSO FDI Survey covers enterprises which submitted a corporate tax declaration, i.e. double and single bookkeeping enterprises and sole entrepreneurs who make corporation tax declarations. The financial sector is excluded.

[2] There are several sets of statistics on FIE employment in Hungary. Although they cover different sets of employers the share of FIE employment was around 30 % in all of these databases in 1998–99. See *Table 1*, Appendix 1.

Figure 1

Changes in employment in the corporate sector by ownership (1992–98)



Source: CSO FDI Database .
Note: financial sector excluded

Recent analysis suggests that foreign firms tend to hire younger than average, relatively well-educated workers, and to pay them more. Moreover, foreign owners not only use more productive labour and capital but are also much better at increasing capital-skill complementarity through a closer match of modern technology and young skilled labour (*Fazekas and Köllő,* 1999*; Köllő,* 1998).

The significant differences between foreign and domestic firms within regions of Hungary – in terms of density, size, industrial organisation, technology, management practice, composition of workforce, and wage levels – suggest that the presence of foreign firms has crucial implications for regional development in Hungary. FDI inflows and employment /unemployment ratios have one common important feature: both show extreme regional differences. Most analyses agree that regions with a higher ratio of foreign firm employment perform much more successfully in the labour market, but they do not investigate the role of FDI inflows in explaining regional labour market differences *(Fóti,* 1995*; Hunya,* 1997*; Hamar,* 1999).

The objective of this paper is to examine the nature and determinants of regional distribution of FDI within Hungary and to identify the impact of FDI inflows on regional labour markets during the transition. The first part gives an outline of the spatial distribution of FIE employment in Hungary.

The second part investigates the most important factors which explain the spatial concentration of FDI inflows. Spatial concentration of foreign-owned firms will be assessed using company seats as a measure. This will give a more realistic picture of the causes and consequences of the regional distribution of FDI than the often-cited official HCSO FDI data, which are based on the regional distribution of company headquarters. The changing regional profile of capital inflows will be analysed using explanatory variables of human and physical characteristics of the regions. Repeated cross-section equations will be used to deconstruct the effects of different factors. The time path of the explanatory power of the most important variables will be analysed. The third section of the paper will consider the impact of regional wage curves on the distribution of FIE employment. The conclusion and some policy implications are set out in the final section.

2. SPATIAL CONCENTRATION OF FDI INFLOWS AND FIE EMPLOYMENT IN HUNGARY

The regional share of FDI inflows and employment in foreign investment enterprises is heavily concentrated in particular regions[3] of Hungary (see *Tables 2* and *3* in Appendix 1). *Map 1* shows that most FIE employment is located in the capital's region and in some of the counties near Budapest and along the Austrian border[4]. *Figure 2* shows that two central and two west border regions[5] accumulated almost three-quarters of the stock of FDI inflows and that their share did not decrease significantly between 1992–98. International comparisons show the same pattern in other CEE countries *(Hunya,* 1997*; Pavlinek* and *Smith,* 1998*)*. A survey of Hungary, Poland and the Czech Republic showed that in all of these countries the geographic distribution of FDI displays a clear preference, first for the capital city, and second, for the regions bordering the EU. Western Hungary and Western Poland have attracted most of the foreign capital outside Budapest and Warsaw, while the eastern parts of these countries have been neglected by foreign investors *(Hunya,* 1997*)*.

[3] Hungary has 7 NUTS II level large regions, 20 NUTS III level regions (Budapest +19 counties), and 150 NUTS IV level micro regions according to the EUROSTAT nomenclature. See *Maps 1–3*, in Appendix 2. NUTS (Nomenclature of Territorial Units Statistics) serves as a reference: *1.* For the collection, development and harmonization of (European) Community regional statistics; *2.* For the socio-economic analyses of the regions; *3.* For the framing of Community regional policies. (European Commission, 1995)

[4] In the case of FDI inflows Borsod county, a traditional centre of heavy industry in north Hungary, also occupies a favourable position.

[5] Budapest and Pest, Győr-Sopron, and Vas counties.

Map 1

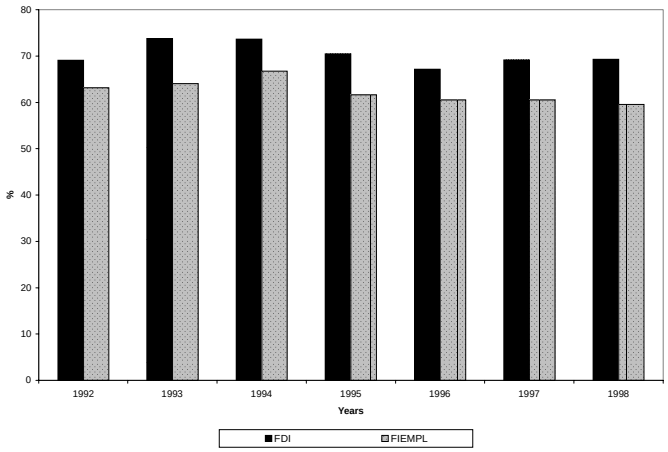
The regional distribution of the stock of FDI inflows and FIE employment in Hungary at the level of counties (1998)

Source: CSO FDI Database

HCSO statistics on FIE employment show a lesser but nonetheless significant spatial concentration than that of FDI inflows. About 60% of the total number of FIE employees were concentrated in the four most investor-friendly regions in 1998. Certain fluctuations have occurred in the regional distribution of FDI and FIE employment in more recent years, but there is no doubt that those regions which were among the 'winners' before and during the first years of the transition are also among the winners of the latest period.

Figure 2

Share of the most preferred regions from the stock of FDI inflows and from FIE employment (1998)



Note: Most preferred regions: Budapest, Pest, Győr-Sopron-Moson and Vas counties.
FDI: Share from the stock of FDI inflows.
FIEMPL: Share from the sum of FIE employees.
Source: CSO FDI Database

3. THE DETERMINANTS OF REGIONAL FDI INFLOWS IN HUNGARY

3.1 Theoretical and methodological background

The regional distribution of FDI and FIE employment within a host country depends in large part upon the availability of an advantageous geographical location. What is considered advantageous in this context may differ from those locational factors which influence the regional distribution of domestic investments. According to neo-classical and traditional approaches[6] a particular region may become attractive to a foreign investor when it possesses abundant and relatively inexpensive means of production which will allow a firm to increase its efficiency *(O'Sullivan,* 1985*; Grabaugh,* 1987*; Resmini,* 1999*)*. Theoretical work on FDI, and related empirical studies, offer a number of interpretations as to why foreign investors tend to choose particular countries as recipients of their investments. A substantial number of these studies have sought to identify and explain the reasons for international flows of capital investment towards CEE countries. However, little effort has been made to investigate the sub-national distribution of these investments, even though knowledge of this distribution is essential to understanding the impact of inward investment on the social and economic welfare of regions *(McDermott,* 1977*)*.

There are two approaches to the investigation of the sub-national distribution of FDI:

A. Questionnaire-based surveys

The first approach is the questionnaire-based survey which enquires about the most important motivations of decision-makers during the process of choosing a location. Those who utilise this approach should, however, take into account the substantial bias of the answers and the high refusal rate, especially in CEE countries (*Makó*, 1998). A number of important factors such as low labour costs or availability of financial assistance may not be disclosed by those questioned for reasons of corporate image (*Munday,* 1990).

Nevertheless, some useful lessons may be learned from the results of a number of empirical questionnaire-based studies carried out in the CEE countries (*Lieb–Dóczi*, 1997; *Makó–Ellingstad–Kuczi*, 1997; *Makó*; 1998):

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[6] See Dunning's OLI paradigm (*Dunning*, 1977, 1981); gravity approach (*Bergstrand*, 1985, 1989); and location theory (*Jones*, 1965; *Ottaviano* and *Puga*, 1997). For a brief overview of the literature of inter- and sub-national distribution of FDI, see *Hill* and *Munday (*1992), and *Resmini* (1999.)

- When evaluating the advantages or disadvantages of a certain regional economy, the regional 'physical capital' (i.e. the development of transportation and communication infrastructures) ranks behind the quality of the available workforce and the presence (or pool) of firms having developed production methods." (*Makó,* 1998)
- "Regional 'physical capital' ranks far behind the importance of regional human capital." (*Lieb–Dóczi*, 1997)
- What makes a CEE region " attractive to foreign investors is not only the cheap labour but rather the combination of a cheaper but more significantly highly trained and flexible workforce." (*Makó,* 1998)

B. Inter-regional econometric studies

The second approach uses inter-regional econometric studies to explain the distribution of the sub-regional FDI in terms of locational characteristics.[7] Most of these analyses emphasise the following regional effects:

- *Wage cost effects*

  Foreign investors prefer regions with relatively low wage levels.

- *Educational effects*

  Foreign investors prefer regions where a relatively well-educated labour force is available.

- *Proximity*

  The distance of the target region from economic centres and major transport networks is one of a set of indicators of market access which would also include proximity to markets and innovation centres, road, rail and air communication, and access to port facilities. Some of the studies emphasise the special advantages of border regions (e.g. *Bergstrand* 1989, *Hill* and *Munday* 1992).

- *Potential agglomeration effects*

  Markusen (1990) draws attention to the possibility that enterprises working in large agglomerations could share both private and public common support services in addition to infrastructures. The higher concentration of foreign firms compared to domestic ones may be considered a sign of the existence of those factors which attract new foreign investors once a "threshold" level has been reached. The "agglomeration effect" has become a generally accepted feature of

[7] *Hill* and *Munday* (1992) and *Martin* and *Velazquez* (1997) give brief overviews of these types of empirical study.

models seeking to explain the regional distribution of FDI inflows following *Krugman*'s (1991) explication. Krugman emphasises the crucial importance of externalities in the spatial concentration of the production. Enterprises concentrating their production in large urban agglomerations seek not only a reduction in their transport costs but also the advantage of labour pooling in those regions. The high concentration of FDI in urban agglomerations is partly explained by the "follow the leader" behaviour of foreign investors. In this way, newcomers can overcome their inexperience of a foreign market (*McConnell*, 1980).

Recent empirical studies based on econometric methods suggest that the regional distribution of FIE employment in CEE countries has been sensitive to most of the effects mentioned above (*Resmini,* 1999; *Fazekas* and *Köllő,* 1999; *Köllő,* 1999; *Fazekas,* 2000).

Table 1

The regional distribution of FDI in Hungary (1995)
(OLS for 170 regions)

Dependent: Foreign firm employees/population of working age

	Coeff.	T-value
Educational level[1]	0,032	5,2
Budapest	0,068	1,9
Austrian border regions:[2]		
* Vas	0,098	5,2
* Győr-Sopron I	0,063	3,1
* Győr-Sopron II	-0,006	0,3
Constant	-0,219	
aR^2	0,411	
Cook-Weisberg hetero.	2,56	(0,1096)
Reset	2,86	(0,0389)
Dependent variable (x100). mean: 4,4; min: 0, max: 25,1		
Predicted values at the minimum (7,0 classes) and maximum (9,4 classes) of the education variable are 0,5 and 7,8		

1) Completed schoolyears in the population over 7 years of age, 1990 Census.

2) Győr-Sopron: I. comprises Győr and the districts around border towns Sopron and Mosonmagyaróvár, II. comprises the Beled, Csorna and Kapuvár regions.

Data source: Foreign firm employees: Wage Survey 1995. Education and population: CSO TSTAR Database

Source: *Köllő* (1998).

In the case of Hungary, the bulk of FDI has so far been directed to Budapest and the western border regions. Regions with high educational levels attracted more FDI, other things being equal. *Table 1* below provides evidence of this picture by regressing an indicator of foreign firm density on educational level and four region dummies standing for the capital and the counties adjacent to Austria. The analyses were based on data from 170 NLC micro regions[8] in 1995. The model accounts for over 40% of the regional variation of foreign firm density.

The next section of the paper presents some new empirical results of regression estimates of determinants of regional differences in FIE employment. It is prefaced by a number of methodological observations.

Regional bias of the CSO FDI database

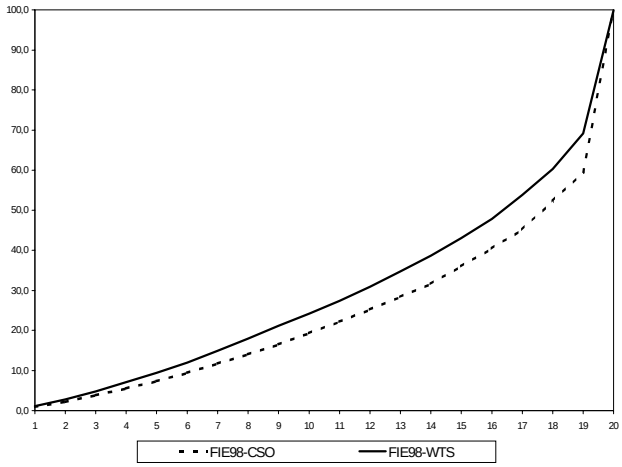
The CSO FDI database is the most comprehensive source of information on FDI inflows to Hungary. Nevertheless, in investigating the regional impact of FDI inflows we must be aware that the CSO FDI statistics substantially overestimate the spatial concentration of foreign investment enterprises. The reason for this bias is that the regional distribution of foreign capital and FIE employment has been measured by the location of company headquarters rather than the foreign-owned branch plants. As a result, the CSO FDI database does answer the requirements of empirical analyses on stochastic effects such as the impact of regional factors on the density of FIE employment. The bias of the sample could be greater than the effects of the factors investigated (*Hamar*, 1999).

Fortunately there is another database which can be used. The National Labour Centre's Wage Tariff Survey (WTS) appears to allow a more accurate measurement of the regional distribution of FIE employment. The WTS database consists of individual data of FIE employees indicating their home addresses. *Figure 3* shows that the county level regional distribution of FIE employees, based on WTS data, is less concentrated than that of the CSO-based figures. Obviously the difference between the two databases would be much greater at the level of micro regions. During the analyses in the following sections we used a number of variables to measure regional distribution of FIE employment from the WTS database.

[8] NLC micro regions refer to service areas of local labour exchange offices of the National Labour Centre in Hungary.

Figure 3

County level regional concentration of FIE employment in CSO-FDI and NLC-WTS databases (1998)

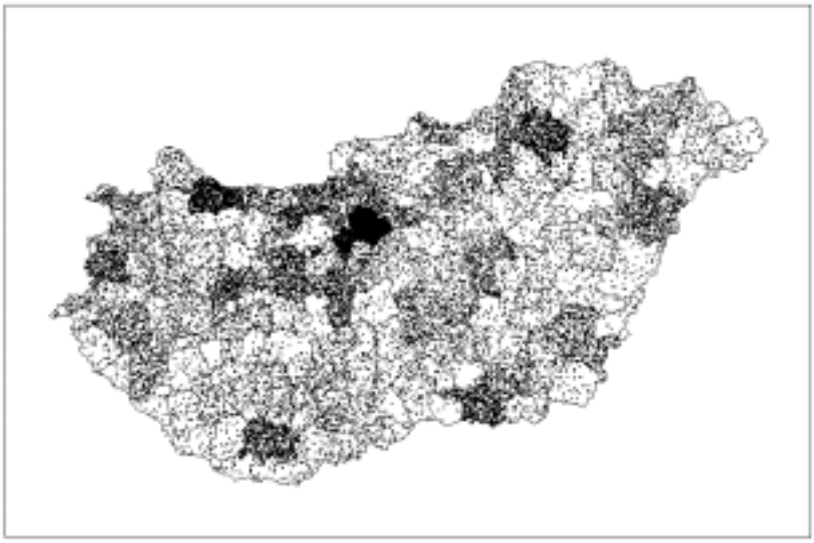


FIE98-CSO: Cumulative shares of FIE employment (CSO FDI database)
FIE98-NLC: Cumulative shares of FIE employment (NLC WTS database)
Source:CSO FDI Database and NLC WTS Database

Using WTS data we can draw a detailed picture of the regional distribution of corporate sector employment in Hungary. *Maps 2* and *3* below show the density of employees and FIE employment in Hungary at the level of micro regions. In both cases the density of employees is higher in the Budapest agglomeration, in county towns and in some regions close to the western border.

Map 2

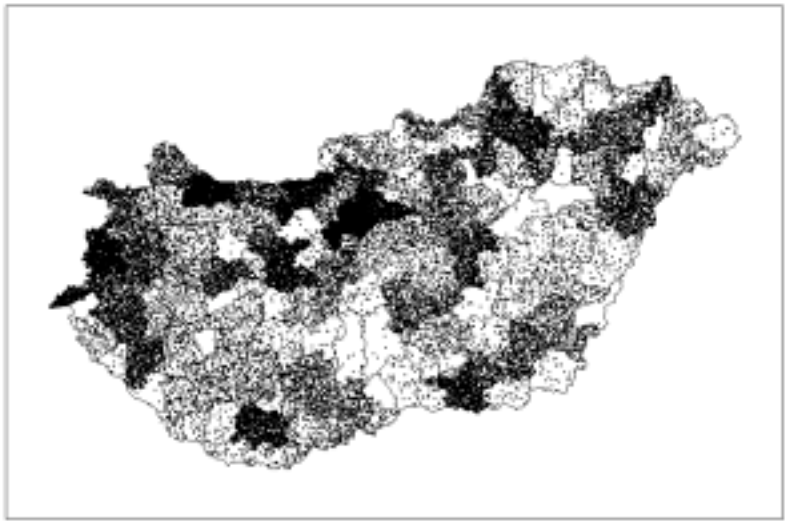
Density of employment in CSO micro regions, 1998 (1 dot = 100 employees)



Source: CSO Tstar database

Map 3

Density of FIE employment in CSO micro regions, 1998
(1 dot = 10 FIEs employees)



Source: NLC WTS database

The next section will investigate the determinants of the sub-national distribution of FIE employment. The following questions are addressed:

- What are the most important *FDI-specific factors of production in Hungary?*
- How do the preferences of foreign investors differ from those of domestic firms?
- How do the FDI-specific factors of production affect the spatial distribution of FDI inflows and the density of FIE employment in Hungary?

3.2 Differences in the regional preferences of domestic firms and foreign investment enterprises

Comparison of regression coefficients of the explanatory variables on the regional density of foreign firm and domestic firm employment yields some information about the preferences of foreign investors in Hungary. Estimates in the model were based on the 150 CSO micro regions. Density of FIE employment (FIEMPL) and domestic firm employment (DOMEMPL) was measured by the ratio of the working age population

employed in foreign and domestic firms. Independent variables in the equations represent the most important explanatory factors mentioned above *(Table 2)*.

Table 2

Variables used in the analyses

Variable labels	Content of variables	Measure
FIEMPL**	Ratio of foreign-firms' employees in the working age population	%
DOMEMPL**	Ratio of domestic firms' employees in the working age population	%
EDU*	Educational level of the local population was measured by years spent in school by the average resident over 7 years old	Years
DISTANCE*	Average distance of region centres from Hegyeshalom and Rábafüzes (crossing points to Vienna and Graz in Austria)	Km
WBORDER*	Stands for micro regions along the Austrian, Western Slovakian and Slovenian borders	Dummy
BUDAPEST*	Stands for the capital of the country	Dummy
COUTOWN*	Dummy variables which stands for county towns of Hungary	Dummy

Source of the variables: * CSO Tstar database; ** NLC WTS database

The R squares in *Table 3* show that the explanatory variables could explain more than 50% of variance of both dependent variables. The educational level of the local population seems to be the crucial factor in both cases. Nevertheless there is one important difference: variables representing proximity and agglomeration effects have significant, (in case of WBORDER dummy high) explanatory power on the density of FIEs employment, while they have no effects on the density of domestic firms employment. It is undoubtedly the case that the educational level of the local population has had the greatest influence on the regional distribution of FIE employment in recent years. However we should enter some caveats before drawing up far-reaching policy recommendations based on this result.

There is a high correlation between the level of education and indicators of infrastructural development of local purchasing power such as per capita phones, proportion of dwellings connected to the drainage and gas systems, and/or per capita taxable income. This calls for caution in interpreting the effect of educational levels on regional density of FIEs and domestic firms.

Table 3

Determinants of regional density of FIE and domestic firm employment (1998)

	DOMEMPL			**FIEMPL**		
	Stand. coef.	t	sig.	Stand. coef.	T	sig.
(Constant)		-1,578	0,118		-1,2803	0,204
EDU	**0,462**	2,706	0,008	**0,3677**	1,9843	0,050
DISTANCE	**-0,072**	-0,830	0,408	**-0,162**	-1,726	0,088
WBORDER	**0,093**	1,238	0,219	**0,252**	3,1099	0,002
BUDAPEST	**0,065**	0,586	0,560	**0,198**	1,6541	0,102
COUTOWN	**0,245**	2,155	0,034	**0,029**	0,2381	0,812
MISSCASE	**-0,090**	-1,295	0,198	**-0,112**	-1,4816	0,142
aR2	**0,604**			**0,537**		
F	25,992			19,944		
Sig.	0,000			0,000		

Educational level is a proxy for several indicators connected to urbanisation. Nevertheless, experiments with alternative specifications suggest that education is indeed the key variable in a set of correlated regional indicators. Adding phone, gas, drainage or income to the equation yields insignificant parameters for these variables but virtually unchanged coefficients for education. If education is dropped and the above-mentioned indicators are entered one by one their effect appears to be significant, except for phones, but the fit of the model deteriorates. Regressing foreign firm density on the share of agricultural employees results in a significant negative parameter but in specifications including education levels the agriculture variable proves insignificant. Other proxies of urbanisation, such as average settlement size or the proportion of the urban population, prove insignificant in any specification.

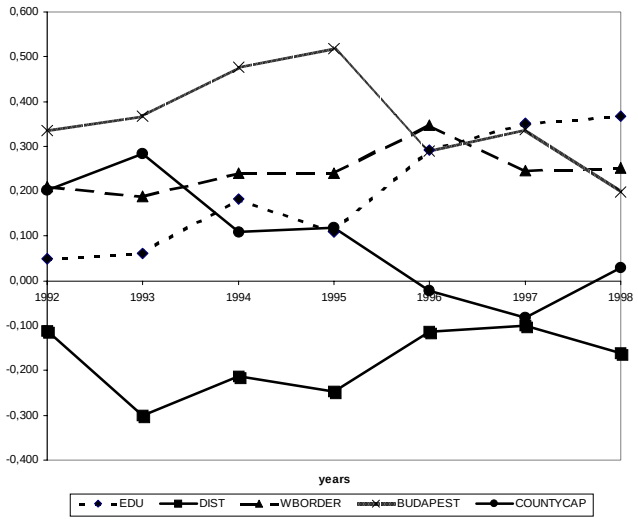
3.3 Time path of explanatory power of key variables

An important task of regional development is to attract foreign investment to less desirable, geographically remote regions. The regional distribution of FDI indicates that government and local actors have not enjoyed much success in this respect to date. However, it is possible that the increasing scarcity of skilled labour may stimulate foreign investment in hitherto neglected areas.

The regional database of the Institute of Economics consists of a number of variables for each year between 1992–98 (see *Table 4*). This makes it possible to use repeated cross-section estimates to measure the time path of the effects of explanatory variables on FIE employment density. Changes in the explanatory power of key variables reflect changes in the preferences of foreign investors over the period. *Table 4* sums up the empirical results of the estimates. Adjusted R^2 indicates the high explanatory power of the variables included for each year. They explain 31–75% of regional variations in FIE employment. Meanwhile, there were substantial changes in the explanatory power of key variables over the period. The time path of standardised regression parameters indicates the following tendencies (see *Figure 4*):

Figure 4

Time path of explanatory power of the independent variables



- Variables indicating geographical situation (DIST, WBORDER, BUDAPEST, COUTOWN) had the dominant role in the early years of the transition.

- The educational level of the local population (EDU) has an important and continuously increasing explanatory power.
- Parameters show the high and stable explanatory power of the WBORDER dummy, the decreasing explanatory power of the BUDAPEST dummy and the diminishing explanatory power of the COUTOWN dummy.

Table 4

Empirical results of estimations on density of FIE employment (1992–98)

Dependent var: FIEMPL

	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
(Constant)							
t.	0,179	0,364	-0,514	0,039	-0,949	-1,222	-1,280
Sig.	0,858	0,716	0,609	0,969	0,345	0,225	0,204
EDU	**0,049**	**0,061**	**0,183**	**0,109**	**0,291**	**0,351**	**0,367**
t.	0,205	0,363	1,243	0,808	1,535	1,850	1,984
Sig.	0,838	0,717	0,217	0,421	0,128	0,068	0,050
DIST	**-0,112**	**-0,301**	**-0,213**	**-0,247**	**-0,114**	**-0,100**	**-0,162**
t.	-0,932	-3,540	-2,807	-3,592	-1,173	-1,026	-1,726
Sig.	0,354	0,001	0,006	0,001	0,244	0,308	0,088
WBORDER	**0,211**	**0,189**	**0,240**	**0,241**	**0,348**	**0,247**	**0,252**
t.	2,045	2,564	3,654	4,030	4,095	2,938	3,110
Sig.	0,044	0,012	0,000	0,000	0,000	0,004	0,002
BUDAPEST	**0,336**	**0,368**	**0,477**	**0,518**	**0,290**	**0,337**	**0,198**
t.	2,143	3,336	4,884	5,842	2,290	2,713	1,654
Sig.	0,035	0,001	0,000	0,000	0,024	0,008	0,102
COUTOWN	**0,202**	**0,283**	**0,109**	**0,119**	**-0,023**	**-0,081**	**0,029**
t.	1,292	2,559	1,105	1,317	-0,180	-0,644	0,238
Sig.	0,200	0,012	0,272	0,191	0,857	0,521	0,812
MIS.CASES	**-0,038**	**-0,093**	**-0,071**	**-0,137**	**-0,129**	**-0,120**	**-0,112**
t.	-0,420	-1,419	-1,202	-2,512	-1,674	-1,549	-1,482
Sig.	0,676	0,159	0,232	0,014	0,098	0,125	0,142
AR2	**0,315**	**0,646**	**0,711**	**0,752**	**0,506**	**0,510**	**0,537**
F	7,948	29,282	39,644	50,088	17,355	17,801	19,945
f sig.	0,000	0,000	0,000	0,000	0,000	0,000	0,000

To sum up: after the first years of the transition, when almost all FIE employment was concentrated in Budapest, the Austrian border regions and

the county towns, FIE employment seems to be spreading towards rural regions and regions where there is a well-educated, skilled workforce.

4. The impact of FIE employment on regional unemployment rates

One of the most important consequences of the transition process for the labour market has been increasingly marked regional differences as measured by regional unemployment rates. *Figure 5* shows the time path of differences in unemployment rates for 150 micro regions. The lines represent average unemployment rates of the deciles divided by the median. It is clear that the upswing in relative differences is the result mainly of the continually worsening position of those regions with the highest unemployment rates.

The causes and implications of regional unemployment differences in Hungary have been extensively discussed (*Fazekas* 1996, 2000, *Ábrahám* and *Kertesi* 1998). The results of empirical studies show that the adjustment mechanism does not function properly due to limitations on the supply side (such as lack of housing market, high cost of commuting etc.). As far as the demand side mechanism is concerned, the outcomes of regional wage adjustment can lead to lower wage costs, and lower wage costs in turn may attract inward investments which would create jobs in regions where unemployment is high.

If we consider the role of FDI inflows in the process of demand side adjustment, some important questions arise. If regional wage adjustment exists and regional wage cost differences increase, what effect would this have on sub-regional FDI inflows? Can we detect signs of FDI inflows towards regions with high unemployment and low wage costs? Might this type of FIE employment result in a substantial decrease in regional unemployment differences?

According to recent empirical studies, increases in regional unemployment differences have the same impact on regional wage differences as they do in most of the developed market economies. Large-scale regional differences in unemployment rates resulted appearance of wage curveduring the first years of the transition (*Kertesi* and *Köllő* 1999). Wages and wage costs fell in regions with relatively high unemployment rates and vice versa. Elasticity of individual earnings with respect to regional unemployment rates increased from –0,016 to –0,1 between 1989 and 1996 (see *Figure 6*).

Figure 5

Time path of regional unemployment rates 1992–99

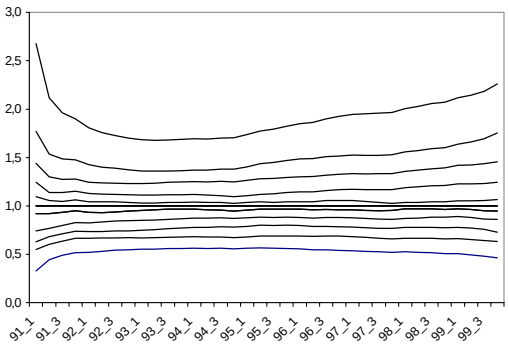
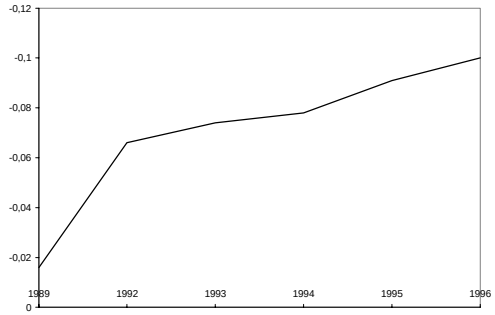


Figure 6

Elasticity of individual earnings with respect to regional unemployment 1989–96



In the next section we test the following hypothesis using a cross-sectional time-series regression model:

- The relationship between relative regional wage costs and the spatial distribution of FIE employment is significant and negative.
- The relationship between relative differences of one year-lag regional unemployment rates and the spatial diffusion of FIE employment is significant and positive

In other words, we assume that, other factors being equal, foreign investors prefer to locate in regions with lower wage costs and higher unemployment rates.

To test this hypothesis we retained two key variables of the cross-section regression model described in the last section (**EDU** and **DIST**) and introduced two new variables: **WCOST**, to measure relative regional wage cost differences after filtering the effects of regional differences in gender composition, educational level, firm size, and productivity of the employed population; and **ULAG,** which measures one year-lag regional unemployment rates.

The original variables of the relative wage cost estimation came from the NLC Wage Tariff Survey. Unfortunately, the sample size of the survey did not enable us to calculate relative wage cost indicators at the level of micro regions. Therefore, we had to compress the 150 micro regions into 14 "FDI regions" by dividing each of the seven large regions of Hungary into two groups: micro regions of county towns and micro regions outside the

county towns. Time-related variables of the model were available for the seven years between 1992–98.

The methodology adopted was to regress the logarithm of the dependent variables (logFIEMPL – measuring regional performance in terms of proportion of FIE employment in the working age population) on the logarithm of the independent variables (logDIST, logEDU, logWCOST, and logULAG) using a set of 14 regions and seven years' data in a pooled sample of 98 observations for dependent and independent variables. The empirical results of the estimates are presented in *Table 5*.

Table 5

Effects of selected regional variables on FIE employment (14 regions over 7 years)

```
Random-effects GLS regression                                   -
sd(u_reg)              =  .1427911       Number of obs =      98
sd(e_reg_t)            =  .1613422             n =      14
sd(e_reg_t + u_reg)    =  .2154544             T =       7
corr(u_reg, X)         =  0 (assumed)     R-sq within  =  0.0749
                                              between  =  0.8996
                                              overall  =  0.8017
                                          chi2(  4)    =   98.74
(theta = 0.6072)                            Prob > chi2 =  0.0000
------------------------------------------------------------------
 logfdi |     Coef.   Std.Err.   z    P>|z|  [95% Conf.Interval]
--------+---------------------------------------------------------
logEDU   | 3.720843  .8748476  4.253  0.000   2.006174  5.435513
logWCOST | .8472347  .4150585  2.041  0.041    .033735  1.660734
logDIST  |-.3291536  .0784514 -4.196  0.000  -.4829155 -.1753917
logulag  |-.1164142  .0593332 -1.962  0.050  -.2327051 -.0001234
   _cons |-6.587073  1.999442 -3.294  0.001  -10.50591 -2.668239
```

Correlation coefficients of EDU and DIST variables show the same tendencies that we have seen in the models discussed in the previous section. Foreign investors seem to prefer urbanised regions with an educated workforce and proximity to the western border. However, the positive significant coefficient of relative wage costs and the negative coefficient of regional unemployment rates do not justify our hypothesis. Foreign investors prefer urbanised regions with proximity to the western border regardless of the presence of higher wage costs and lower unemployment rates. These results concur with the conclusions of research which shows that FIEs pay higher than average wages, employ higher quality labour, prefer Budapest and western Hungarian urbanised regions and are reluctant to change their allocation preferences even in the face of increasing labour scarcity in the local labour markets of these regions (*Köllő* and *Fazekas,* 1999; *Köllő,* 1999).

Does this mean that all types of FDI favour regions with an educated and relatively costly labour force?

Our hypothesis was based on the assumption that FIE labour demand has a homogenous character. We assumed that foreign investors would on the whole prefer regions with quite a high concentration of relatively low cost, educated workers, and which are accessible to western innovation centres. It would appear, however, that FIE labour demand is not homogenous: we can distinguish at least two main types of FIE.

1. *Knowledge-based enterprises*

   Knowledge based enterprises definitely prefer a well-educated workforce and are prepared to accept the relatively higher wage costs which characterise the regions in which this type of labour is available. This type of firm is concentrated in large urban agglomerations and their location preferences are not influenced by differences in regional unemployment rates.

2. *Labour intensive enterprises*

   Labour intensive enterprises[9] have a preference for regions with low labour costs where unskilled labour is available. They tend to locate outside large urban agglomerations with higher than average unemployment rates.

In the next section of the paper we will test the following hypothesis, that, among preferred regions, those with an urban character attract knowledge based FIEs, while those outside urban centres attract labour intensive FIEs. If this is correct, it means that the impact of relative regional wage costs and regional unemployment rates on the density of FIE employment would be different in the two groups of regions.

[9] The high density of this type of firm is called the "Maquiladora syndrome" after the region of Maquiladora near the US - Mexican border. This region has attracted an extremely high concentration of small foreign enterprises as a result of the availability of cheap and unskilled labour and proximity to US markets. Several studies have been published on the "Maguiladora syndrome" in CEE countries, *Pavlinek* and *Smith* (1998) *Begg* and *Pickles* (1998), *Ellingstad* (1996).

Table 6

Effects of selected regional variables on FIE employment in urban regions (Panel A: 7 urban regions over 7 years)

```
Random-effects GLS regression                                   *
7 Regions (county towns)                                        *

sd(u_reg)             =         0        Number of obs =      49
sd(e_reg_t)           =  .1215369                 n =       7
sd(e_reg_t + u_reg)   =  .1215369                 T =       7

corr(u_reg, X)        =  0 (assumed)     R-sq within   =  0.0099
                                              between  =  0.9947
                                              overall  =  0.9141
                                         chi2(  4)     =  468.44
(theta = 0.0000)                           Prob > chi2 =  0.0000
------------------------------------------------------------------
logfdi |    Coef.    Std.Err.    z      P>|z| [95% Conf. Interval]
---------+--------------------------------------------------------
logEDU  | 4.699459  .8479327   5.542   0.000  3.037541  6.361376
logWCOST| .7693246  .4446572   1.730   0.084 -.1021874  1.640837
logDIST |-.3491474  .0313759 -11.128   0.000  -.410643 -.2876519
logULAG |-.0832547   .055285 - 1.506   0.132 -.1916114  .0251019
   _cons|-8.527856  1.829357  -4.662   0.000 -12.11333 -4.942382
```

Table 7

Effects of regional variables of FIE employment in rural regions (Panel B: 7 rural regions over 7 years)

```
Random-effects GLS regression                                   *
7 regions (regions not connected to county towns)               *
sd(u_reg)             =   .0641802        Number of obs =      49
sd(e_reg_t)           =  .1920253                 n =       7
sd(e_reg_t + u_reg)   =  .2024669                 T =       7

corr(u_reg, X)        =  0 (assumed)      R-sq within   =  0.1305
                                              between  =  0.8816
                                              overall  =  0.6895
                                         chi2(  4)     =   65.00
(theta = 0.2509)                           Prob > chi2 =  0.0000
------------------------------------------------------------------
 logfdi|   Coef.     Std.Err.    z    P>|z| [95% Conf. Interval]
---------+--------------------------------------------------------
 logisk| -6.601861  2.832011  -2.331  0.020   -12.1525 -1.051222
   logw|  1.011334  .6394553   1.582  0.114  -.2419757  2.264643
 logtav| -.7148035  .1435604  -4.979  0.000  -.9961768 -.4334303
logulag| -.2333451  .1104386  -2.113  0.035  -.4498007 -.0168895
  _cons|  16.84805   6.48085   2.600  0.009   4.145814  29.55028
```

Tables 6 and *7* show the results of linear regression estimates in two panels of regions: Panel A ("urban regions": seven regions of county towns) and Panel B ("rural regions": seven regions not connected to county towns). We can see that there are substantial differences in the standardised coefficients of the explanatory variables:

- In the case of urban agglomerations the educational level is the dominant variable. Distance from the Austrian border has a significant negative effect on the density of FIE employment. Relative wage costs have a positive effect on the density of FIE employment.
- FIEs in rural regions prefer regions close to the western border where the level of education is relatively low. Relative wage costs have no significant effect on the density of FIE employment.

These tendencies at least partly justify our hypothesis. Preferred urban agglomerations with higher than average wage costs and higher than average educational levels tend to attract knowledge-based firms, while preferred regions outside urban centers with equal or lower than average wage costs and lower than average educational levels tend to attract labour intensive enterprises.

5. Conclusion and policy implications

5.1 Main findings

The main purpose of this paper was to illuminate the determinants and impacts of the geographical distribution of FIE employment in Hungary. Empirical results confirm that the educational level of the population, urbanisation and proximity to the western border are the crucial factors in this field. Budapest and some other urban centres with a high concentration of skilled workers and proximity to the western border offer the most favourable conditions for FIE employment development. Outside urban areas, FDI seems to prefer rural regions with a lower level of education. The low wage costs which are typical of remote underdeveloped rural regions with high unemployment rates had no significant impact on the spatial distribution of FIE employment.

The fact that there is no significant negative effect resulting from relative wage cost difference indicates the absence of a demand side adjustment mechanism affecting regional labour market differences. FDI has created jobs in regions which originally had lower than average unemployment rates. *Figure 7* shows a strong correlation between regional unemployment

rate differences in 1991 and differences in the regional density of FIE employment in 1998.[10] *Figure 8* illustrates that changes in the position of regions with regard to the density of FIE employment did not correlate with changes in regional unemployment rate differences.

Figure 7

Relative regional unemployment rates (1991) by relative regional density of FIE employment (1998) in the 14 FDI regions

(cor.coef: -0,783)

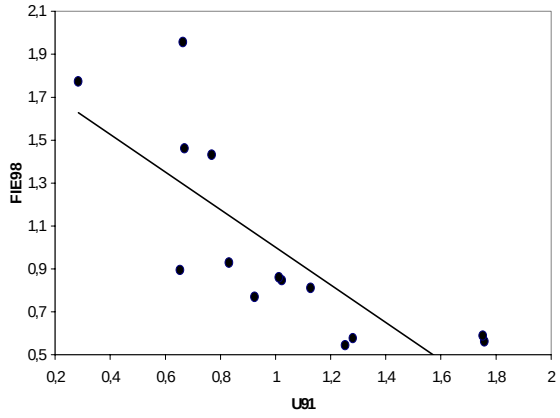
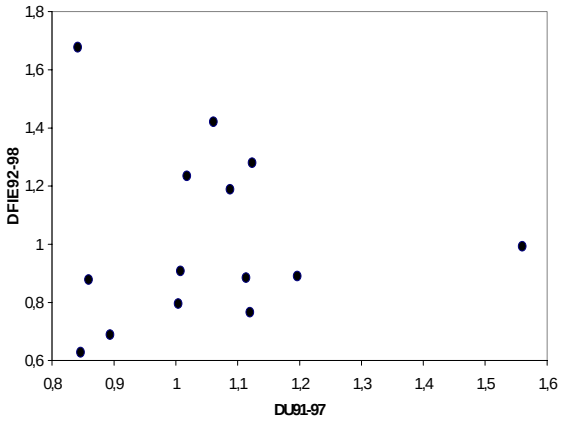


Figure 8

Changes of relative regional unemployment rates (1991–97) by changes of relative density of FIE employment (1992–98) in the 14 FDI regions

(cor.coef: 0,000)



The growing explanatory power of educational levels and stability of proximity related factors, together with the effects of geographical factors, call attention to the limits of large-scale decentralisation of FIE employment in Hungary in the future. Despite the fact that skilled labour is becoming scarce and more costly in the developed urban regions, foreign firms do not seem to be willing to move to the eastern periphery of the country. Underdeveloped regions (such as those east of the Tisza river) with a poorly educated population have attracted only a very small number of new firms. Since educational levels, urbanisation and proximity have proved to be the most important considerations in attracting FIEs to a particular region, we cannot expect to witness a major shift to the east in the foreseeable future.

[10] Relative regional unemployment rate = regional unemployment rate as a percentage of the national average. Relative density of FIE employment = regional density of FIEs employees as a percentage of the national average.

5.2 Policy implications

- It is clearly not possible to change the distance of regions from the western border, but accessibility to the western innovation centres could be improved by the development of transport and communication infrastructures.
- Positive cross-border effects could be encouraged, and their scope extended, by the introduction and enlargement of cross-border co-operative initiatives.
- There is an urgent need for large-scale investment in a much more decentralised educational infrastructure, particularly at secondary level.[11]
- Urban agglomerations, especially Budapest, have very important FDI-related externalities in addition to a high concentration of educated workers. FDI-related regional development should be based on the further development of urban agglomerations to improve their capacity in a range of areas, such as financial, production, telecommunications and cultural services.
- The spatial impact of job creation through FIE enterprises in urban areas could be diffused by ensuring the employability of people living in regions outside urban centres, for example by providing access to urban educational infrastructures, developing transport links for commuters, etc.
- Last but not least, different fields of FDI-based employment development should be integrated into a coherent framework. For example, financial initiatives to subsidise commuting would succeed only where there was already a relatively well-educated workforce and a developed traffic system.

[11] Among the 3,200 communities in the country only 200 have any kind of secondary education (including vocational schools and vocational training schools) (*Kertesi* and *Köllő*, 1999).

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Appendix 1

Table 1 **FIE employment in Hungary (%)**

	Double and single bookkeeping enterprises (financial sector excluded*)	Enterprises covered by corporation-tax declarations**	Enterprises covered by NLC wage-tariff survey***
1992	13,2	n.a.	–
1993	18,4	20,0	–
1994	21,3	23,5	–
1995	25,0	25,3	–
1996	25,7	25,1	–
1997	28,0	27,1	24,50
1998	29,1	32,8	28,30
1999	n.a.	n.a.	30,60

Sources: * CSO database in FDI to Hungary
** CSO FDI Database
*** NLC individual wage-earnings surveys (earlier data did not include this information)

Notes: * Enterprises which submitted a corporation-tax declaration, i.e. double and single bookkeeping enterprises and sole entrepreneurs who submitted a corporation-tax declaration (financial sector excluded).
** Enterprises which submitted a corporation-tax declaration, i.e. double and single bookkeeping enterprises and sole entrepreneurs who submitted a corporation-tax declaration
*** Corporate sector enterprises with more than 10 employees

Table 2 **Regional proportions of employment in FIEs in the corporate sector (%)**

	1992	1993	1994	1995	1996	1997	1998
Budapest*	**50,0**	**49,7**	**53,1**	**46,1**	**44,5**	**42,6**	**40,5**
Baranya	4,1	3,3	3,1	3,3	3,3	2,9	2,9
Bács-Kiskun	3,1	3,0	2,9	2,5	2,5	2,5	2,5
Békés	1,0	1,0	1,1	1,4	1,3	1,3	1,7
Borsod	3,9	3,0	2,4	2,9	5,2	4,4	4,4
Csongrád	3,2	2,7	2,5	3,3	3,2	3,3	3,2
Fejér	2,2	3,5	3,2	3,7	3,9	4,1	4,5
Győr-Sopron**	**4,5**	**5,1**	**4,9**	**5,8**	**5,4**	**6,7**	**7,3**
Hajdú-Bihar	2,9	2,3	2,0	3,7	3,1	3,4	3,2
Heves	2,0	1,8	1,7	2,6	2,5	2,3	2,3
Komárom	2,6	2,9	2,6	2,8	2,8	2,9	2,8
Nógrád	1,2	1,2	0,9	0,8	0,9	0,8	0,9
Pest*	**5,3**	**5,3**	**5,2**	**5,6**	**6,3**	**6,7**	**7,1**
Somogy	1,5	1,4	1,6	1,7	1,6	1,7	1,8
Szabolcs	1,4	1,5	1,3	1,2	1,6	1,5	1,6
Jász-Nagykun-Szolnok	2,3	1,2	1,6	1,7	1,7	2,1	2,1
Tolna	1,1	1,2	1,1	0,9	1,0	1,2	1,3
Vas**	**3,4**	**3,9**	**3,6**	**4,2**	**4,3**	**4,5**	**4,7**
Veszprém	2,2	3,1	2,7	3,0	2,6	2,7	3,0
Zala	2,2	2,7	2,5	2,7	2,5	2,3	2,3
FIEs employment (000)	331	368	432	473	490	538	572

* central regions ** western border regions

Source: CSO FDI Database

Table 3 Regional shares of the stock of FDI in the competitive sector (%)

	1992	1993	1994	1995	1996	1997	1998
Budapest*	**52,8**	**58,4**	**57,4**	**52,2**	**50,1**	**50,4**	**48,8**
Baranya	2,9	2,3	2,2	2,8	2,4	2,0	2,2
Bács-Kiskun	1,9	2,1	1,7	1,3	1,2	1,3	1,1
Békés	2,2	1,5	1,5	1,3	1,0	0,8	1,1
Borsod	**4,5**	**2,2**	**2,3**	**3,0**	**6,9**	**5,8**	**5,9**
Csongrád	1,5	1,2	1,4	3,0	2,9	3,0	3,0
Fejér	3,7	3,7	3,8	3,5	3,4	4,0	3,9
Győr-Sopron**	**4,1**	**3,9**	**4,3**	**5,9**	**5,4**	**6,0**	**6,6**
Hajdú-Bihar	1,8	1,4	1,2	3,4	3,2	3,1	3,1
Heves	2,0	1,4	1,2	1,9	2,1	1,8	2,0
Komárom	2,9	3,6	3,7	3,0	3,5	2,9	2,6
Nógrád	1,1	0,7	0,7	0,7	0,5	0,5	0,5
Pest*	**8,2**	**8,3**	**8,3**	**8,9**	**8,6**	**10,1**	**11,1**
Somogy	0,9	0,9	1,0	0,9	0,8	0,9	1,0
Szabolcs	0,7	1,0	0,8	0,6	0,7	0,8	0,7
Jász-Nagykun-Szolnok	1,8	0,8	1,1	1,0	1,0	1,0	1,0
Tolna	0,4	0,6	0,5	0,4	0,3	0,3	0,3
Vas**	**3,9**	**3,2**	**3,8**	**3,5**	**3,0**	**2,8**	**2,8**
Veszprém	1,3	1,1	1,2	1,0	1,5	1,3	1,2
Zala	1,3	1,5	1,7	1,7	1,4	1,2	1,0
FDI Billion HUF	359.307	609.302	750.257	1191.089	1449.629	1831.817	2137.155

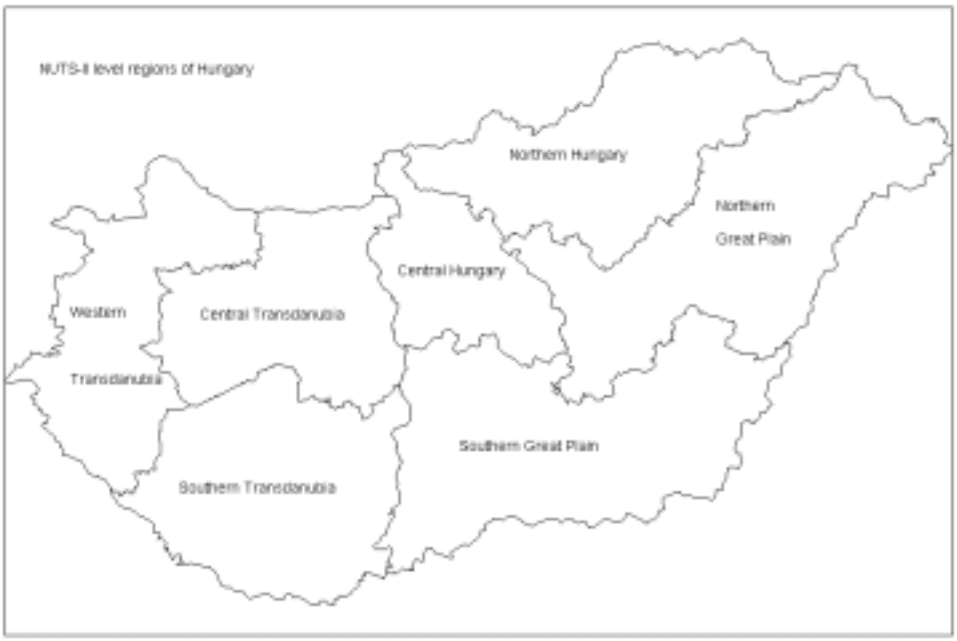
* central regions ** western border regions

Source: CSO FDI Database

Appendix 2

Regions of Hungary according to the EUROSTAT nomenclature

Map1 ***NUTS-II level regions***



Map 2 ***NUTS-III level regions***

Map 3 ***NUTS-IV level regions***