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Working Paper

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Contrasting the dynamic patterns of manufacturing and service FDI: Evidence from transition economies[*]

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Abstract — *We contribute to the foreign direct investment (FDI) literature by providing first empirical evidence on the relative importance of location factors for service and manufacturing FDI. This is of particular interest as the global stock of inward FDI in the service sector has become predominant in the last ten years. Based on a sectoral panel of eight new European member states in the period of 1998 to 2004 we perform a dynamic panel analysis allowing for individual adjustment periods across sectors. Results support our assumption that investment into the service sector, which is characterized by low installation costs, adjusts much faster to its desired level than manufacturing FDI. Furthermore, since services are mostly non-tradable, FDI into this sector is largely based on market-seeking motives while manufacturing FDI is also driven by international price competitiveness measured via real unit labor costs.*

Keywords: Foreign direct investment; service sector; stock adjustment model; transition economies

JEL-Classification: C23; F21; P33

1 Introduction

Foreign direct investment (FDI) has increasingly shifted towards the tertiary sector. This global trend is not only a result of the growing services economy but largely reflects the non-tradability of many services, which implies that local operations have to be established through FDI in order to serve the foreign market. While in 1990 the world global FDI inward stock in services accounted for 48%, it increased to roughly 60% in 2002 (UNCTAD, 2004). Given this shift in the industrial composition of FDI and the specific (non-tradable) nature of service activities the question arises, whether determinants of investment patterns have changed accordingly. In order to tackle this issue, service and manufacturing FDI have to be contrasted within one framework so as to reveal the relative importance of its location factors and hence, to assess which determinants are likely to dominate future investment patterns.

Yet, empirical evidence on these matters is so far missing. Although, there is a fast growing literature analyzing FDI determinants empirically, most of these studies rely on FDI data aggregated over industries or on investment operations into the manufacturing sector.[1] Some few papers focus on determinants of service FDI (e.g., Kolstad and Villanger, 2008 performing a panel analysis of the whole service sector at the industry-level and Yamori, 1998 focusing on the financial sector). We are not aware of any study contrasting manufacturing and service industries by means of a single model framework. Thus, the available empirical results are not suited to assess whether investment decisions are based on the same determinants across the two major recipient sectors.

In particular, service FDI is likely to be attracted primarily by a large customer base since services mostly have to be produced where they are consumed. In contrast, the relevance of international price competitiveness is higher for multinational enterprises (MNEs) that reexport their goods outside the respective host country. As service products are far less tradable than manufactured goods, input cost factors like real unit labor costs are likely to have a much lower impact on service FDI.

Our analysis addresses this open issue by explaining the allocation of FDI in 20 manufacturing and service industries of eight new EU member states[2] (NMS-8) by means of host-country location factors. The considered time period from 1998 to 2004 very well reflects the global trend of increasing services FDI. Already in 1998, the stock of inward FDI in the tertiary sector

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[1]For a broad literature review on FDI determinants see for example Bloningen, 2005.

[2]Czech Republic (CZ), Estonia (EE), Hungary (HU), Latvia (LV), Lithuania (LT), Poland (PL), Slovakia (SK), Slovenia (SI)

was predominant in these countries and its share enlarged over the years as can be seen in figure 1.
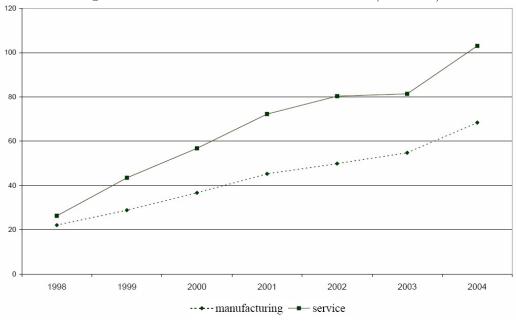
Figure 1: FDI inward stocks in the NMS-8 (bn Euro)

Source: WIIW Database (2006)

To account for the persistence of FDI stocks, the econometric specification is built on the partial adjustment model, where the desired level of investment stocks is assumed to adjust gradually rather than instantaneously. This approach enables to distinguish the short- and long-run evolution of FDI, which is of particular interest as the speed of adjustment to the desired investment stock is likely to vary across sectors due to differences in capital intensities.

Our estimation results indicate that service FDI indeed follows a different pattern concerning both, the adjustment path and certain location factors. While FDI into the manufacturing sector needs around five years to adjust to its equilibrium level, service FDI converts already within two years. In terms of location factors, market size has a higher impact on services FDI in the short-run but aligns to the elasticity of manufacturing FDI in the long-run. Moreover, it is shown that labor cost differences across host countries do only matter for investment activities in the manufacturing sector.

The paper is structured as follows. The next section provides the theoretical foundation for the econometric model and discusses the selection of location variables and their measurement. The econometric specification is

outlined in section 3, with an emphasis on the proper choice of the estimator. In section 4 the results are presented, thereby stressing the difference in determinants across sectors. The final section concludes.

2   Theoretical Foundation

To explain the patterns of multinational activity within the NMS-8 we follow Cheng and Kwan (2000) and adopt a stock adjustment model.[3] It is assumed that the equilibrium level of FDI stock y_t^* adjusts by a certain proportion of the difference between desired and actual capital in each period such that,

$$y_t - y_{t-1} = \theta(y_t^* - y_{t-1}) \tag{1}$$

or re-arranging terms

$$y_t = (1 - \theta)y_{t-1} + \theta y_t^*. \tag{2}$$

Following the contributions to the neoclassical investment theory by e.g., Eisner and Strotz (1963) and Lucas (1967) firms have to pay certain adjustment costs in order to increase their fixed capital stock. The idea is that new capital is fully effective after a learning or installation period. The resulting adjustment or installation costs increase with the level of investment. Therefore, it is not optimal for firms to raise the capital stock instantaneously but to converge to the targeted level. The parameter θ, which is assumed to be in the range of $(0, 1)$ indicates the speed of this adjustment process. Since expenditures on fixed capital are much higher in manufacturing FDI (UNCTAD, 2004) the desired level of investment is likely to be achieved slower due to higher installation costs. Thus, given the difference in capital intensities across sectors, we would expect the speed of adjustment coefficient θ to be higher for FDI into the service sector. This would imply that determinants of service FDI exhibit a higher part of their overall impact at the beginning of the investment process while they would have a more lasting and smooth effect on manufacturing FDI.

While the speed of adjustment depends on internal adjustment costs, the distribution of the targeted capital stock y_t^* across the NMS-8 is assumed to depend on location factors comprising several transition specific country

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[3]Kinoshita and Campos (2006) take a similar approach to investigate FDI determinants at the aggregate level for a panel of transition economies. For econometric details see Verbeek (2004) or Hendry (1995).

characteristics (Dunning, 1988). These determinants of FDI are summarized in X_t, such that the complete model reads

$$y_t = (1 - \theta)y_{t-1} + \theta\omega X_t. \tag{3}$$

They can be classified according to the motives of the multinational enterprise (e.g., Barba Navaretti and Venables, 2004). While the purpose of *market-seeking* FDI is to serve the domestic or regional market, *efficiency-seeking* FDI aims at exploiting cost advantages (e.g. labor costs differences) by splitting production processes according to factor intensities. Variables affecting the accession to the host market, like transportation costs, are assumed to impact differently depending on the investment type. Accordingly, market-seeking FDI is encouraged by trade costs as they induce investors to supply a foreign market through FDI rather than through exports. In contrast, efficiency-seeking investment is negatively affected by trade costs as it becomes more costly to reexport produced goods.

Yet, the specific nature of services enables to draw conclusions about investors' motives. Since many services are neither tradable nor storable, but must be produced where they are consumed, FDI activities in the service sector are expected to be primarily affected by market-seeking motives. In contrast, manufacturing FDI is likely to be driven by efficiency-seeking motives as well, since manufactured goods are not characterized by the *uno actu* principle and are therefore potentially exposed to international price competition. Thus, the relevance of input cost factors is higher for MNEs that reexport their products or simply have to compete with internationally supplied goods in the respective host market. Moreover, a large share of inward FDI in transition economies stems from developed countries (WIIW, 2006) where factor prices are much higher, suggesting that efficiency-seeking motives play a non-negligible role. This is supported by various empirical studies dealing with determinants of manufacturing FDI into transition economies, which report significantly negative effects of wages on FDI (e.g., Pusterla and Resmini, 2007, Walkenhorst, 2004 and Resmini, 2000, amongst others).

Besides factor endowment differences and the proximity to large markets, *agglomeration* economies derived from New Economic Geography (NEG) models encourage firms to concentrate in industrial districts, thereby exposing themselves to local competition (Fujita et al., 2000). Following the categorization of Baldwin (2005), agglomeration forces may work through production factors or through goods. The latter arise because of the accession to specialized input suppliers (forward linkages) and customers (backward linkages) associated with large local markets.

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The second kind of agglomeration force results from production factors. Due to knowledge spillovers labor and capital become more productive as firms concentrate spatially. Furthermore, the possibility to share a skilled labor market motivates companies to locate in an area where their sector of activity is well developed. To capture this motivation a sector-specific variable is considered that reflects the concentration of a particular industry across countries. As the service sector is a relatively young industry where improvements in information and communication technology have caused a surge of product innovation, knowledge spillovers are likely to be of main relevance in this sector. Thus, one can assume that benefits from this kind of agglomeration force are lower in the manufacturing sector where the impact of new technologies have not been that high (Desmet and Rossi-Hansberg, 2007). On the other hand, backward and forward linkages are likely to be a major force of agglomeration in the manufacturing industry due to its high demand of specialized and semi-finished products (e.g. Pusterla and Resmini, 2007 and Bekes, 2005). Thus, it remains an empirical question whether the impact of this compound measure reflecting industry concentration differs across the two sectors.

Measurement of location variables To reflect the sales capacity of a host country its gross domestic product (*lngdp*) is considered. This variable is commonly used in the empirical literature to measure market size, which appears to impact positively and significantly on aggregate and manufacturing FDI.[4] In order to exploit efficiency-seeking location factors we consider labor costs and corporate profit taxes. Labor costs are measured following Bellak et al. (2008) who propose using real unit labor costs (*ulc*) when investigating investment location decisions in transition economies. As this measure reflects the wage share in value added it directly focuses on the profitability pressures associated with the employment of labor. Moreover, as the former centrally planned countries are very heterogeneous concerning their infrastructure endowment and are lagging behind the EU-15 average, the considered measure also captures an internationally comparable productivity rate[5].

To account for the tax burden incurred by MNEs we follow Devereux and Griffith (1998) and implement the effective average tax rate (*eatr*), which

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[4]For studies investigating FDI determinants in transition economies at the aggregate level see for example Bevan and Estrin (2004) and Carstensen and Toubal (2004) and for firm-level studies on manufacturing FDI refer to Pusterla and Resmini (2007), Bekes (2005), Walkenhorst (2004) and Resmini (2000).

[5]For a detailed discussion on the appropriate measurement of labor costs and a comprehensive survey on FDI and labor costs into the CEECs see Bellak et al. (2008).

comprises information on the statutory tax rate and on certain rules specifying the extent of profits that are subject to taxation. As the eatr measures the extent to which the pre-tax profit is reduced by taxation it is the relevant decision variable for the location choice of MNEs.[6] Finally, to capture transportation costs import tariffs (*tariff*) and a distance variable (*dist*)[7] are considered.

Agglomeration economies are measured by a sector-specific variable (*agglo*), which is calculated as the ratio of industry GDP to total sector GDP. It reflects the concentration of a particular industry within a country and varies across the NMS-8.[8] It has to be mentioned that this variable cannot capture forward and backward linkages completely within our sectoral framework, since input suppliers may engage in different industry activities than their customers. Thus, data on a more dis-aggregate level would be needed to fully identify potential interdependences between suppliers and producers.

Finally, transition-specific determinants are incorporated to control for the individual transition progress of the former centrally-planned economies. Empirical studies mostly implement risk indicators and variables reflecting the level of privatization and the degree of openness, which generally seem to play an important role in explaining the distribution of FDI across transformation economies (e.g. Janicki and Wunnava, 2004, Smarzynska, 2004, Bevan and Estrin, 2004, Merlevede and Schoors, 2004, Resmini, 2000 and Holland and Pain, 1998). Therefore, variables reflecting economic stability (*infl*), political *risk* and the level of privatization (*priv*) are considered as potential determinants of FDI. A detailed description of the variables and the respective sources are provided in table 3 in the appendix.

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[6]For a survey on the taxation effects on FDI flows see DeMooij and Ederveen (2003) and for a special focus on transition economies Bellak and Leibrecht (2008).

[7]Since the underlying sectoral database does not reveal the home country of FDI, the integration of a variable reflecting transportation costs is nontrivial. In Gravity type models the distance between the home and the host country is used to proxy transportation costs, which appear to be an important determinant of FDI (e.g. Demekas et al., 2007 and Bevan and Estrin, 2004). We will therefore measure transportation costs by the time a lorry needs to drive from the capital city of the respective host country to Brussels, the center of Western Europe (IRPUD, 2000), to capture relative distances.

[8]While in Hungary for example the concentration of the electrical and optical equipment industry (dl) equals 26.2% it accounts only for 7.4% in Poland.

3 Econometric Specification

3.1 Data

To reflect foreign investment operations of MNEs we follow Devereux and Griffith (2002) and rely on FDI inward stock data grouped according to the main economic activities of the host company. The data is obtained ¿from the WIIW Database on Foreign Direct Investment in Central, East and Southeast Europe (2006) and is based on company surveys reporting FDI stocks to host countries' Central Banks. It represents the value of assets held by a foreign investor at a specific reference date each year. The data constitutes a panel dataset of eight countries[9] and covers the period of 1998 to 2004. It is grouped according to the NACE classification at the 1-digit level for the service sector and at the 2-digit level for the manufacturing sector.[10] Overall, FDI stocks of 20 industries are available, which account for 90% of total inward FDI into the NMS-8. This results in 160 country-industry groups, each observed within a seven year period. Because of some missing data points of FDI stocks within five groups[11] their are dropped entirely. This yields a balanced panel including overall 1085 observations.

3.2 The Model

Based on the theoretical model and the structure of the data set, the empirical specification reads

$$y_{ijt} = c + \alpha y_{ijt-1} + X_{it}\beta + \gamma z_{ijt} + \delta t_t + u_{ijt} \tag{4}$$

where i denotes the country dimension $i = 1, 2..., 8$; j reflects the industry $j = 1, 2, ..., 21$ and t denotes the time dimension $t = 1, 2, ..., 7$. The dependent variable y_{ijt} is the stock of FDI, y_{ijt-1} is the one-year lagged FDI stock, X_{it} are the regressors varying over country and time (e.g. inflation), z_{ijt} is the agglomeration variable varying over all three dimensions and t_t are time dummies reflecting common unobservable time effects. While y_{ijt-1} is endogenous, the remaining regressors are assumed to be exogenous. The disturbance term is characterized by

$$u_{ijt} = \mu_{ij} + \nu_{ijt}, \tag{5}$$

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[9]HU, SL, SI, CZ, LT, LV, EE, PL

[10]A detailed list of industries is provided in table 4 in the appendix.

[11]The country-industry groups that are droped are cz-dc, pl-dc, pl-de, pl-di and sl-f.

where μ_{ij} denotes the unobservable country-industry-specific effect and ν_{ijt} is the remainder disturbance. Both error components are assumed to be random and independent of each other. The model is a dynamic triple-indexed specification with time constant individual random effects that capture unobservable country and industry characteristics not included in the regressors. In specification (4) the coefficients α, β and γ are assumed to be equal across service and manufacturing FDI. This assumption will be relaxed for the sector comparison in section 4, such that the unrestricted model will be of the form

$$y_{ijt} = c + \alpha_k y_{ijt-1} + X_{it}\beta_k + \gamma_k z_{ijt} + \delta_k t_t + u_{ijt}, \tag{6}$$

where $k = 1, 2$ indicates the sector.

3.3 Estimator Selection

While in a static random and fixed effects panel setting generalized least squares and fixed effects estimators can be applied respectively, they are both biased in a dynamic setting with a small time period (Hsiao, 2003). Independently of whether individual effects are treated as random or as fixed parameters, any lagged dependent variable is correlated with the error term, thus creating an endogeneity problem. Several approaches were developed to overcome this problem. Under the assumption of serially uncorrelated errors Anderson and Hsiao (1981) propose an instrumental variables estimator. Taking first differences of the basic equation – thereby wiping out the individual effects – and instrumenting Δy_{ijt-1} with y_{ijt-2}, results in consistent estimates of the necessary coefficients, since y_{ijt-2} is not correlated with $\Delta\nu_{ijt}$. However, since the first-differenced error term follows a first-order moving average process the estimator is not asymptotically efficient.

By considering the differenced error structure and exploiting additional instruments Arellano and Bond (1991) propose a Generalized Method of Moments (GMM) procedure to obtain efficient results. The proposed estimator, hereafter difference GMM, exploits all available lags in levels as instruments for the differenced variables. Yet, Blundell and Bond (1998) showed that if y_{ijt} is close to a random walk, difference GMM performs poorly because past levels contain little information about future changes. Instead, they propose adding additional moment conditions by using past differences for endogenous variables in levels and show that it improves efficiency. The resulting estimator, hereafter system GMM, has the additional advantage that time-invariant regressors can be estimated, which would be wiped out in difference

GMM. Since in our model specification the distance variable is time constant and the panel unit root test developed by Levin et al. (2002) indicates a high lag parameter of 0.826, the system GMM estimator is the appropriate choice for estimating the models outlined in equations (4) and (6). Furthermore, the system GMM estimator exploits the variability between industry-country groups. This has to be considered when investment decisions between various locations are modeled.[12]

To control for arbitrary patterns of heteroscedasticity the feasible system GMM estimator is applied (Blundell and Bond, 1998). This two-step estimator is asymptotically efficient because it models the error structure more accurately. Since the standard errors of the two-step estimation are typically downward biased in smaller samples, the finite-sample correction developed by Windmeijer (2000) is applied. The robust estimates assume that the idiosyncratic disturbances are not correlated across individuals. This assumption is quite reasonable since time dummies are included in the model (Roodman, 2006).

3.4 Estimation

Prior to the estimation an outlier inspection is performed via box plot analysis reporting no severe outliers. Furthermore, variance inflation factors (VIF) are calculated to identify potential multicollinearity (MC). All values are found to be lower than six, suggesting that no severe MC effects are present. This result is strengthened by an inspection of the pairwise correlation coefficients being all below 0.80. The pre-estimation results are reported in Tables 6 and 5 in the appendix.

The estimation is performed by applying a general to specific strategy for the restricted model. First, the complete model is estimated and the most insignificant variable is dropped from the model. If time dummies are jointly insignificant their are removed from the model first. Following this procedure, re-estimation yields a model with significant variables only, at least at the 10%-level. After obtaining the specification for the restricted model, the estimation is performed allowing for different coefficient slopes for the manufacturing and service sector. This is done by adding each significant variable twice, multiplied by the respective sector dummy. Long-run estimates are obtained by dividing the parameter estimates by $1 - \alpha$. This value corresponds to θ in equation (3), which reflects the speed of adjustment coefficient.[13]

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[12]For a discussion on difference and system GMM see Baltagi (2005).

[13]See Gujarati (2003) for a discussion on auto-regressive models.

The feasible and robust system GMM estimator is implemented by using the xtabond2 command of the Stata software with the options *two-step robust*. The endogeneity of the lagged dependent variable is considered by including it in the *gmm* option, whereas the remaining exogenous regressors enter the *iv* option.

4   Results

The estimation results for the restricted model are reported in Table 1. As the moment conditions are set up under the assumption of no serial correlation across disturbances, the differenced residuals should be correlated of order one, but not of order two. This is supported by the Arellano-Bond tests reported at the bottom of Table 1. Moreover, since there are more instruments available than regressors, a Hansen test of overidentifying restrictions is reported as well, accepting the Null Hypothesis of valid instruments. This specification is robust to the exclusion of industries with respect to all variables except $risk_{it}$.[14]   Therefore we will drop $risk_{it}$ from the model when estimating the unrestricted specification.

Table 1: FDI Stocks (in log): Restricted specification

Variable	Coefficient	(Std. Err.)
lnstock$_{ijt-1}$	0.850***	(0.060)
lngdp$_{it}$	0.166**	(0.069)
ulc$_{it}$	-0.377***	(0.091)
risk$_{it}$	0.011**	(0.005)
agglo$_{ijt}$	0.008**	(0.003)
Intercept	-0.423*	(0.245)
N	930	
Time dummies $\chi^2_{(5)}$	36.91***	
Hansen test $\chi^2_{(19)}$	17.39	
Arellano-Bond AR(1) z	-2.85***	
Arellano-Bond AR(2) z	1.14	

Significance levels : $* : 10\%$ $** : 5\%$ $*** : 1\%$

The coefficient of the lagged dependent variable is significant and high with an elasticity of 0.82. It seems that FDI is highly persistent and adjusts

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[14]If the industries dm, e, f and j are removed from the sample the risk parameter becomes insignificant.

rather slowly to the desired level. The lag parameter of 0.85 lies slightly above the upper bound of the results found in Kinoshita and Campos (2006). Based on aggregate FDI stock data for 24 transition economies they report significant lag coefficients ranging from 0.73 to 0.80.[15]

As expected, market-seeking factors seem to affect the location decisions of FDI into the NMS-8. An increase in GDP by one percent results in an increase of investment by 0.17 percent, which corresponds to Euro 1.17 mn of FDI stocks.[16] In terms of efficiency-seeking variables, real unit labor costs are a relevant location factor too. A rise in ulc by one percentage point leads to a decrease in FDI by 0.38 percent. The negative response of investment decisions on labour costs is in line with several other studies investigating determinants of FDI into central and eastern European countries (e.g. Bellak et al., 2008, Carstensen and Toubal, 2004 and Bevan and Estrin, 2004, amongst others). While corporate tax rates are found to deteriorate FDI in some studies, they are not significant in our specification. This can be due to the fact that bilateral tax regulations are not captured by the considered tax variable since our data set does not reveal the home country of investment (Bellak and Leibrecht, 2008).

In terms of transition-specific country characteristics only political risk seems to be a relevant determinant of FDI, whereas inflation and the privatization level are insignificant. Since inflation has already been at a low level in the NMS-8 for the considered period and the privatization process has almost ended, these variables could not exert any influence on investment decisions any more. In contrast, political risk was quite unequally dispersed between countries and has improved much during the last years within all countries. Thus, the development in political stability influenced FDI significantly for the considered period. However, as this variable shows a high convergence within the NMS-8, it is not assumed to play a decisive role in the future. Indeed, if the year 2004 is excluded from the observations the risk parameter becomes robust to the exclusion of industries.

The degree of industrial concentration within a country appears to be a significant location factor as well. If the variable reflecting agglomeration economies rises by one percentage point the stock of FDI increases by about

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[15]Carstensen and Toubal (2004) also employ a dynamic model of aggregate FDI into transition economies. However, their results are not comparable to ours as they investigate FDI flows instead of stocks. Thus, the parameter of the lagged variable does not reflect the speed of adjustment to an equilibrium capital stock level, but at best indicates that investors mimic location decisions of previous investment operations. Accordingly, the corresponding estimates are much lower, ranging between 0.19 and 0.35.

[16]This is calculated by taking the overall mean of the FDI stock, which is Euro 704.48 mn.

1.0 percent. Surprisingly, both variables reflecting transportation costs do not enter the econometric model significantly. This might be due to measurement problems of transportation expenditures. Since tariffs are only a fraction thereof and were already brought down to a very low level, they might be a poor indicator, in general. While distance appears to deter investment flows in gravity-type modelsit cannot explain the variance in FDI stocks in our specification. The reason for this is probably the low number of observations. Distance is not only time-invariant as in typical gravity-type models, but it cannot be observed bilaterally since data on the investor country is not available.

Sector Comparison In order to investigate whether the relevant location factors differ across sectors, the specification outlined above is re-estimated allowing for different slope-parameters between manufacturing and service FDI as described in section 3.4. The results are reported in Table 2. The corresponding tests at the bottom of the Table again support the validity of the moment conditions. The reported χ^2 statistic on the equality of slope parameters indicates that two out of four variables —$lnstock_{ijt-1}$ and $lngdp_{it}$— differ significantly across the two sectors. Moreover, ulc_{it} are not significant for service FDI.

In line with our expectations, the parameter reflecting the speed of adjustment to the desired investment level ($lnstock_{ijt-1}$) is significantly lower in the service sector. While investment into manufacturing industries takes around five years to converge to the targeted level, service sector FDI reaches its equilibrium level already within two years.[17] Since investment into the manufacturing sector exhibits a considerable proportion of fixed capital, higher installation costs are likely to be responsible for the long adjustment path. In contrast, service firms have their competitive advantage in intangible assets that are less capital-intensive[18] (UNCTAD, 2004) and may therefore reach their desired investment stock much faster.

Moreover, the estimated coefficients for ulc_{it} confirm that labor cost advantages across countries do matter only for FDI into the manufacturing sector, which is, in contrast to the service sector, mainly characterized by the tradability of produced goods. For service firms that basically sell their products on the local market, this parameter is insignificant. Accordingly, service FDI is significantly stronger attracted by a large market size. However, this

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[17]The average period of adjustment is expressed by the mean lag following Hendry (1995) which is $\alpha/(1-\alpha)$. This yields an adjustment period of 5.2 years for manufacturing FDI and 1.7 years for service FDI.

[18]The bulk of service FDI into the NMS-8 goes to financial intermediaries, wholesale, retail trade and real estate (WIIW, 2006).

Table 2: FDI Stocks (in log): Sector comparison

	short-run			long-run		
Variable	manuf.	service	$\chi^2_{(1)}$	manuf.	service	$\chi^2_{(1)}$
lnstock_{ijt-1}	0.839***	0.628***	9.40***			
	(0.089)	(0.092)				
lngdp_{it}	0.227**	0.355***	10.47***	1.408***	0.954***	2.31
	(0.099)	(0.101)		(0.253)	(0.131)	
ulc_{it}	-0.243***	-0.271	0.01	-1.504*	-0.729	0.44
	(0.095)	(0.364)		(0.853)	(1.032)	
agglo_{ijt}	0.008*	0.014***	1.23	0.052***	0.037***	1.47
	(0.005)	(0.005)		(0.008)	(0.009)	
intercept	-0.584*	-0.584*	—	-3.618***	-1.570***	4.49**
	(0.301)	(0.301)		(0.848)	(0.580)	
N		930				
Time d. $\chi^2_{(5)}$		17.99***		3.73	10.17*	
Hansen $\chi^2_{(38)}$		41.27				
A.-B. AR(1) z		-3.20***				
A.-B. AR(2) z		0.92				

Significance levels : $*: 10\%$ $**: 5\%$ $***: 1\%$

applies only if we look at the short-run effects. Dividing the coefficient estimates on market size by the respective speed of adjustment parameters $(1 - \alpha_k)$ creates a reversed picture. Though not significantly different, manufacturing FDI exhibits a higher elasticity with respect to $lngdp_{it}$ compared to service FDI. This diverse long-run pattern emerges due to the much longer adjustment period of manufacturing FDI, where the addition of the single elasticities in each period results in an alignment of the market size effects across sectors.

The same pattern applies to agglomeration economies, where service FDI seems to respond more heavily compared to manufacturing FDI in the short run but reacts contrary in the long run. However, neither difference is statistically significant, indicating that the concentration of industries is equally important for both sectors. Since our measure does not discriminate between different agglomeration forces this result may be driven by the predominance of knowledge spillovers in the service sector on the one hand, and backward and forward linkages in the manufacturing sector on the other hand. However, to verify this presumption would require information based on a more disaggregated level, which is beyond the scope of this paper.

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5 Concluding Remarks

The observed global shift of FDI towards services is recently reflected by the investment activities into the NMS-8, where FDI inward stocks in the service sector have been predominant since 1998. A large growing literature analyzes the determinants of FDI into these countries, thereof several firm-level studies focusing on the manufacturing sector. In this paper we concentrate on the service sector and investigate whether service and manufacturing FDI respond differently with respect to host country location factors. To control for the persistence of FDI stocks we follow Cheng and Kwan (2000) and apply a partial stock adjustment model, which provides an insight into the dynamics of FDI into both sectors.

Our findings support the hypothesis that service FDI adjusts much faster to its desired stock level than FDI into the manufacturing sector. Since the service sector is less capital-intensive lower installation costs are likely to be responsible for the observed investment behavior. This short adjustment period implies that location factors exhibit a much higher part of their long-term impact on service FDI already within one year. Accordingly, government interventions to attract FDI are likely to boost the service sector immediately and to impact rather slowly but effectively on the manufacturing sector in the long-run. The observed difference in the adjustment period corresponds to the findings of Kinoshita and Campos (2006) who observe a higher persistence of FDI for a subgroup of transition economies receiving FDI predominantly in the manufacturing sector.

In terms of host country location factors our results favor the assumption that due to the limited tradability of many services unit labor costs is not a relevant parameter for deciding in which of the transition countries service FDI is undertaken. Since services are mainly sold where they are produced investors in this sector are not that exposed to international price competition as they are in the manufacturing industry. The observed importance of labor costs for manufacturing FDI into the NMS-8 is supported by various studies that focus on FDI determinants into this sector, e.g. Pusterla and Resmini, 2007 and Bekes, 2005. However, the ongoing development in telecommunication technologies is likely to improve the tradability of services such that labor cost differences across host countries are likely to become relevant in this sector, as well.

As expected, market size measured in GDP exhibits a significantly higher influence on service FDI compared to FDI in the manufacturing sector. This, however, applies only for the short run. Due to the long adjustment period of manufacturing FDI to its desired level, the total impact of market size aligns across sectors. Accordingly, an increase in GDP exerts a much higher

part of its total impact (i.e. one third) on service FDI already within the first period while it affects manufacturing FDI rather smoothly (i.e. one seventh). Furthermore, agglomeration economies measured by industry concentration are found to impact equally on services and manufacturing FDI.

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Appendix

Table 3: Variable Description

Variable	Measure	Source
agglo	Ratio of industry GDP (or GVA) to total sector GDP (or GVA) in percent	WIIW IDB and FDI, OECD NA, National Banks
dist	Time in minutes a lorry needs to drive to a destination in 2000	IRPUD (2000)
eatr	The effective average tax rate is calculated using the method of Devereux and Griffith (1999)	Centre for European Economic Research (Overesch 2005)
Infl	Inflation is the percentage increase in producer prices	EBRD Transition Report
lngdp	Nominal GDP in mn Euro converted by market exchange rates in log	Ameco Online Database, WIIW CIT for exchange rates
lnstock	Annual inward FDI stock in mn Euro per industry in log	WIIW FDI
priv	Private sector share in GDP in Percent	EBRD Transition Report
risk	Euromoney political risk indicator (0-25), where 0 indicates the highest risk	Various Issues
tariff	Tariffs on goods and services in percent of Imports	EBRD Transition Report
ulc	Nominal compensation costs per employee in Euro at market exchange rates divided by nominal GDP in Euro converted by current PPPs per employment	Ameco Online Database, WIIW CIT for exchange rates

CIT: Countries in Transition, IDB: Industrial Database Eastern Europe

Table 4: Industries by NACE Classification

Sector	Industry
Manufacturing	da food products, beverages & tobacco
Manufacturing	db textiles and textile products
Manufacturing	dc leather and leather products
Manufacturing	dd wood and wood products
Manufacturing	de pulp, paper, pap.prod, publish. & printing
Manufacturing	dg chemicals, chemical prod. & man-made fibr.
Manufacturing	dh rubber and plastic products
Manufacturing	di other non-metallic mineral products
Manufacturing	dj basic metals & fabricated metal prod.
Manufacturing	dk machinery and equipment n.e.c.
Manufacturing	dl electrical and optical equipment
Manufacturing	dm transport equipment
Manufacturing	dn manufacturing n.e.c.
Service	e electricity, gas and water supply
Service	f construction
Service	g wholesale, retail trade, rep. of mot. veh. etc
Service	h hotels and restaurants
Service	i transport, storage and communication
Service	j financial intermediation
Service	k real estate, renting & business activities

Table 5: Descriptive statistic and Variance Inflation Factors

Variable	Mean	Std. Dev.	Min	Max	Obs	VIF
$agglo_{ijt}$	8.584	6.683	0.1	34.6	1085	1.00
$dist_i$	1841.995	568.062	1165.74	2626.779	1085	3.71
$eatr_{it}$	22.169	4.879	12.4	36.3	1085	1.80
$infl_{it}$	5.193	3.502	-1.2	14.3	1085	2.20
$lngdp_{it}$	4.414	0.457	3.694	5.317	1085	5.60
$lnstock_{ijt}$	2.206	0.856	-0.959	4.091	1085	
$priv_{it}$	73.641	6.241	60	80	1085	3.78
$risk_{it}$	16.001	2.334	11.41	20.86	1085	5.34
ulc_{it}	0.275	0.079	0.190	0.475	1085	4.59
$tariff_{it}$	1.088	0.880	0	3.8	1085	5.55

Table 6: Correlation matrix

	agglo	dist	eatr	infl	lngdp	priv	risk	ulc
agglo	1.000							
dist	-0.010	1.000						
eatr	0.023	-0.283	1.000					
infl	0.005	-0.434	0.269	1.000				
lngdp	0.021	-0.714	0.180	0.212	1.000			
priv	-0.000	-0.237	-0.054	-0.002	0.290	1.000		
risk	0.022	-0.522	-0.253	0.134	0.551	0.180	1.000	
ulc	0.007	-0.328	-0.085	0.112	0.119	-0.505	0.558	1.000
tariff	0.010	-0.437	0.493	0.495	0.509	-0.332	0.081	0.235

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