

Mühlen, Henning; Nunnenkamp, Peter

**Working Paper**

## FDI by early movers, followers and latecomers: timing of entry by German firms during transition in the Czech Republic

Kiel Working Paper, No. 1571

**Provided in Cooperation with:**

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

*Suggested Citation:* Mühlen, Henning; Nunnenkamp, Peter (2009) : FDI by early movers, followers and latecomers: timing of entry by German firms during transition in the Czech Republic, Kiel Working Paper, No. 1571, Kiel Institute for the World Economy (IfW), Kiel

This Version is available at:

<https://hdl.handle.net/10419/30042>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

*Kiel*

## **Working Papers**

Kiel Institute  
for the World Economy



**FDI by Early Movers, Followers and  
Latecomers: Timing of Entry by  
German Firms during Transition in  
the Czech Republic**

by Henning Mühlen,  
Peter Nunnenkamp

**No. 1571** | November 2009

Kiel Working Paper 1571 | November 2009

## **FDI by Early Movers, Followers and Latecomers: Timing of Entry by German Firms during Transition in the Czech Republic**

Henning Mühlen and Peter Nunnenkamp

### **Abstract:**

Theoretical considerations suggest that the option of waiting under conditions of uncertainty affects the relative importance of firm-level productivity and distance-related transaction costs as driving forces of FDI. Yet the timing of FDI has received little attention in the empirical literature on FDI determinants. To help close this gap we analyze FDI decisions by German firms with and without affiliates in the Czech Republic at different stages of transition. We find that FDI entry strongly depends on firm productivity immediately after the political and economic regime change, but less so with diminishing uncertainty. Likewise, distance-related transaction costs discourage FDI by latecomers considerably less than FDI by early movers.

**Keywords:** multinational enterprises, firm-level productivity, distance, timing of FDI

**JEL classification:** F 23

### **Henning Mühlen**

University of Bochum  
44801 Bochum, Germany  
Telephone: +49-234-32-27050  
E-mail: [henning.muehlen@rub.de](mailto:henning.muehlen@rub.de)

### **Peter Nunnenkamp**

Kiel Institute for the World Economy  
24100 Kiel, Germany  
Telephone: +49-431-8814209  
E-mail: [peter.nunnenkamp@ifw-kiel.de](mailto:peter.nunnenkamp@ifw-kiel.de)

---

*The responsibility for the contents of the working papers rests with the author, not the Institute. Since working papers are of a preliminary nature, it may be useful to contact the author of a particular working paper about results or caveats before referring to, or quoting, a paper. Any comments on working papers should be sent directly to the author.*

*Coverphoto: uni\_com on photocase.com*

## **1. Introduction**

Investments are largely irreversible as sunk costs cannot be recovered. This is why firms may delay investment decisions until uncertainty is sufficiently reduced (Pindyck 1991). With the option value of waiting being firmly established in the theory of investment, it is all the more surprising that the empirical literature on the driving forces of foreign direct investment (FDI) has paid little attention to issues of timing. It is still true that most analyses focus on the “who”, “why” and “where” of FDI, while ignoring the question of “when” (Rivoli and Salorio 1996).

Timing is obviously relevant for firms facing a trade-off when deciding on FDI. On the one hand, uncertainty provides incentives to postpone FDI entry decisions, notably in potential host countries having undergone major political changes and economic reforms. On the other hand, entering earlier than rivals offers monopoly status until latecomers follow (Lin and Saggi 2002). For instance, Luo (1998) finds that early entrants in China have outperformed followers in terms of gaining local market shares.

Transition countries in Central and Eastern Europe provide a case in point with respect to the risk and opportunity that early entrants faced after the regime change in the early 1990s. At the same time, the “when” of FDI is of crucial importance to the host countries. Transition countries may have particularly strong incentives to “induce firms to relinquish the option [of waiting] and move forward with investment” (Rivoli and Salorio 1996: 352). Early movers bringing in FDI help overcome transition crises such as those experienced in Central and Eastern Europe.

Against this background, we employ firm-level data to assess the determinants of German FDI after the collapse of the communist regime in the Czech Republic. The focus is on the importance of firm productivity and distance to the foreign (Czech) location for FDI decisions by early movers, followers and latecomers among German parent firms, compared to a control group without FDI in the Czech Republic. Employing two-step Heckman models, we find that FDI entry strongly depends on firm productivity in the first phase of transition, but less so with diminishing uncertainty about its future course. Likewise, distance-related transaction costs discourage FDI by latecomers considerably less than FDI by early movers.

## **2. Major determinants of entry under uncertainty: Analytical background**

Economic and political risk are widely considered in cross-country and panel analyses of the determinants of FDI (e.g., Schneider and Frey 1985; Gastanaga et al. 1998; Chakrabarti 2001). However, this strand of the literature focuses on where, rather than when FDI is

undertaken. For instance, it has often been shown that politically unstable host countries receive less FDI. By contrast, some earlier studies explicitly address the issue of optimal timing of FDI. Buckley and Casson (1981) provide a notable example. They model the switch to FDI depending on the cost structures of alternative modes of servicing foreign markets and local market development in the host country. In particular, Buckley and Casson (1981) show that the switch is postponed once FDI-related sunk costs are taken into account. They also note that familiarisation with foreign markets tends to reduce costs over time. They assume, however, that the costs of doing business abroad decline for all modes in the same way so that the timing of the switch to FDI is unaffected.

FDI-specific uncertainty is at the centre of some recent models on the timing of FDI decisions by heterogeneous firms. Brandao de Brito and De Mello Sampayo (2005) attribute delayed FDI decisions to uncertainty regarding future labour costs, as a measure of the attractiveness of foreign locations. According to Chang and Lu (2009), the risk that FDI projects fail increases with the sophistication of production technologies as well as unfavourable host-country conditions such as deficient infrastructure. The risk of failure diminishes over time to the extent that new information becomes available. In contrast to Buckley and Casson (1981), this development is FDI-specific as uncertainty is reduced by the diffusion of new information coming from first movers among foreign investors. The argument that previous FDI creates positive externalities for followers is also underlying the model of Lin and Saggi (2002). Consequently, “each potential entrant faces a trade-off between entering earlier than its rivals and enjoying monopoly status until additional entry occurs versus waiting and entering later in order to lower entry costs” (Lin and Saggi 2002: 211).

This trade-off challenges some widely held views on the driving forces of FDI. In particular, the role of firm-level productivity and distance need to be reconsidered as their importance may depend on the timing of FDI. According to Helpman et al. (2004: 300), “of those firms that serve foreign markets, only the most productive engage in FDI.” The productivity of parent firms must be sufficiently high to bear the extra fixed costs of establishing affiliates in foreign markets. While this reasoning is widely accepted by now, it has to be refined once the “when” of FDI is taken into account. In Chang and Lu’s (2009) model, the introduction of risk has the effect that the relationship between firm productivity and FDI becomes non-monotonic. Firms with intermediate productivity levels are more likely to undertake FDI than the most (and the least) productive firms. Similarly, Rivoli and Salorio (1996) argue that strong ownership advantages, typically supposed to render FDI more likely,

may actually delay FDI. The larger the competitive edge a firm has over its competitors, the longer it can afford to wait for new information to reduce uncertainty. By contrast, the sequence of entry derived by Lin and Saggi (2002) is more in line with the conventional view: More cost efficient firms are likely to enter first, even though the model emphasizes trade-offs of early entry.

Apart from the timing of FDI entry, the trade-off between the profit opportunities and sunk costs of early entry may also affect the size of FDI as long as uncertainty is high. Foreign firms may forgo the option of delaying entry, for instance, if new markets with sufficient potential open up to FDI. Yet early entrants may prefer limiting their risk exposure in uncertain environments by undertaking smaller FDI projects (Luo 1998).

Previous empirical evidence largely corroborates the view that more productive firms are more likely to undertake FDI (e.g., Raff et al. 2008; 2009). It should be noted, however, that the sample of host countries is often biased towards advanced economies.<sup>1</sup> In these locations, FDI-related uncertainty and the trade-offs facing early movers are minor due to the long experience of foreign firms operating there. The limited evidence available for developing and transition economies appears to be rather ambiguous. Görg et al. (2009) find that firm productivity mattered for German parents deciding on whether or not to invest in India, but productivity remained insignificant in the second step of deciding on the ownership share in Indian affiliates. Chang and Lu (2009) present some stylized facts suggesting that early movers among Taiwanese investors in mainland China were mainly firms with intermediate productivity levels. The “when” of FDI should be particularly important in the context of developing and transition economies where “a great deal of potential opportunity [...] and a tremendous amount of uncertainty” go often hand in hand (Luo 1998: 392). Hence, the subsequent analysis of German FDI in the Czech Republic may help close important empirical gaps by comparing the importance of firm-level productivity for FDI decisions during different phases of economic transition.

New insights are also expected on the role of distance when taking the timing of FDI into account. The impact of distance on FDI is theoretically ambiguous (e.g., Markusen and Maskus 2002). On the one hand, FDI-related management and transaction costs increase with greater distance between the home and the host country of FDI. On the other hand, remote markets might be served at lower cost through local production than through exports from the home base. Empirical investigations “equivocally report a negative distance parameter”

---

<sup>1</sup> For instance, Raff et al. (2008) consider only relatively advanced European host countries of Japanese FDI. Even the “wide” sample of 38 host countries of US FDI used by Helpman et al. (2004) includes just five lower-middle income countries and no low-income country.

(Egger and Pfaffermayr 2004: 240), indicating that geographical distance is one of the most important obstacles to FDI.<sup>2</sup>

Similar to firm-level productivity, however, the option of waiting under conditions of uncertainty may have as a result that the importance of distance varies over time. Chang and Lu (2009) model distance as a factor impeding the diffusion of new information from remote locations. Less knowledge diffusion would, in turn, keep the uncertainty of firms about FDI-related risks relatively high. All the same, distance would become less of an impediment to FDI by followers when an increasing number of early movers reveal more information on remote locations. The self-reinforcing character of FDI entry decisions let us expect that the discouraging effect of distance weakens over time. This should apply at least as long as FDI-related uncertainty looms large, which is most likely to be the case in developing and transition countries having undergone major political and economic upheaval.

### **3. Data and method**

We combine two firm-specific datasets to assess the determinants of German company decisions on whether and when to undertake FDI in the Czech Republic. The first source portrays about 1,200 German affiliates operating in the Czech Republic; the snapshot provided by the German-Czech Chamber of Industry and Commerce relates to the situation as of 2007 (GCCIC 2008). The directory offers information on the year when the German parent firm engaged in the FDI project as well as annual sales and employment of the affiliate. We use employment data as a measure of the size of the FDI project.<sup>3</sup> It is also stated where in the Czech Republic the affiliate is located, which allows for the calculation of distances between parents and affiliates (see below).

The second source, the online database of Hoppenstedt (2009), a commercial data provider, contains company profiles of German firms with more than ten employees or annual sales of more than one million € including most of the parent firms with FDI in the Czech Republic. We use these company profiles to obtain information on the German parent firms, including (major and minor) line(s) of business (NACE industry codes), annual sales, number of employees, and number of foreign affiliates.

---

<sup>2</sup> According to Egger (2008), there are two possible reasons for distance to discourage FDI: (i) distance-related trade costs affecting vertical FDI, and (ii) plant set-up costs rising with distance so that horizontal FDI becomes less likely to replace exports from the home base. However, the results presented in Egger and Pfaffermayr (2004) and Egger (2008) suggest that the parameters of distance are sensitive to the econometric model choice.

<sup>3</sup> Employment data are missing for only 79 out of 1,228 entries in GCCIC (2008). By contrast, annual sales are available for just about half the overall sample.

Furthermore, we use Hoppenstedt's online database to construct a control group of German companies without affiliates in the Czech Republic. The number of firms in the control group closely resembles the number of firms in the FDI group. The control group has been selected randomly from the universe of about 250,000 German firms listed by Hoppenstedt. More precisely, the control group principally consists of every 200<sup>th</sup> entry in this alphabetically ordered database.<sup>4</sup> The list of variables collected for the control group is exactly the same as for the sample of German parent companies with FDI in the Czech Republic.

In our empirical analysis we model the FDI decision of German firms as a two-step problem.<sup>5</sup> First, firms decide whether or not to invest in the Czech Republic. This zero/one decision is supposed to depend on firm ( $i$ ) and industry ( $j$ ) characteristics,

$$Pr(FDI_i) = \beta_1 X_i + \beta_2 Z_j + \beta_3 ExV_i + e_i \quad (1)$$

Equation (1) is estimated using data for the German investors as well as the control group. For those firms that do invest in the Czech Republic, we can then also model the choice of the size of the foreign affiliate,

$$FdiSize_i = \alpha_1 X_i + \alpha_2 Z_j + \lambda_i + v_i \quad (2)$$

where  $FdiSize$  is the number of employees employed in the Czech affiliate of firm  $i$ .

This model is estimated using the Heckman (1979) two-step procedure.  $X_i$  denotes a vector of firm characteristics, and  $Z_j$  a vector of industry characteristics. The parameter  $\lambda_i$  in equation (2) captures the probability of firm  $i$  being observed in this second step (inverted Mills ratio in Heckman's parlance) and  $v_i$  is the remaining error term. Equation (1) includes  $ExV_i$  as an exclusion variable to aid identification (see below).

Vector  $X_i$  comprises the size of the German parent firm (measured in terms of employment), its productivity (measured as labour productivity), the number of foreign affiliates (reflecting the parent's experience with foreign operations), and the degree of diversification. As noted above, the parent firm's productivity ( $\ln Productivity$ ) figures prominently as a determinant of FDI decisions in the recent literature on firm heterogeneity.

---

<sup>4</sup> Note that we skipped multiple entries for various branches of the same company. For instance, Hoppenstedt lists about 6,000 entries under "Sparkasse", i.e., local savings banks, including various branches without data on employment and turnover.

<sup>5</sup> See Görg et al. (2009) for a similar approach.



We control for firm size (*lnEmployees*), which is “the company attribute that has most frequently been identified as determining the propensity to produce outside the home country” (Kravis and Lipsey 1982: 203). Again in line with earlier studies, previous experience with foreign operations (*#ForAffiliates*) is supposed to affect current FDI decisions, even though the effect may not be strictly positive if the sample largely consists of relatively small parent firms that tend to be constrained financially. The number of industries in which the parent firm is active (*#NaceCodes*) is our proxy for the degree of diversification.

The firm-specific variables  $X_i$  are complemented by variables  $Z_j$  at the industry level. We include a proxy for skill intensity as well as a measure of market structure.<sup>6</sup> The impact of skill intensity (*lnIndSkiInt*) on FDI decisions is theoretically ambiguous. Skills may reflect higher productivity at the industry level and, thus, increase the likelihood of FDI. However, skill intensive industries may also have weaker incentives and less pressure to undertake (vertical) FDI to save costs.<sup>7</sup> Market structure (*lnIndCom*) is measured by the number of firms per 1,000 € of value added in an industry.

Finally, we consider geographical distance as our exclusion variable,  $ExV_i$ , affecting the selection in equation (1), though not the size of FDI projects.<sup>8</sup> Distance is measured between the geographical centre of the German federal state where the parent is based and the geographical centre of the Czech province where the affiliate is located. For *lnDistance* to serve as an exclusion variable we calculate a hypothetical distance between the location of firms in the control group and the centres of all Czech provinces as potential locations of foreign affiliates.<sup>9</sup> Alternatively, we consider a dummy variable (*DumBS*) set equal to one for all German sample firms located in Bavaria and Saxony, the two federal states bordering the Czech Republic, to check whether our results are sensitive to the measurement of distance-related transaction costs.

It should be stressed that we draw on cross-section data. Without convincing instruments, it is therefore difficult to control for possible endogeneity. The firm-level variables, in particular *lnProductivity* and *lnEmployees*, may be jointly determined with the decision to invest in the Czech Republic and /or the size of those investments. However, there

---

<sup>6</sup> All industry-level data are from Statistisches Bundesamt (<http://www.destatis.de/jetspeed/portal/cms/>; accessed: August 2009). Ideally, one would of course refer to skill intensity at the firm level. However, these data are generally not available. See Appendix A1 for detailed definitions of variables and sources.

<sup>7</sup> Moreover, the measure of skill intensity suffers from the (data enforced) shortcoming that it increases also if average wages for all skill categories are relatively high in a particular industry.

<sup>8</sup> Strictly speaking, identification of the two-step estimation does not hinge on an additional exclusion variable. If there were no additional variable in the first step, identification would be solely on the different functional form of the two equations. We also experimented with including *lnDistance* in the second step, but the variable turned out to be statistically insignificant.

<sup>9</sup> See Appendix A1 for details.

is little reason to be concerned about reverse causality running from German FDI in the Czech Republic to parent firm characteristics. Most German FDI projects are fairly small, involving no more than 50 local workers. Still, in order to mitigate the problem, we follow Raff et al. (2009) and lag  $\ln Productivity$  and  $\ln Employees$  in equations (1) and (2).

Summary statistics are presented in Appendix A2. As can be seen, German parent firms in the FDI group are considerably larger than firms in the control group. At the same time, the experience with foreign operations ( $\#ForAffiliates$ ) differs significantly between both groups. By contrast, differences in productivity and the degree of diversification ( $\#NaceCodes$ ) appear to be minor. Over the whole period of observation, the average distance between the location of the German parents and their Czech affiliates is just about 40 kilometres less than the average of the hypothetical distances calculated for firms in the control group.

As noted before, we are mainly interested in whether the relevance of firm-level productivity and distance-related transaction costs for FDI decisions varies over time. More precisely, we differentiate between three sub-periods in the following: 1990-1993, 1994-1999, and 2000-2007. About 43 per cent of all FDI entries in GCCIC (2008) fall into the first transition period so that the corresponding German parents may be labelled “early movers.” Uncertainty was still high shortly after the collapse of the communist regime and the dissolution of former Czechoslovakia. The sub-group of “followers” having undertaken FDI in 1994-1999 accounts for about 37 per cent of all entries in GCCIC (2008). While the Czech Republic became a full EU member only in 2004, investor uncertainty about Czech transition was substantially reduced since the mid-1990s already when the so-called Europe Agreements entered into force, governing trade and capital flows between accession countries and old EU members. The last group of “latecomers” is relatively small (about 19 per cent), compared to the number of early movers and followers.<sup>10</sup>

#### 4. Empirical results

In columns (1) and (2) of Table 1 we report the estimation results for the overall sample of German affiliates in the Czech Republic, irrespective of the time of entry, plus the control group without FDI. While both industry variables are statistically insignificant, the baseline findings on firm-specific variables are mostly as expected. In particular, larger and more productive German parents are more likely to undertake FDI in the Czech Republic (column

---

<sup>10</sup> Note that 17 German firms in GCCIC (2008) had Czech affiliates prior to the regime change in 1990 already, accounting for 1.4 per cent of all entries. These firms are not considered in the following as they do not fit into the classification of transition-related uncertainty.

1). At the same time, German parents with these characteristics tend to establish larger Czech affiliates in the second step (column 2). Selection into the FDI group also depends positively on previous experience of parent companies, measured by the number of foreign affiliates. The insignificant correlation of *#ForAffiliates* with the size of FDI in the second step may be due to financial constraints of German parent firms.<sup>11</sup>

The degree of diversification enters significantly positive in the selection equation. This is in contrast to earlier studies finding that more diversified parent firms are less likely to select FDI (Görg et al. 2009). The relatively large number of diversified parents in the services sector among German firms with FDI in the Czech Republic provides a possible explanation.<sup>12</sup> The exclusion variable, distance, enters significantly negative at the one per cent level. The coefficient of *lnDistance* implies that increasing the distance between the German parent and the Czech affiliate by some 40 kilometres from the mean distance of about 380 kilometres reduces the probability of observing the firm in the FDI group by 6.8 per cent. When also included in the second step of deciding on the size of FDI, the distance variable turned out to be completely insignificant and the coefficients of all other variables remained as before (not shown).

The estimation results for the sub-samples of early movers, followers and latecomers among German parents with FDI in the Czech Republic are reported in columns (3)-(8) of Table 1. Several baseline findings for the overall sample carry over to essentially all three sub-samples. For instance, parent size remains significantly positive at the one per cent level in both steps of the Heckman model with just one exception. Previous experience with foreign operations matters for the selection into the FDI group, irrespective of the timing of FDI. Skill intensity at the industry level enters insignificant throughout, possibly due to the above noted ambiguity and measurement problems. The second industry characteristic, i.e., market structure, continues to be insignificant in all three selection equations. When deciding on the size of FDI, early movers from German industries comprising a large number of relatively small firms opt for smaller Czech affiliates (column 4). More surprisingly perhaps, the coefficient of *lnIndCom* turns significantly positive for followers deciding on the size of FDI (column 6). Possibly, parents based in more competitive German industries (reflected in a larger population of firms per unit of value added) had stronger incentives to engage in more

---

<sup>11</sup> Most parent firms in the sample are relatively small. In the FDI group, the average number of employees is just 250 (Appendix A2).

<sup>12</sup> Indeed, additional estimations (not shown here) for German parents in the manufacturing sector and the services sector reveal that the significantly positive correlation between the degree of diversification and FDI selection is restricted to the services sector.

(cost-saving, vertical) FDI once uncertainty was no longer as high as at the beginning of transition.

Turning to the FDI determinants that are of principal interest in the present context, we find strong evidence that timing matters for the relative importance of both firm productivity and distance. The results on firm-level productivity for selecting FDI are in conflict with the hypothesis advanced by Rivoli and Salorio (1996) as well as Chang and Lu (2009), according to whom the most productive parents would adopt a wait-and-see attitude as long as FDI-related uncertainty is high. The relatively large and significantly positive coefficient of *lnProductivity* in the selection equation for early movers with FDI entry in 1990-1993 is clearly more in line with Lin and Saggi (2002), who expect more cost efficient firms to enter first. Actually, we find that the importance of firm productivity for self-selection into FDI groups declines over time with diminishing uncertainty about the future path of transition in the Czech Republic. Firm productivity still enters positive and almost significant at the ten per cent level in the selection equation for followers among German parents with FDI entry in 1994-1999 (column 5), while productivity proves completely insignificant for self-selection by latecomers (column 7).

However, we do find some indications of a non-monotonic relationship between firm productivity and FDI in the second step of deciding on the size of FDI projects. The insignificant coefficient of *lnProductivity* in column (4) of Table 1 may suggest that productive early movers among German parents tested the waters during the first years of transition, but were no more inclined than less productive peers to risk high sunk costs under conditions of considerable uncertainty. This tends to support the reasoning that early movers may mitigate the trade-off between profit opportunities and sunk costs by limiting their engagement to relatively small FDI projects (Luo 1998). The positive correlation between firm productivity and the size of FDI found before for the overall sample is attributable exclusively to the sub-sample of followers in 1994-1999. The sustainability of transition was beyond serious doubt at this time so that more productive firms opted for larger affiliates.<sup>13</sup>

Using distance as an exclusion variable is justified not only for the overall sample but also for the three sub-samples. Distance enters significantly negative in all selection equations, whereas it proved irrelevant as a determinant of the size of FDI by early movers,

---

<sup>13</sup> The Heckman model for latecomers in 2000-2007 reveals that firm productivity, as before for FDI selection, did not play a significant role at the second step either. This may be partly because the number of uncensored observations is rather small for this sub-group. One may also suspect that latecomers among services firms are driving this result. This could also explain why it is only in the selection equation for latecomers that the coefficient of *#NaceCodes* is significantly positive. As noted before, we found a significantly positive correlation between the degree of diversification and FDI in the services sector only.

followers as well as latecomers in additional (unreported) estimations. All the same, the relative importance of distance for self-selection of German parents with affiliates in the Czech Republic varies depending on FDI timing. The discouraging effect of a larger distance between the locations of the German parent and the Czech affiliate is clearly strongest immediately after the political and economic regime change. In the first phase of transition, the negative coefficient of  $\ln Distance$  is more than twice as large as in the most recent past when the Czech Republic became a full EU member.

As explained in more detail in Section 3, we had to construct a hypothetical distance measure for the control group of German firms without affiliates in the Czech Republic. In order to check the sensitivity of our estimation results to the treatment of distance-related transaction costs, we replace  $\ln Distance$  by a simple dummy variable.  $DumBS$  is set equal to one for the two German federal states sharing a common border with the Czech Republic, Bavaria and Saxony. Results of this robustness test are reported in Table 2.

Apart from the proxy of transaction costs, all other results are essentially the same as before in Table 1. In particular, previous findings on the importance of firm-level productivity for the sub-samples of early movers, followers and latecomers are not affected by the change in accounting for transaction costs. There are just some minor changes in the level of significance. Most notably, the positive coefficient of the skill intensity at the industry level,  $\ln IndSkiInt$ , now just passes the ten per cent level of significance in the equation with FDI size for followers (column 4 in Table 2).

It also remains that the German parents' geographical closeness to Czech locations was most important for early movers to self-select into the FDI group during the first phase of transition. By setting the dummy variable equal to one for neighbouring Bavaria and Saxony, its positive coefficient implies that FDI from more distant federal states was discouraged by higher transaction costs. The difference in the size of the coefficient of the dummy variable between the first and subsequent phases of transition in Table 2 is comparable to, though slightly less pronounced than the corresponding difference for the distance variable in Table 1.

## 5. Summary and conclusion

Theoretical considerations suggest that the option of waiting under conditions of uncertainty affects the relative importance of firm-level productivity and distance-related transaction costs as driving forces of FDI. Yet the timing of FDI has received little attention in the empirical literature on FDI determinants. To help close this gap we analyze FDI decisions by German

firms with and without affiliates in the Czech Republic at different stages of transition. We find that FDI entry strongly depends on firm productivity immediately after the political and economic regime change, but less so with diminishing uncertainty about the future course of transition. Likewise, distance-related transaction costs discourage FDI by latecomers considerably less than FDI by early movers.

Obviously, the case of German FDI in the Czech Republic is special in various respects. It is thus open to debate whether and to which extent our findings would hold for FDI from other sources and under different host-country conditions. On the one hand, one might suspect that the “when” of FDI plays a minor role where political transition is rather gradual and economic reform more piecemeal, compared to the regime change in Central Europe in the early 1990s. On the other hand, uncertainty may loom even larger when the sources and hosts of FDI are not as geographically close to each other as in the present case study. Hence, uncertainty can reasonably be expected to shape the timing of FDI in various other places, including China, India (notably after the balance-of-payments crisis in 1990/91 and the subsequent liberalization programme), and Sub-Sahara Africa (for large parts of which foreign investors may still lack reliable information on opportunities and risks).

Future research may also provide a fuller account of the options of foreign investors under conditions of uncertainty. Delaying FDI entry or testing the waters by committing limited resources to small FDI projects are just two ways to deal with the trade-off between extra profits and sunk costs of early entry. In addition, the choice of ownership structures may be related to the timing of FDI. In particular, joint ventures with local or international partners may offer a means for early movers to mitigate uncertainty. Furthermore, the type of FDI is likely to matter for the option value of waiting. It may be easier for foreign investors to avoid large sunk costs with various host countries competing for vertical FDI – compared to horizontal FDI in host countries offering potentially large markets.

From the perspective of host countries, it is obviously relevant to induce foreign investors to forgo the option of waiting (see also Rivoli and Salorio 1996). However, it is less clear how to reduce uncertainty and which policy options are most effective in bringing FDI forward. Arguably, it is not only the depth and speed of reforms that matters for attracting more FDI from early movers, but also the credibility of local institutions and binding character of economic policy. For instance, bilateral investment treaties and trade agreements may be more effective in reducing uncertainty and luring early movers, compared to unilateral liberalization measures, even if mutually binding FDI provisions are less far-reaching. Ultimately, host countries considering policy options may face a trade-off similar to the trade-

off facing firms considering FDI entry: While bold reforms may pay off in terms of higher FDI in the longer run, more modest reforms may have stronger effects in the short run if foreign investors have less doubt about their sustainability.

## References:

- Brandao de Brito, J., and F. de Mello Sampayo (2005). The Timing and Probability of FDI: An Application to US Multinational Enterprises. *Applied Economics* 37 (4): 417-437.
- Buckley, P.J., and M. Casson (1981). The Optimal Timing of a Foreign Direct Investment. *Economic Journal* 91 (March): 75-87.
- Chakrabarti, A. (2001). The Determinants of Foreign Direct Investment: Sensitivity Analyses of Cross-country Regressions. *Kyklos* 54 (1): 89-114.
- Chang, P.-L., and C.-H. Lu (2009). Risk, Firm Heterogeneity, and Dynamics of FDI Entry. [http://www.mysmu.edu/faculty/plchang/papers/Hetero\\_FDI.pdf](http://www.mysmu.edu/faculty/plchang/papers/Hetero_FDI.pdf).
- Egger, P. (2008). On the Role of Distance for Outward FDI. *Annals of Regional Science* 42 (2): 375-389.
- Egger, P., and M. Pfaffermayr (2004). Distance, Trade and FDI: A Hausman-Taylor SUR Approach. *Journal of Applied Econometrics* 19 (2): 227-246.
- Gastanaga, V.M., J.B. Nugent and B. Pashamova (1998). Host Country Reforms and FDI Inflows: How Much Difference Do They Make? *World Development* 26 (7): 1299-1314.
- GCCIC (2008). Deutsche Unternehmen in Tschechien: Gemeinschaftsunternehmen, Beteiligungen, Niederlassungen. CD-Rom. Praha: Deutsch-Tschechische Industrie- und Handelskammer/ German-Czech Chamber of Commerce and Industry.
- Görg, H., H. Mühlen and P. Nunnenkamp (2009). FDI Liberalization, Firm Heterogeneity and Foreign Ownership: German Firm Decisions in Reforming India. *Journal of Development Studies*, forthcoming.
- Heckman, J.J. (1979). Sample Selection Bias as a Specification Error. *Econometrica* 47 (1): 153-161.
- Helpman, E., M.J. Melitz and S.R. Yeaple (2004). Export versus FDI with Heterogeneous Firms. *American Economic Review* 94 (1): 300-316.
- Hoppenstedt (2009). Online database; <http://www.hoppenstedt-hochschuldatenbank.de>; accessed: September 2009.

- Kravis, I.B., and R.E. Lipsey (1982). The Location of Overseas Production for Export by US Multinational Firms. *Journal of International Economics* 12 (3/4): 210-223.
- Lin, P., and K. Saggi (2002). Timing of Entry under Externalities. *Journal of Economics* 75 (3): 211-225.
- Luo, Y. (1998). Timing of Investment and International Expansion Performance in China. *Journal of International Business Studies* 29 (2): 391-408.
- Markusen, J.R., and K.E. Maskus (2002). Discriminating among Alternative Theories of the Multinational Enterprise. *Review of International Economics* 10 (4): 694-707.
- Pindyck, R.S. (1991). Irreversibility, Uncertainty, and Investment. *Journal of Economic Literature* 29 (Sept): 1110-1148.
- Raff, H., M.J. Ryan and F. Stähler (2008). Firm-specific Characteristics and the Timing of Foreign Direct Investment Projects. *Review of World Economics* 144 (1): 1-31.
- Raff, H., M.J. Ryan and F. Stähler (2009). Whole versus Shared Ownership of Foreign Affiliates. *International Journal of Industrial Organization* 27 (5): 572-581.
- Rivoli, P., and E. Salorio (1996). Foreign Direct Investment and Investment under Uncertainty. *Journal of International Business Studies* 27 (2): 335-357.
- Schneider, F., and B.S. Frey (1985). Economic and Political Determinants of Foreign Direct Investment. *World Development* 13 (2): 161-175.



## Appendix A1: Definition of variables and sources

Variable	Definition	Source
lnFdiSize	Number of employees employed in the Czech affiliate, in logs; 2007	GCCIC 2008
#NaceCodes	Number of industries (5-digit Nace codes) in which the German parent firm is active; proxy for the degree of diversification; 2006 or closest year available	Hoppenstedt 2009
#ForAffiliates	Number of existing foreign affiliates of the German parent firm; proxy for experience in foreign markets; 2006 or closest year available	Hoppenstedt 2009
lnEmployees	Size of the German parent firm, measured by the number of employees; in logs; 2006 or closest year available	Hoppenstedt 2009
lnProductivity	Productivity of the German parent firm, proxied by value of sales per employee; in logs; 2006 or closest year available	Hoppenstedt 2009
lnIndCom	Market structure of the German industry to which the parent firm belongs, measured by the number of firms per 1000 € of gross value added at factor costs; in logs; 2006	Statistisches Bundesamt 2008
lnIndSkiInt	Skill intensity of the German industry to which the parent firm belongs, defined as gross annual wages and salaries per employee (1000 €); in logs; 2006	Statistisches Bundesamt 2008
lnDistance	Distance in kilometres between the city lying in the geographical centre of the German federal state ( <i>Bundesland</i> ) where the parent firm is located and the city lying in the geographical centre of the Czech province where the affiliate is located; for firms in the control group we enter a hypothetical distance by weighting the distances between the centre of the German federal state where the firm is located and the centres of all Czech provinces; weights are according to the distribution of the German FDI sample across Czech provinces; in logs	www.convertunits.com; GCCIC (2008)
DumBS	Dummy variable; 1 for German parent firms located in Bavaria and Saxony, i.e., the two German federal states bordering the Czech Republic; 0 for all other German parents	GCCIC 2008; Hoppenstedt 2009

## Appendix A2: Summary statistics (sample underlying baseline estimation reported in columns 1 and 2 of Table 1)

### 1. FDI group

Variable	Obs	Mean	Std. Dev.	Min	Max
lnFdiSize	599	3.655621	1.627663	0.6931472	10.01239
lnEmployees	599	5.506654	1.793362	0.6931472	11.94527
lnProductivity	599	0.2477392	0.2911527	0.0001	3.897434
#ForAffiliates	599	2.532554	3.893463	0	10
#NaceCodes	599	2.208681	1.268947	1	6
lnIndSkiInt	599	3.64282	0.2122782	2.73855	4.174674
lnIndCom	599	-8.78684	1.165918	-13.36619	-4.816533
lnDistance	599	5.933626	0.4527718	4.304065	6.669498

### 2. Control group

Variable	Obs	Mean	Std. Dev.	Min	Max
lnEmployees	586	3.302353	1.261712	0.6931472	10.15677
lnProductivity	586	0.2367632	0.3469466	0.0242889	3.684681
#ForAffiliates	586	0.0477816	0.4653133	0	7
#NaceCodes	586	1.868601	1.070891	1	6
lnIndSkiInt	586	3.5	0.2438386	2.73855	4.174674
lnIndCom	586	-7.83127	1.282792	-11.67526	-4.532377
lnDistance	586	6.026096	0.2965936	5.247024	6.381816

Table 1: Total sample and sub-samples: Heckman results with distance between location of German parent and Czech affiliate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Baseline estimation		1990-1993		1994-1999		2000-2007	
	Heckman		Heckman		Heckman		Heckman	
	Selection	Size of FDI	Selection	Size of FDI	Selection	Size of FDI	Selection	Size of FDI
<i>Firm variables</i>								
lnEmployees	0.455*** (0.038)	0.191*** (0.055)	0.495*** (0.049)	0.179*** (0.069)	0.419*** (0.050)	0.260*** (0.101)	0.370*** (0.061)	-0.105 (0.267)
lnProductivity	0.425*** (0.157)	0.497** (0.219)	0.607*** (0.189)	0.269 (0.252)	0.324 (0.201)	1.516*** (0.426)	-0.056 (0.338)	0.582 (0.718)
#ForAffiliates	0.246*** (0.048)	-0.020 (0.019)	0.293*** (0.055)	-0.012 (0.027)	0.203*** (0.056)	-0.046 (0.036)	0.273*** (0.080)	-0.202** (0.098)
#NaceCodes	0.078** (0.045)	0.028 (0.048)	0.069 (0.057)	-0.045 (0.058)	0.054 (0.063)	0.009 (0.084)	0.143** (0.072)	-0.199 (0.170)
<i>Industry variables</i>								
lnIndSkiInt	0.161 (0.983)	0.893 (1.392)	1.430 (1.288)	-0.503 (1.876)	-0.722 (1.226)	3.916 (2.482)	0.407 (2.504)	7.859 (6.372)
lnIndCom	-0.110 (0.181)	-0.326 (0.229)	0.310 (0.252)	-0.827*** (0.299)	-0.332 (0.241)	0.826** (0.408)	-0.242 (0.301)	1.219 (0.767)
lnDistance	-0.679*** (0.132)	--	-0.975*** (0.193)	--	-0.575*** (0.177)	--	-0.464** (0.225)	--
Observations	1185		857		804		696	
uncensored obs	599		271		218		110	
Wald test (p-value)	0.000		0.000		0.000		0.178	
Mills ratio (p-value)	0.014		0.120		0.481		0.061	

Standard errors in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. All regressions include three-digit industry dummies.

Table 2: Total sample and sub-samples: Heckman results with dummy for bordering states (Bavaria and Saxony)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Baseline estimation		1990-1993		1994-1999		2000-2007	
	Heckman		Heckman		Heckman		Heckman	
	Selection	Size of FDI	Selection	Size of FDI	Selection	Size of FDI	Selection	Size of FDI
<i>Firm variables</i>								
lnEmployees	0.451*** (0.037)	0.167*** (0.058)	0.490*** (0.049)	0.166** (0.069)	0.412*** (0.050)	0.213** (0.109)	0.375*** (0.061)	-0.203 (0.327)
lnProductivity	0.397*** (0.158)	0.467** (0.221)	0.574*** (0.190)	0.248 (0.254)	0.294 (0.202)	1.444*** (0.431)	-0.066 (0.344)	0.624 (0.846)
#ForAffiliates	0.242*** (0.047)	-0.023 (0.020)	0.290*** (0.055)	-0.014 (0.027)	0.203*** (0.056)	-0.056 (0.037)	0.262*** (0.080)	-0.236** (0.122)
#NaceCodes	0.081* (0.045)	0.027 (0.048)	0.071 (0.058)	-0.045 (0.058)	0.051 (0.063)	0.003 (0.085)	0.148** (0.072)	-0.213 (0.197)
<i>Industry variables</i>								
lnIndSkiInt	0.116 (0.987)	0.801 (1.397)	1.368 (1.281)	-0.639 (1.886)	-0.696 (1.232)	4.099* (2.488)	0.357 (2.512)	6.783 (7.593)
lnIndCom	-0.102 (0.181)	-0.335 (0.231)	0.324 (0.251)	-0.843*** (0.300)	-0.301 (0.240)	0.881** (0.410)	-0.264 (0.302)	1.067 (0.852)
<i>DumBS</i>	0.551*** (0.113)	--	0.702*** (0.152)	--	0.396*** (0.152)	--	0.428** (0.185)	--
Observations	1185		857		804		696	
uncensored obs	599		271		218		110	
Wald test (p-value)	0.000		0.000		0.000		0.740	
Mills ratio (p-value)	0.004		0.084		0.231		0.057	

Standard errors in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. All regressions include three-digit industry dummies.