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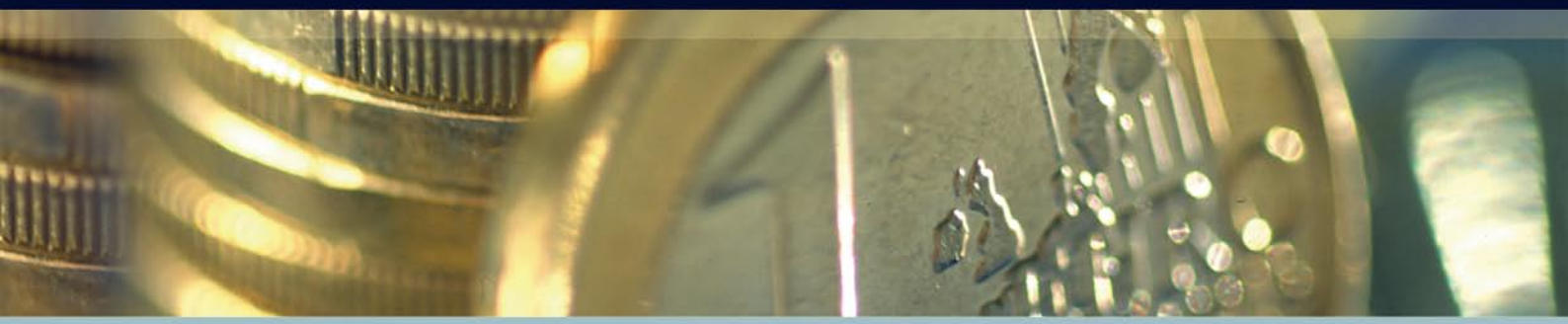

FDI Spillovers in the Czech Republic: Takeovers vs. Greenfields

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FDI Spillovers in the Czech Republic: Takeovers vs. Greenfields

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Abstract
This paper analyzes the effects of foreign direct investment on the sales growth rate of domestic companies in the Czech Republic. Using firm-level panel data from 1995 to 2005, it studies both horizontal and vertical spillovers with respect to two kinds of foreign investment – takeovers and greenfields. This is the first paper applying this framework on firm level. The study allows also for the lagged nature of these spillovers. The results suggest that the sales growth rates of domestic companies mostly decrease in the presence of foreign companies, especially in upstream sectors. The impact through horizontal spillovers is mixed – positive from foreign takeovers, negative from greenfields. Positive forward spillovers are present mainly in recent years. Time sensitivity is revealed for horizontal as well as vertical spillovers.

Keywords: productivity, sales growth, spillovers, FDI, ownership
JEL classification: C23, F2, D24, D57, L6

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1. Introduction

Foreign direct investment (FDI) is a driving force of growth for every developing economy. It brings new capital, technology and know-how. This investment comes either in the form of a greenfield project, where a new plant is built and therefore a new company formed, or in the form of foreign capital inflow to an existing domestic company. In both cases, this company is typically characterized by higher productivity and competitiveness (Javorcik and Arnold 2005).

Besides these *direct effects* from FDI, there are also varieties of indirect effects. The entry of any high productivity company should naturally encourage other companies within the same sector to improve their performance and competitiveness. The increase in efficiency of the production process can happen by copying new technologies or by hiring trained workers and managers from foreign-owned companies (Javorcik 2004). On the other hand, those domestic companies that are not able to catch up with the higher performance of other companies within the sector may be crowded out of the market. In general, these effects are referred to as *horizontal spillovers*.

However, companies from sectors other than that of the foreign enterprise might be affected by its presence as well if they are in direct business contact with it. This includes companies that supply or provide services for foreign firms, as well as companies that are supplied by foreign firms. It is likely that foreign companies require higher standards from their suppliers. On the other hand, it is also likely that higher standards are provided by foreign companies to domestic companies as well, which might improve the domestic companies' efficiency and performance. In general, these effects are referred to as *vertical spillovers*.

An extent of these spillovers depends also on the type of foreign investment. Based on the industry where they operate, foreign investors have several options. If they are in non-tradable business, they can pick the best local company, take over and price others out of the local market. Or they can pick the industry with weak local companies and put in a greenfield. In both of these cases we can expect negative horizontal spillovers. On the other hand, if they operate in exporting industry, they do not have to care about local companies within a sector. They can find good suppliers and concentrate on export. This may result in positive horizontal and backward spillovers. Another important factor is a character of an

investment itself. Takeovers usually start by improving acquired companies' organization and management; new technologies may arrive much later. Moreover, they are likely to use an existing network of suppliers and customers. Whereas greenfields often bring state-of-the-art technologies immediately and may not use local markets at all.

Governments in transition and developing countries often compete to attract foreign investors by offering them various advantages. The Czech Republic is no exception. In 1998 its government approved a system of subsidies for foreign investors that was supposed to increase the competitiveness of Czech industry. One of the supporting arguments was that foreign investors would help other domestic companies to improve. However, contrary to these arguments and expectations, the recent study by Stančík (2007) shows that the impact on domestic companies is actually negative. This brings up new interesting questions. Does this negative impact differ with different type of investment? Is there a type of investment that we should support more?

The goal of this paper is therefore to answer these questions by analyzing the effects of FDI on the performance of domestic companies in the Czech Republic with respect to different types of foreign investment – acquisitions and greenfields. We study these effects within the same sector as well as through vertical linkages. We employ up-to-date data that cover the period 1995-2005. We also focus on the time structure of these effects.

To our best knowledge, this is the first paper analyzing FDI spillovers on firm-level data by dividing them into takeovers and greenfields. Therefore, one of the goals of this paper is to suggest a framework that might be used and further developed in future empirical studies.

This paper finds that there are differences between the two types of foreign investment; in sign of their impact on domestic companies as well as in magnitude. Particularly, supplying domestic companies are affected by the presence of foreign investors downstream through negative backward spillover effects. Since foreign investors prefer to import their supplies from abroad, Czech supplying companies oriented mainly on domestic markets consequently lose on sales. The impact is double in case of greenfields. Regarding horizontal spillover effects, they are much smaller in magnitude. However, the main difference is that they differ in sign. The impact of greenfields remains negative, while the impact of takeovers on domestic companies within the same sector is now positive. No forward spillover effects are present. Furthermore, the results suggest a dynamic pattern in FDI spillovers. Initial positive/negative horizontal spillovers from takeovers/greenfields are later translated into positive/negative forward spillovers.

The paper is structured as follows. The second section deals with the previous studies relevant for this research. Our research strategy is explained in the third section. The fourth section contains the data description. The empirical results are presented in the fifth section. The last section concludes.

2. Literature Review

One of the first studies investigating the benefits for domestic companies from FDI using company-level panel data is Aitken and Harrison (1999) who employ data from Venezuela during the years 1976-1989. They find a positive effect of FDI on smaller domestic companies and a small negative effect of FDI on all domestic companies. They further claim that the positive effect of the presence of foreign enterprises is gained by joint ventures with foreign capital. According to the authors, the overall effect is thus only slightly positive. Javorcik (2004) goes a little bit further and besides horizontal spillovers, she stresses also the role of vertical spillover effects. Her research is based on a sample of Lithuanian companies in the period 1996-2000. She does not find any significant horizontal spillover effect or effects within a region. However, she finds a positive significant vertical spillover effect of FDI on domestic companies. She also claims there is no difference in magnitude between the effects from partially or fully foreign-owned companies.

There are also several company-level studies of the Czech Republic. Djankov and Hoekman (2000) study the impact of FDI on total factor productivity growth of recipient firms and find that this impact is positive and significant. On the other hand, the effect of joint ventures is less positive and not statistically significant. As regards the spillover effects, they find a negative horizontal spillover effect of FDI and joint ventures, taken together, on domestic companies. Kinoshita (2000) finds no significant technology spillover effect of joint ventures or FDI on productivity growth neither within the firm nor within the industry. The author further examines the two roles of the firm's R&D – innovation and absorptive capacity. She claims that the latter is far more important. According to her results, the effects of FDI are significant for firms that perform their own R&D – the horizontal spillover is positive and the direct effect is negative, whereas the effect of just R&D remains insignificant. Jarolím (2001) concentrates mainly on the performance of foreign-owned companies, but he examines also the horizontal spillover effects of FDI on domestic companies within the same sector. In line with the previous literature, he shows that foreign-owned companies are characterized by higher total factor productivity. However, he does not

find any significant horizontal spillover effects. Moreover, he compares the performance of greenfield ventures with foreign acquisitions and concludes that the former perform significantly better.

Damijan et al. (2003a) examine the direct effect of FDI, intra-industry knowledge spillovers from FDI and the impact of firms' own R&D accumulation on productivity growth using a sample of eight transition countries.[1] Regarding the Czech Republic, they find a positive direct effect of FDI on domestic recipient companies. Intra-industry knowledge spillovers are found to be insignificant, but, similarly to Kinoshita (2000), their significance increases when controlling for a firm's own R&D. Surprisingly, the productivity growth of Czech companies that perform their own R&D decreases with foreign presence in the industry. In a closely related study, Damijan et al. (2003b) use the same sample and add Lithuania and Latvia. Their analysis now incorporates not only horizontal but also vertical spillovers. They conclude that vertical spillover effects are more important than horizontal effects. Particularly, both of these effects are positive in the Czech Republic.

These previous studies about the Czech Republic have some similar characteristics. Most of them suffer from small samples and from focusing on the early transition period. Early transition (i.e., 1991-1996) is characterized by mass privatization and unclear ownership structures, whereas the main boom of foreign investment came in and after 1998 (see Figure 1 in the Appendix), which is the last sample year in almost all of these studies. Therefore, there is no surprise that they often did not succeed in finding any significant spillover effects. Furthermore, most of this previous literature is limited to manufacturing sectors only. However, it is likely that especially domestic companies from service sectors would be affected by the presence of foreign investors. Unlike manufacturing companies, these companies are not able to export their services abroad and they are limited to domestic market only. Finally, they incorporate mostly only horizontal spillovers.

Stančík (2007) attempts to improve over this literature by analyzing the effects of FDI on sales growth rate using a panel of 4,067 Czech companies from all sectors during the period of 1995-2003. He studies both horizontal and vertical spillovers. Moreover, he pays attention also to the potential endogeneity of FDI with respect to future industry growth. The results suggest that domestic companies are mostly *suffering* in the presence of foreign companies, especially in upstream sectors.

A slightly different concept is studied in Kosová (2004) where she concentrates on the

[1] Bulgaria, Czech Republic, Estonia, Hungary, Poland, Romania, Slovakia, and Slovenia.

crowding-out effect from the presence of foreign companies. She uses a sample of 9,986 Czech companies from all sectors covering the period 1994-2001. She finds a positive effect of foreign capital presence on domestic firms' growth and survival. She claims that exit rates are lower for companies in industries with foreign presence. On the other hand, Kosová and Ayyagari (2006) deal with the impact of FDI on domestic entrepreneurship. They find that foreign presence contributes positively to the entry rates of domestic companies through both horizontal and vertical spillovers. Although both of these effects are statistically significant, they claim the dominance of vertical spillovers over horizontal spillovers, especially through forward linkages. For this research they use a sample of 9,979 Czech companies covering the period 1994-2000.

There is another string of literature which focuses more closely on different types of foreign investment, not necessarily in the Czech Republic. However, instead of studying spillover effects, one part of this literature concentrates on direct impact of FDI on its recipients (Evenett and Voicu [2003]; Hanousek et al. [2005]; Javorcik and Arnold [2005]). The common finding from these studies is that acquired companies are positively affected by the presence of foreign investors. The other part of literature then studies distinct modes of entry of foreign investors. It usually deals with strategies of foreign investors or factors contributing to their decision process (Zejan [1990]; Hennart and Park [1993]; Harzing [2002]; Aminian et al. [2005]).

Regarding the literature that would clearly connect these two concepts – FDI spillovers and the type of foreign investment, there is almost nothing. One of the attempts is Wang and Wong (2007). They separate FDI into greenfields and cross-border mergers & acquisitions and study the impact on economic growth. However, this is a country level study and greenfield FDI is only estimated from total FDI inflow values. The main reason for shortage of studies about this issue is probably a lack of information in data that would allow to distinguish between acquisitions and greenfields.

3. Research Approach

3.1. Spillover Variables

In this study we follow the approach of Stančík (2007) and create six spillover variables. The variable $THORIZ_{jt}$ measures the foreign presence[2] in takeovers within a sector.

[2] We interpret a company as foreign if it has at least 10% of its equity owned by a foreign investor. The same

It represents the share of foreign capital invested in acquired domestic companies by foreign ones, i.e., in takeovers, in sector *j* at time *t* and is defined as

$$THORIZ_{jt} = \frac{\sum_{i:i \in j, FS_{ijt} \geq 0.1} FS_{ijt} FA_{ijt}}{\sum_{i:i \in j} FA_{ijt}} \quad (1)$$

where FS_{ijt} denotes the share of foreign capital in firm *i* at time *t* in sector *j*, given that firm *i* is a takeover, and FA_{ijt} denotes the fixed assets of firm *i* at time *t* in sector *j*.

The variable $TBACK_{jt}$ represents the weighted share of foreign capital in takeovers in all sectors that are supplied by sector *j* at time *t* and, conversely, the variable $TFORW_{jt}$ represents the weighted share of foreign capital in takeovers in all sectors that supply sector *j* at time *t.* They are defined as

$$TBACK_{jt} = \sum_{k:k \neq j} \beta_{jkt} THORIZ_{kt} \quad (2)$$

$$TFORW_{jt} = \sum_{k:k \neq j} \beta_{kjt} THORIZ_{kt}, \quad (3)$$

where β_{xyt} stands for the fraction of output from sector *x* supplied to sector *y* at time *t*. $TBACK_{jt}$ measures the presence of foreign takeovers downstream and $TFORW_{jt}$ measures the presence of foreign takeovers upstream.

In a similar fashion we define three remaining variables $GHORIZ_{jt}$, $GBACK_{jt}$, $GFORW_{jt}$. The only difference is that instead of foreign capital in takeovers these variables are now related to foreign capital invested in greenfields that are built by foreign investors.

3.2. Theoretical Model

The goal of this paper is to examine whether sales growth is affected by the share of foreign capital within and across sectors and whether these effects differ with respect to the type of foreign investment (takeovers vs. greenfields). For this purpose, we follow the methodology of Haddad and Harrison (1993). They assume a production function with value-added *Y* that is a function of two inputs, capital *K* and labor *L*:

$$Y_{ijt} = A_{jt} f(K_{ijt}, L_{ijt}).$$

The level of productivity is given by A_{jt}. It is assumed to vary across sectors *j* and time *t*. By using total differential, taking logs, and using the fact that the value of the marginal product for each factor equals its cost, we now have

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threshold is also used in the Czech National Bank official definition of FDI and in Damijan et al. (2003b), Javorcik (2004), and Stančík (2007).

$$\Delta \ln Y_{ijt} = \frac{\Delta A_{jt}}{A_{jt}} + \alpha_1 \Delta \ln K_{ijt} + \alpha_2 \Delta \ln L_{ijt}, \quad (4)$$

where $\frac{\Delta A}{A}$ is productivity growth. The coefficients on the growth of labor and capital are simply their share in value-added. We test the hypothesis that productivity growth is affected by the share of foreign capital both within and across sectors and that there are differences between takeovers and greenfields in these effects. Thus, we proceed by assuming that productivity growth can be decomposed into the following components:

$$\frac{\Delta A_{jt}}{A_{jt}} = \alpha_0 + \alpha_3 THORIZ_{jt} + \alpha_4 TBACK_{jt} + \alpha_5 TFORW_{jt} + \\ + \alpha_6 GHORIZ_{jt} + \alpha_7 GBACK_{jt} + \alpha_8 GFORW_{jt} + \alpha_t + \varepsilon_{ijt} \quad (5)$$

where *THORIZ*, *TBACK*, and *TFORW* are variables measuring the spillover effects from foreign takeovers, *GHORIZ*, *GBACK*, and *GFORW* are variables measuring the spillover effects from foreign greenfields and the set of dummy variables, α_t, is introduced to control for year-specific effects. A disturbance term ε_{ijt} is added to account for possible changes in productivity growth due to stochastic shocks at the firm or sector level over time. Combining (4) and (5) yields the equation we estimate:

$$\Delta \ln Y_{ijt} = \alpha_0 + \alpha_1 \Delta \ln K_{ijt} + \alpha_2 \Delta \ln L_{ijt} + \alpha_3 THORIZ_{jt} + \alpha_4 TBACK_{jt} + \alpha_5 TFORW_{jt} + \\ + \alpha_6 GHORIZ_{jt} + \alpha_7 GBACK_{jt} + \alpha_8 GFORW_{jt} + \alpha_t + \varepsilon_{ijt} \quad (6)$$

4. Data

The company-level annual data used here come from the *ASPEKT* database, which is a Czech source for the *Amadeus* database[3] and is widely used in empirical research (Earnhart and Lízal [2002]; Hanousek et al. [2005]; Bena and Hanousek [2006]). Financial data cover the period 1993-2006, include almost 30,000 Czech firms in total and form an unbalanced panel, where the number of usable companies varies from almost 2,000 in 1993 to more than 19,000 in 2004. The *ASPEKT* database also provides information about companies' ownership structure. However, due to the limited availability of this information, the total number of companies is significantly reduced. Ownership information allows us to distinguish foreign companies from domestic ones. Unfortunately, this ownership information does not allow to distinguish foreign takeovers from greenfields. For this purpose, we use internet and search web pages for history of all foreign companies in our sample. In contrast to most previous studies about FDI spillovers, we do not limit the analysis

[3] *Amadeus* is a pan-European financial database.

only to the manufacturing sectors. With few exceptions, we employ data from all sectors; only sectors with a strong regulatory role of the government are excluded (see the Appendix for details).

For studying vertical spillover effects, we employ inter-industry data (input-output matrices) that come from the Czech Statistical Office (CSO) and are available for every year during 1995-2005. There is an often used assumption in previous studies[4] that these matrices do not change much over time. However, a descriptive analysis in Stančík (2007) reveals that for almost 30% of relations[5] the standard deviation over time is bigger than the mean value. Therefore, in order to remove possible measurement errors, we follow the approach in Stančík (2007) and use fitted values of time trends based on these matrices instead of the original values. In other words, we still have a different input-output matrix for each year but these matrices now capture trends in supplying and demanding rather than just oscillating official values.

After merging all variables and performing several data cleaning procedures,[6] the resulting sample covers the period 1995-2005 and contains information about 4,253 companies from 44 sectors,[7] 23,680 observations in total. An overview of the time, sector and ownership structure of the final sample is provided in Table 1 and Table 3. The number of companies varies from 1,124 in 2005 to 2,788 in 2000. Foreign companies represent 26% of all observations. As regards sectors, most of the companies are from service sectors (56%) and manufacturing sectors (38%). Table 3 also includes information about the structure of our sample regarding takeovers and greenfields. From the total 4,253 companies, 12% are acquisitions and almost 19% are greenfields.

Finally, Table 2 shows the summary statistics of all the variables used in this research. As regards the ownership structure, the average share of a foreign investor in a Czech company is almost 20%.

[4] Damijan et al. (2003b), Javorcik (2004), or Kosová and Ayyagari (2006).
[5] A relation is a time series of the flow of goods and services from sector *X* to sector *Y* for the whole period 1995-2005. There are almost 7,000 such relations – for every combination of sectors *X* and *Y*, as well as for the supply and demand relationship. These relations are used to generate a mean value and standard deviation for every time series.
[6] All of these procedures are described in the Appendix.
[7] At 2-digit NACE classification (Classification of Economic Activities in the European Community).

5. Estimation Results

5.1. Baseline Specification

In order to study the horizontal and vertical spillover effects from FDI, the following modification of model (6) is estimated:

$$\Delta \ln SALES_{ijt} = \gamma_i + \alpha_1 \Delta \ln FA_{ijt} + \alpha_2 \Delta \ln SC_{ijt} + \alpha_3 THORIZ_{jt} + \alpha_4 TBACK_{jt} + \alpha_5 TFORW_{jt} + \alpha_6 GHORIZ_{jt} + \alpha_7 GBACK_{jt} + \alpha_8 GFORW_{jt} + \alpha_t + \varepsilon_{ijt} \quad (7)$$

where $SALES_{ijt}$, FA_{ijt}, and SC_{ijt} stand for sales, fixed assets, and staff costs, respectively, for firm i at time t in sector j. The set of year dummy variables, α_t, is also introduced because sales, fixed assets, and staff costs are originally collected in nominal values. Moreover, each company has its own unobserved characteristics, e.g., better management or better technologies, which are assumed to be constant over time. For this reason, the variable γ_i is included for capturing such firm characteristics. Model (7) is thus estimated with firms' fixed effects.

A positive value of the variable $THORIZ_{jt}$ would imply that the presence of foreign takeovers in the sector has a positive impact on the productivity of domestic companies within a sector. A positive value of the variable $TBACK_{jt}$ would imply that the presence of foreign takeovers has a positive impact on the productivity of those domestic companies that supply the foreign companies' sectors. Similarly, a positive value of the variable $TFORW_{jt}$ would imply that the presence of foreign takeovers has a positive impact on the productivity of those domestic companies that are supplied by the foreign companies' sectors. Furthermore, variables measuring spillover effects from greenfields are defined accordingly. A positive value of the variable $GHORIZ_{jt}$ would imply that the presence of foreign greenfields in the sector has a positive impact on the productivity of domestic companies within a sector. A positive value of the variable $GBACK_{jt}$ would imply that the presence of foreign greenfields has a positive impact on the productivity of those domestic companies that supply the foreign companies' sectors. Similarly, a positive value of the variable $GFORW_{jt}$ would imply that the presence of foreign greenfields has a positive impact on the productivity of those domestic companies that are supplied by the foreign companies' sectors.

Since the goal of this paper is to study the effects on domestic companies, model (7), as well as all further models, are estimated on a sample of "always-domestic" companies only. This sample excludes companies that are foreign at any time during the sample frame. It

allows one to study the pure spillover effects of FDI that are not affected by the better performance of either foreign greenfield companies, local companies that have been taken over by a foreign entity or local companies that are about to become foreign in the near future. However, for comparison, we estimate model (7) using the whole company population as well, including foreign companies.

Furthermore, in this kind of study, one has to be aware of the potential endogeneity of ownership at the firm level. In that case, foreign investors would acquire better domestic companies, while the worse ones would remain domestic. As a result, estimated coefficients would be biased towards negative values. In order to check whether this is the case, we also run regression (7) on a sample of companies that are always domestic plus the companies that will be acquired by foreign investors in the future during the period 1995-2005 but are still domestic now.

The estimates from these regressions are summarized in Table 4. The first column includes the estimated coefficients using a sample of always-domestic companies. The coefficients of capital and labor inputs are positive and significant, which is in line with expectations. The coefficient of the horizontal spillover variable from takeovers is positive and weakly significant. On the other hand, the coefficient of the same variable but from greenfields is negative and more significant. This implies that domestic companies are gaining in the presence of foreign takeovers within the same industry but losing from the presence of foreign greenfields within the same sector. However, it is necessary to emphasize that economically, these effects are very small: a one-percentage point increase in foreign capital's share in takeovers/greenfields within a sector causes an increase/decrease in the growth rate of the sales of domestic companies in the same sector by only 0.14/0.26 percentage points. Since there are no previous studies dealing with an FDI impact of takeovers and greenfields separately, it is possible to compare these results only in global aspects. In this sense, these results are in line with previous studies, which mostly find only weak or non-significant horizontal spillover effect. One of the reason can be exactly the fact that the impact of takeovers differs from the impact of greenfields and put together, these impacts negate each other.

Regarding backward spillovers, the situation is different when both coefficients are negative and strongly significant. These results correspond to previous finding by Stančík (2007) who finds negative backward spillover effects from FDI, though neither his study recognizes takeovers from greenfields. The current estimates suggest that domestic companies supplying both foreign takeovers and greenfields are negatively affected by their

presence: a one-percentage point increase in foreign capital's share in takeovers/greenfields in a downstream sector causes a decrease in the growth rate of the sales of supplying domestic companies by 0.7/1.5 percentage points. These impacts are about 5-6 times bigger than horizontal ones. The interesting fact is that the impact of greenfields is double in magnitude compared to takeovers and this holds for horizontal as well as for backward spillover effects. Finally, the coefficients of the forward spillover variables are in both cases insignificant so there are no spillover effects on consuming domestic companies.

According to these results, domestic companies are mainly negatively affected by the presence of foreign investors, either takeovers or greenfields, in downstream sectors. The explanation for this finding can be found in Tables 5 and 6. Table 5 shows the results from a regression of industry imports, the amount of goods and services imported to sector *j* at time *t* from abroad, on the share of foreign capital. The positive coefficients of $THORIZ_{jt}$ and $GHORIZ_{jt}$ suggest that both types of foreign investors tend to import their supplies from abroad rather than use domestic suppliers. In addition, according to the Table 6, domestic companies oriented at foreign markets are able to deal with this fact. The regression in Table 6 is run on the firm level, although companies are divided into export- and non-export-oriented groups based on data on the sector level. A sector is considered to be export-oriented if it exports on average over the period 1995-2005 at least 50% of its production abroad. The coefficients of both backward spillover variables are statistically insignificant. However, domestic companies oriented mostly on the domestic market have nobody else to supply. In this case, there are significant and negative backward spillover effects, from takeovers as well as from greenfields. Since the number of these domestically-oriented companies is bigger than the export-oriented, these negative effects dominate when the sample of all "always-domestic" companies is employed.

Table 4 also presents the results from the estimation using a population of "to-now-domestic" companies in order to verify the potential endogeneity of foreign ownership. The results are consistent with little *cherry picking* by foreign investors because the estimated coefficients have basically the same magnitudes as when the sample of "always-domestic" companies was employed.

5.2. FDI Spillovers on Various Subsamples

The previous results indicate that there are strong backward spillover effects from FDI on domestic companies, either from takeovers or from greenfields. Horizontal spillover

effects are present as well but they are much less statistically or economically significant. Additionally, there are no forward spillovers present. However, these effects may be prevalent or stronger only in some period of time or in some specific group of companies. Fortunately, our sufficiently big sample allows us to create several smaller subsamples. Thus, regression (7) is run stepwise on two subsamples from the periods 1995-2000 and 2001-2005. Moreover, it is run on a subsample from the period 1998-2005 to see the impact of FDI on domestic companies after the boom in 1998. Then, it is run also on a subsample of "smaller" companies. In this case, a company is defined as "smaller at time *t*" if its amount of fixed assets in year *t* is lower than the average amount of fixed assets of all companies within a sector in year *t*. This case is interesting because there are potentially two opposite effects. Due to their smaller size, these companies may be flexible and capable to quickly adjust to a new situation in a market. On the other hand, precisely because of their smaller size, they have only limited sources for improving their technologies or hiring new managers. Finally, regression (7) is run on subsamples of only-manufacturing companies as well as only-service companies to see the impact of FDI on these specific industries.

The results of the estimated coefficients from the six regressions on subsamples of always-domestic companies are summarized in Table 7. The coefficients of inputs are almost the same as with the original sample. The only difference is that the coefficient of fixed assets is not significant for later periods. The results for the period 1998-2005, i.e., the period of FDI boom in the Czech Republic, are almost the same as for the whole sample. However additionally, there are positive and significant, though only weakly, forward spillover effects from takeovers as well as from greenfields. These results are even more obvious during the years 2001-2005 when positive and strongly significant forward spillover effects are the only found effects. Thus, it might suggest an ability of domestic companies to improve themselves once they are offered better or improved products and services from foreign companies from upstream sectors and their enhanced ability to learn and adjust in this later period. It is also interesting that while at the beginning domestic companies used to only suffer from the presence of foreign investors, especially greenfields, the situation turned around recently and domestic companies mostly gain from the presence of these foreign investors.

The situation for "smaller" companies just copies the overall results with mixed results for horizontal spillovers and negative backward spillovers. Thus, as regards the potential opposite effects mentioned above, none of them dominates the other one. While the results for manufacturing companies do not reveal any significant spillovers, the last column shows that especially the service sector is the one that loses in the presence of foreign investors.

Both backward spillovers from takeovers and greenfields are negative, significant and more than double in magnitude compared to the overall results. Regarding horizontal spillovers, the overall positive spillover effect from takeovers now diminishes and the negative impact from greenfields is even bigger. These are natural results because service companies are almost completely domestically oriented and usually they are not forced by the domestic market to improve their products. Therefore, it is even harder for them to adjust to the presence of foreign companies. However, a forward spillover effect from takeovers is found to be positive, which is partially in line with the results from the previous paragraph.

5.3. Time Aspects of FDI Spillovers

The sections above assume that horizontal and vertical spillover effects from takeovers as well as greenfields are constant over time. But it is reasonable to assume that since foreign investors are usually one step ahead of domestic companies, these domestic companies need some time to improve their technology or efficiency. Moreover, the inflow of FDI has increased substantially since 1998, but this increase takes some time to have an effect. It is often the case, particularly for big greenfield investments, that although they are assigned to one specific year, it takes 1-2 years till these new companies start to produce and consequently to have an impact on a market. The similar reasoning holds also for acquisitions by foreign investors; an impact on these companies' production is often not immediate.

Therefore, in order to allow for the lagged effects of horizontal and vertical spillovers, two separate modifications of model (7), already with the lagged spillover variables, are estimated. The estimation results are reported in Table 8. For comparison, the first column comprises the results from the baseline model (7). Although there are positive/negative significant horizontal spillovers from takeover/greenfields in time *t*, they are now insignificant for both lags. Hence, initially domestic companies are slightly affected by the presence of foreign companies within their sector. But already after 1 year both of these positive and negative effects disappear. Regarding backward spillovers, they show some persistence for takeovers but only for 1 period. Otherwise, the situation is similar to horizontal spillovers. Domestic companies tend to adjust within a year, so after an initial negative shock they are able to regain their positions within 1-2 years. Thus, horizontal and backward spillover effects are sensitive to time and they occur mostly within the same year as a foreign investment. However, forward spillover effects on consuming domestic companies are significant only after 1 or 2 years after a foreign investment. In case of takeovers, this

effect is positive, while for greenfields this effect is negative. This is an interesting result, especially in connection with the results from time *t*. It suggests a dynamic pattern in FDI spillovers. At first, domestic companies are positively affected by the presence of foreign takeovers within their sector. Then, this positive impact is translated through forward spillovers on their consumers in the next period. At the same time, foreign greenfields cause an opposite effect – negative initial impact on domestic companies, later translated through negative forward spillovers.

6. Conclusion

In this paper we analyze the horizontal and vertical spillover effects of FDI on the sales growth of Czech domestic companies over the period 1995-2005. In contrast to the previous literature, we study these spillovers with respect to two kinds of foreign investment – acquisitions and greenfields.

The results suggest that especially supplying domestic companies are affected by the presence of foreign investors downstream through negative backward spillover effects. The impact is bigger in case of greenfields: a 1 percentage point increase in foreign capital in takeovers/greenfields in a downstream sector causes a decrease in the growth rate of the sales of supplying domestic companies by 0.7/1.5 percentage points. This evidence can be explained by the fact that both types of foreign investors tend to import their supplies from abroad instead of using domestic suppliers. As a consequence, those domestic companies that are oriented mainly on the domestic market lose their sales. Regarding horizontal spillover effects, they are statistically weaker and much smaller in magnitude. However, the main difference is that foreign takeovers have a positive impact on domestic companies within their sector. The impact of greenfields remains negative. These contradictory results are probably the reason why the most of previous studies find only weak or insignificant horizontal spillovers. No forward spillover effects are present. Negative spillovers, horizontal or backward, are present especially in service sectors, which is again the consequence of their mainly domestic orientation. However, once they are offered "better" products from upstream sectors with foreign takeovers presence, their sales growth increases.

Furthermore, we consider also the time aspect of these spillovers. In this case, the results suggest a dynamic pattern in FDI spillovers. At first, domestic companies are positively affected by the presence of foreign takeovers within their sector. Then, this positive impact is translated through forward spillovers on their consumers in the next period.

At the same time, foreign greenfields cause an opposite effect – negative initial impact on domestic companies, later translated into negative forward spillovers. Thus, we can conclude that all of these spillover effects are sensitive to time. Horizontal and backward spillovers occur mostly within the same year as a foreign investment, whereas forward spillovers need at least 1 year.

To conclude, we find that Czech domestic companies are not profiting from the presence of foreign investors. The overall impact on their sales growth rate is mostly negative, although the impact from takeovers is mixed and differs for supplying and consuming domestic companies. On the other hand, the results from the recent period are quite promising. Especially consuming domestic companies start to gain and their sales growth rates increase. Nevertheless, we are still not able to answer the question laid at the beginning – whom should we support more? Takeovers partially promote sales growth rate of other domestic companies, while the impact from greenfields is rather negative. But in fact, it is greenfields who create new jobs or start production in previously sleeping sectors.

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8. Appendix

Data cleaning procedure

Starting with the original data set we perform the following procedures:

- **sales, fixed assets, staff costs**
  - Observations other than from December 31 are dropped.
  - If there are more observations (from various accounting systems) for the same company and year, we use only the one from the most frequent accounting system.
  - Missing values are replaced by interpolated values.
- **ownership structure**
  - The sum of weighted averages, according to the number of reported days out of 365, of all owners within a year is used for creating a company's ownership structure. This structure afterwards includes the share of foreign as well as domestic capital for each company in each particular year.
  - When in two consecutive years (*t* and *t+1*) the share of domestic capital does not change and

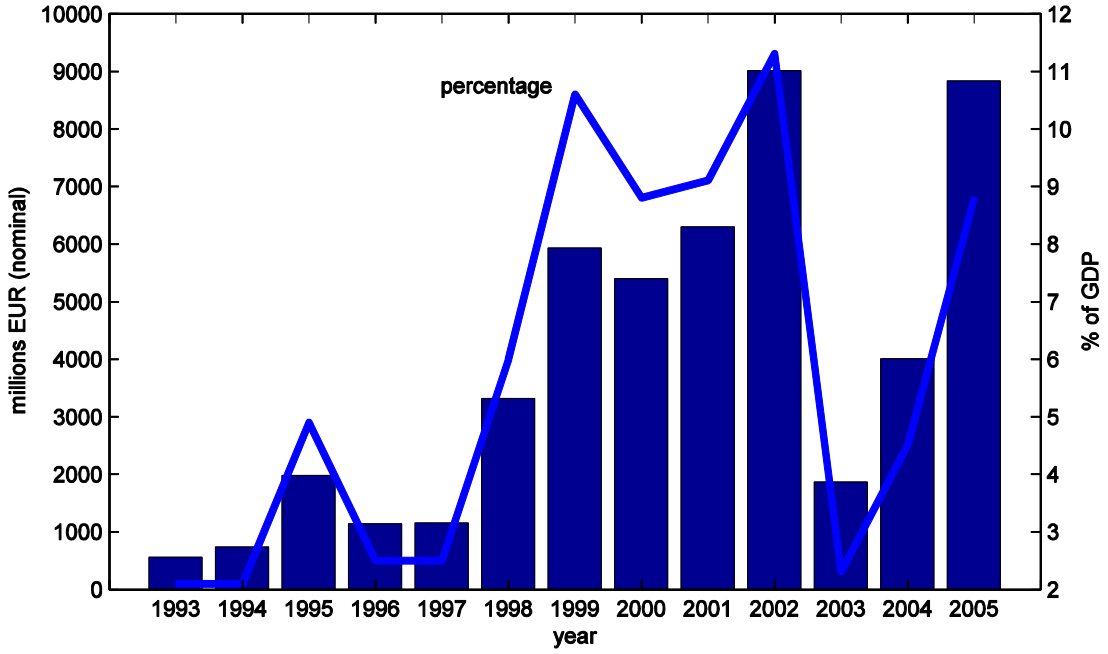
the value of the share of foreign capital in time *t* is missing, then this missing value is replaced with the value of foreign share from time *t+1*.

- We also assume the foreign share to be non-decreasing which allows considering a company as foreign also in the next year even in absence of ownership structure information once it is found to be foreign in any previous year with a known ownership structure.
- Observations from the years 1993 and 1994 are dropped due to missing ownership information.
- Observations from the year 2006 are dropped as well because they are recorded only till June 30, 2006.

- **cleaning of variables**
  - Companies with only one year-observation are dropped since it is not possible to compute a growth rate for them.
  - Negative values of ownership shares are dropped.
  - If the sum of percentage ownerships of foreign and domestic owners is greater than 110%, the observation is dropped.
  - Sectors with a strong regulatory role of the government are dropped:
    * NACE-01 Agriculture, hunting and related service activities
    * NACE-02 Forestry, logging and related service activities
    * NACE-05 Fishing, fish farming and related service activities
    * NACE-40 Electricity, gas, steam and hot water supply
    * NACE-41 Collection, purification and distribution of water
    * NACE-75 Public administration & defence; compulsory social security
    * NACE-80 Education
    * NACE-85 Health and social work

Tables and Figures

Figure 1: FDI inflow into the Czech Republic.



Source: Czech National Bank

Table 1: Number of companies by year.

The column "all" includes information about the number of companies from each year; the column "domestic" denotes only always-domestic companies in each year; the column "foreign" includes the number of foreign companies in each year; the column "takeover" comprises the number of takeovers in each year; and the column "greenfield" denotes the number of greenfields in each year.

year	all	domestic	foreign	takeover	greenfield
1995	1 336	1 066	127	176	94
1996	2 007	1 558	273	256	193
1997	2 370	1 816	400	309	245
1998	2 570	1 924	507	330	316
1999	2 682	1 936	636	357	389
2000	2 788	1 937	777	401	450
2001	2 644	1 763	838	413	468
2002	2 599	1 674	910	410	515
2003	2 361	1 528	833	370	463
2004	1 199	722	473	201	276
2005	1 124	665	459	178	281
Total	23 680	16 589	6 233	3 401	3 690

Table 2: Summary statistics.

The variable *foreign* denotes the share of foreign capital in a company and the variable *domestic* denotes the share of domestic capital in a company.

variable	observations	mean	std. deviation	min	max
sales (ths. CZK)	23 680	663 282	3 453 186	1	177 800 000
fixed assets (ths. CZK)	23 680	410 876	2 792 964	1	130 500 000
staff costs (ths. CZK)	23 680	71 009	279 695	1	8 499 800
Δln sales	23 680	0.019	0.997	-10.979	14.458
Δln fixed assets	23 680	0.030	0.745	-9.543	11.785
Δln staff costs	23 680	0.062	0.617	-9.641	9.968
foreign (%)	23 680	19.900	37.328	0	100.275
domestic (%)	23 680	37.854	40.290	0	109.678
T-horizontal	23 680	0.095	0.128	0	0.929
T-backward	23 680	0.073	0.065	0	0.648
T-forward	23 680	0.073	0.051	0.004	0.323
G-horizontal	23 680	0.143	0.158	0	1.000
G-backward	23 680	0.086	0.058	0.001	0.411
G-forward	23 680	0.076	0.049	0.007	0.322

Table 3: Number of companies by NACE classification.

This table presents the classification of companies according to NACE and the type of ownership. The column "all" includes the total number of all companies in each sector; the column "domestic" denotes only always-domestic companies in each sector; the column "takeover" comprises the number of takeovers in each sector; and the column "greenfield" denotes the number of greenfields in each sector.

NACE	all	domestic	takeover	greenfield
10 Mining of coal and lignite; extraction of peat	10	9	1	0
14 Other mining and quarrying	33	25	5	3
15 Manufacture of food products and beverages	280	228	35	17
16 Manufacture of tobacco products	3	0	0	3
17 Manufacture of textiles	78	61	10	7
18 Manufacture of wearing apparel; dressing and dyeing of fur	14	13	1	0
19 Manufacture of leather and leather products	12	10	2	0
20 Manufacture of wood and wood products	75	59	13	3
21 Manufacture of pulp, paper and paper products	33	19	8	6
22 Publishing, printing and reproduction of recorded media	50	33	9	8
23 Manufacture of coke, refined petroleum products and nuclear fuel	4	3	1	0
24 Manufacture of chemicals and chemical products	91	55	21	15
25 Manufacture of rubber and plastic products	53	25	14	14
26 Manufacture of other non-metallic mineral products	152	97	40	15
27 Manufacture of basic metals	75	59	13	3
28 Manufacture of fabricated metal products	151	110	23	18
29 Manufacture of machinery and equipment n.e.c.	222	165	34	23
30 Manufacture of office machinery and computers	4	1	0	3
31 Manufacture of electrical machinery and apparatus n.e.c.	95	55	21	19
32 Manufacture of radio, TV and communication equipment	37	23	4	10
33 Manufacture of medical, precision and optical instruments	38	29	4	5
34 Manufacture of motor vehicles, trailers and semi-trailers	62	28	18	16
35 Manufacture of other transport equipment	30	21	8	1
36 Manufacture of furniture; manufacturing n.e.c.	32	20	8	4
37 Recycling	15	15	0	0
45 Construction	225	190	26	9
50 Sale, maintenance and repair of motor vehicles and motorcycles	106	81	3	22
51 Wholesale trade, except of motor vehicles and motorcycles	647	341	52	254
52 Retail trade; repair of personal and household goods	182	113	12	57
55 Hotels and restaurants	70	55	5	10
60 Land transport; transport via pipelines	107	96	7	4
63 Supporting and auxiliary transport activities; travel agencies	50	24	8	18
64 Post and telecommunications	43	17	8	18
65 Financial intermediation, except insurance and pension funding	207	150	19	38
66 Insurance and pension funding, except compulsory social security	1	1	0	0
67 Activities auxiliary to financial intermediation	19	15	1	3
70 Real estate services	260	206	24	30
71 Renting of machinery and equipment without operator	14	8	1	5
72 Computer and related services	84	45	7	32
73 Research and development	28	24	2	2
74 Other business services	460	332	42	86
90 Sewage and refuse disposal, sanitation and similar activities	63	56	4	3
92 Recreational, cultural and sporting activities	32	27	1	4
93 Other service activities	6	6	0	0
Total	4 253	2 950	515	788

Table 4: Baseline specification.

This table presents the estimated horizontal and vertical spillover effects of FDI, divided by takeovers and greenfields. The dependent variable is *Δ*ln *SALES*. The first column represents the model with spillovers examined on the sample of always-domestic companies, the second represents spillovers estimated on the sample of to-now-domestic companies, and the last one shows the results using the sample of all companies, including the foreign owned.

	always-domestic	to-now-domestic	whole population
const	0.267***	0.270***	0.269***
	(0.037)	(0.036)	(0.035)
ΔlnFA	0.065***	0.063***	0.049***
	(0.021)	(0.020)	(0.018)
ΔlnSC	0.601***	0.609***	0.632***
	(0.043)	(0.043)	(0.038)
T-Horizontal	0.144*	0.164**	0.165**
	(0.081)	(0.080)	(0.072)
T-Backward	-0.714***	-0.732***	-0.787***
	(0.265)	(0.263)	(0.224)
T-Forward	0.463	0.501	0.132
	(0.398)	(0.412)	(0.366)
G-Horizontal	-0.255**	-0.247**	-0.153
	(0.115)	(0.113)	(0.098)
G-Backward	-1.468***	-1.391***	-1.235***
	(0.411)	(0.403)	(0.411)
G-Forward	-0.278	-0.302	0.526
	(0.568)	(0.561)	(0.498)
Year dummies	yes	yes	yes
number of obs.	16 589	17 447	23 680
F statistic	40.64	42.11	60.82

Note: Regressions with firms' fixed effects. Robust standard errors are in parentheses; they have been corrected for clustering for each company; significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Table 5: The relationship between FDI and import.

This table presents the results from the regression of sector import on the shares of foreign capital in takeovers and greenfields within the sector.

dependent variable	$IMPORT_{it}$
const	19 366.840***
	(2 164.019)
$THORIZ_{jt}$	98 220.337***
	(13 581.524)
$GHORIZ_{jt}$	12 035.839*
	(7 109.411)
number of obs.	441
R^2	0.135

Note: Robust standard errors are in parentheses; significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Table 6: Division by non-exporting and exporting sectors.

This table presents the estimated horizontal and vertical spillover effects of FDI, divided by takeovers and greenfields, on two different subsamples of always-domestic companies. The division is done according to exporting strategies on the sector level. It explains the negative backward spillover effects found in regression (7). The dependent variable is Δln *SALES*.

sectors	non-exporting	exporting
const	0.331***	0.112**
	(0.045)	(0.045)
$\Delta lnFA$	0.068***	0.030
	(0.022)	(0.057)
$\Delta lnSC$	0.583***	0.704***
	(0.048)	(0.084)
T-Horizontal	0.262**	0.019
	(0.106)	(0.120)
T-Backward	-1.156***	0.037
	(0.353)	(0.329)
T-Forward	1.126**	-0.053
	(0.504)	(0.657)
G-Horizontal	-0.381**	-0.138
	(0.150)	(0.150)
G-Backward	-2.109***	-0.446
	(0.517)	(0.694)
G-Forward	-0.005	-2.944***
	(0.660)	(1.064)
Year dummies	yes	yes
number of obs.	13 383	3 206
F statistic	33.90	15.92

Note: Regressions with firms' fixed effects. Robust standard errors are in parentheses; they have been corrected for clustering for each company; significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Table 7: Different subsamples.

This table presents the estimated horizontal and vertical spillover effects of FDI, divided by takeovers and greenfields, on several different subsamples of always-domestic companies. The first three columns represents different time spans, the last three represent a sample of smaller domestic companies, a sample of companies from manufacturing sectors, and a sample of companies from service sectors. The dependent variable is Δln *SALES*.

specification	1995-2000	2001-2005	1998-2005	*FA<mean*	manufacture	service
const	0.337***	-0.700***	0.047	0.244***	0.034	0.483***
	(0.053)	(0.262)	(0.155)	(0.045)	(0.040)	(0.066)
ΔlnFA	0.066**	0.026	0.036	0.056***	0.081**	0.053**
	(0.026)	(0.043)	(0.025)	(0.021)	(0.038)	(0.025)
ΔlnSC	0.617***	0.528***	0.565***	0.604***	0.639***	0.567***
	(0.051)	(0.083)	(0.051)	(0.043)	(0.083)	(0.052)
T-Horizontal	0.080	-0.155	0.157*	0.206**	0.027	0.211
	(0.183)	(0.197)	(0.093)	(0.096)	(0.101)	(0.160)
T-Backward	1.033	0.671	-0.947***	-0.741**	0.438	-1.720***
	(0.673)	(1.202)	(0.344)	(0.314)	(0.293)	(0.496)
T-Forward	-1.360	3.106***	0.909*	0.344	0.482	2.833***
	(1.058)	(1.048)	(0.480)	(0.468)	(0.577)	(0.668)
G-Horizontal	-0.055	-0.067	-0.270**	-0.245*	0.100	-0.475***
	(0.202)	(0.223)	(0.131)	(0.138)	(0.164)	(0.173)
G-Backward	-2.366***	-0.919	-1.602***	-1.194**	-0.640	-3.191***
	(0.734)	(0.930)	(0.507)	(0.468)	(0.519)	(1.005)
G-Forward	-2.521**	4.422***	1.328*	0.035	0.044	0.448
	(1.133)	(1.523)	(0.767)	(0.665)	(0.670)	(1.221)
Year dummies	yes	yes	yes	yes	yes	yes
number of obs.	10 237	6 352	12 149	13 007	6 891	8380
F statistic	39.25	8.83	23.75	34.86	24.38	25.06

Note: Regressions with firms' fixed effects. Robust standard errors are in parentheses; they have been corrected for clustering for each company; significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Table 8: The specification with lags.

This table presents the results from specifications when spillover variables are allowed to be lagged by 1 or 2 years. The results are estimated on a sample of always-domestic companies only. The dependent variable is Δln *SALES*.

	t	*t-1*	*t-2*
const	0.267***	0.274**	0.064
	(0.037)	(0.115)	(0.133)
$\Delta lnFA$	0.065***	0.061***	0.054**
	(0.021)	(0.022)	(0.022)
$\Delta lnSC$	0.601***	0.588***	0.599***
	(0.043)	(0.042)	(0.047)
$T\text{-}Horizontal_t$	0.144*		
	(0.081)		
$T\text{-}Horizontal_{t-1}$		0.028	
		(0.100)	
$T\text{-}Horizontal_{t-2}$			-0.038
			(0.127)
$T\text{-}Backward_t$	-0.714***		
	(0.265)		
$T\text{-}Backward_{t-1}$		-0.742**	
		(0.289)	
$T\text{-}Backward_{t-2}$			0.175
			(0.311)
$T\text{-}Forward_t$	0.463		
	(0.398)		
$T\text{-}Forward_{t-1}$		1.847***	
		(0.486)	
$T\text{-}Forward_{t-2}$			2.119***
			(0.637)
$G\text{-}Horizontal_t$	-0.255**		
	(0.115)		
$G\text{-}Horizontal_{t-1}$		-0.125	
		(0.111)	
$G\text{-}Horizontal_{t-2}$			0.026
			(0.142)
$G\text{-}Backward_t$	-1.468***		
	(0.411)		
$G\text{-}Backward_{t-1}$		0.221	
		(0.451)	
$G\text{-}Backward_{t-2}$			0.544
			(0.526)
$G\text{-}Forward_t$	-0.278		
	(0.568)		
$G\text{-}Forward_{t-1}$		-2.427***	
		(0.647)	
$G\text{-}Forward_{t-2}$			-1.968**
			(0.798)
Year dummies	yes	yes	yes
number of obs.	16 589	15 523	13 965
F statistic	40.64	33.79	29.93

Note: Regressions with firms' fixed effects. Robust standard errors are in parentheses; they have been corrected for clustering for each company; significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.