Liquidity Constraints and Linkages with Multinationals

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April 4, 2008

Abstract: Using a unique data set from the Czech Republic for 1994-2003, this study examines the relationship between a firm's liquidity constraints and its supply linkages with multinational corporations (MNCs). The empirical analysis indicates that Czech firms supplying MNCs are less credit constrained than non-suppliers. A closer inspection of the timing of the effect, however, suggests that this result is due to less constrained firms self-selecting into becoming MNC suppliers rather than the benefits derived from the supplying relationship. As recent literature finds that productivity spillovers from foreign direct investment (FDI) are most likely to take place through contacts between MNCs and their local suppliers, our finding suggests that well-developed financial markets may be needed in order to take full advantage of the benefits associated with FDI inflows.

Keywords: *foreign direct investment, cash flow, liquidity constraints*

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The authors would like to thank Steve Fazzari, Leonardo Iacovone, Yue Li, Inessa Love, Jan Svejnar for helpful comments and suggestions.

I. Introduction

The role of financial sector development in fostering economic growth has received a lot of attention in recent years. For instance, in an influential paper Rajan and Zingales (1998) provided evidence suggesting that financial sector development reduces the costs of external finance to firms, by demonstrating that industrial sectors that are relatively more in need of external finance develop disproportionately faster in countries with more developed financial markets.

More recent research has argued that access to financing may promote economic growth by allowing firms to tap into new sources of knowledge by entering foreign markets and becoming suppliers to multinationals (MNCs). In a theoretical contribution, Chaney (2005) has shown that if firms must pay entry costs in order to sell in a foreign market and if they face liquidity constraints to finance these costs, only those firms that have sufficient liquidity will be able to export. While a set of firms could profitably export, they are prevented from doing so because they lack sufficient liquidity. Manova (2006) has provided empirical support for this view by showing that countries with better developed financial systems tend to export relatively more in highly external capital dependent industries and in sectors with fewer collateralizable assets. A theoretical model and a calibration exercise undertaken by Alfaro et al. (2006) has suggested that well developed local financial markets are needed in order for host countries to benefit from spillovers from foreign direct investment (FDI), because without access to financing local entrepreneurs are unable to become suppliers to MNCs. And indeed, in a cross-country growth regression Alfaro et al. (2004) have found that FDI inflows contribute to a faster economic growth only in the presence of well-developed financial markets.

The relationship between facing financing constraints and supplying MNCs, however, could go both ways. If a firm needs some investment in order to become an MNC supplier (e.g., to upgrade the product quality or increase the scale of production) then the causality will go from the absence of liquidity constraints to becoming an MNC supplier. However, it is also possible that receiving a contract from an MNC increases the creditworthiness of the supplier in the eyes of a lending institution and thus makes it easier to obtain a loan or other outside financing.

The purpose of this paper is to examine the relationship between liquidity constraints and being an MNC supplier using the approach pioneered by Fazzari, Hubbard and Petersen (1988). Our analysis is possible thanks to a unique data set collected by the World Bank through two surveys of domestic and foreign companies in the Czech Republic in 2003 and 2004. The surveys allow us to identify companies making sales to MNCs operating in the country along with the detailed information about the duration and the characteristics of these relationships. The survey responses are supplemented with panel data on firms' balance sheets and profit and loss statements from a commercial database (Amadeus). Our data set spans the period 1994-2003 and includes 319 Czech firms, 88 of which are MNC suppliers.

The Czech Republic is suitable place to study this question for several reasons. After starting its transition from central planning to a free market economy, it has received large inflows of foreign direct investment. During the period 1993-2005, these inflows totaled 59.5 billion dollars or 5,818 dollars per capita. Survey evidence suggests

that MNCs are actively engaged in local sourcing. As illustrated in Figure 1, they purchase about half of intermediate inputs (in terms of value) from Czech suppliers. The virtual absence of FDI before the beginning of transition also means that supplying relationships between MNCs and Czech firms are of a relatively new vintage. Finally, as is the case with all transition countries many local firms tend to be liquidity constrained (Konings, Rizov and Vandenbussche 2003).

Survey evidence suggests that before signing a purchase order, multinationals often explicitly require their future Czech suppliers to make some improvements or investments. This was the case for more than a quarter of all suppliers surveyed by the World Bank in 2004.[1] The prospect of a contract from a multinational also induced Czech suppliers to undertake improvements on their own. Thirty-six percent of suppliers reported making improvements with the explicit purpose of finding a multinational customer.[2] It is also striking that 17 percent of Czech companies surveyed reported getting a quality certification (e.g., ISO 9000) *in order to become suppliers to multinationals.* These firms constituted 40 percent of all companies reporting having such a certification. In sum, complying with the expectations or requirements imposed by MNCs may be more difficult or even impossible for potential suppliers that do not have access to credit. And indeed credit constraints faced by Czech companies were mentioned by MNCs as one of the top factors preventing them from sourcing more inputs locally (Javorcik and Spatareanu 2005).

At the same time, contracts from MNCs (or prospects of such contracts) may have eased credit constraints of potential or actual suppliers. 31 out of 137 MNCs surveyed in the Czech Republic in 2003 reported providing their suppliers with advance payments and financing. Similarly, a quarter of suppliers reported that being a MNC supplier helped them obtain a bank loan.

The results of our empirical analysis indicate that Czech firms supplying multinationals tend to be less liquidity constrained than other firms. However, a careful examination of the timing of the phenomenon suggests that this result is due to the self-selection of less liquidity constrained firms into supplying relationships rather than suppliers benefiting from the interactions with multinational customers. The data suggest that MNC suppliers become less liquidity constrained one year *before* starting their relationship with an MNC and continue to be less liquidity constrained for the duration of the relationship. To eliminate the possibility that this finding is driven by MNCs extending credit to their future suppliers, we show that the result is robust to excluding from the sample suppliers that had received this type of assistance from their MNC customers. Similarly, to eliminate the possibility that a future contract from an MNC increases creditworthiness of a Czech firm, we show that the results hold after excluding from the sample firms that identified a supply relationship with a MNC that helped them obtain finance from a Czech or a foreign bank.

[1] The most frequent requirements were improvements to the quality assurance process, acquisition of a costly quality certification (such as an ISO 9000), improvements to the timeliness of deliveries, use of a new technology or purchase of new equipment (see Figure 2).

[2] As illustrated in Figure 3, these improvements included investment in new machinery and equipment, improving product quality, staff training, increasing production volume, reducing the share of defective units produced and reorganizing manufacturing lines.

Given that the recent empirical literature has suggested that linkages between multinationals and their local suppliers are the key channel through which indigenous firms benefit from inflows of FDI (Schoors and van der Tol 2001, Javorcik 2004, Blalock and Gertler 2007), understanding how firms become MNC suppliers has important policy implications. Our findings suggest that in the absence of well functioning credit markets, local firms may find it difficult to start business relationships with MNCs and thus may not be able to reap the benefits of productivity spillovers that such relationships bring. Thus, consistent with the evidence from the cross-country growth regressions (Alfaro et al. 2004), we conclude that development of financial markets is needed in order to take full advantage of the benefits associated with FDI inflows.[3]

This study is structured as follows. The next section presents the role of cash flow and discusses the estimation strategy. Section 3 describes the data and the summary statistics. Section 4 presents the empirical specification and the results. Section 5 concludes.

II. The Role of Cash Flow and Estimation Issues

Ever since the influential paper by Fazzari, Hubbard and Petersen (1988) a large number of studies have examined the effects of liquidity constraints on investment. These papers challenged the neoclassical theory of investment, which suggests that the decision to invest is driven solely by the relative prices, and a firm's financial structure is irrelevant to investment since external funds provide a perfect substitute for internal capital. Or, as put by Modigliani and Miller (1958), with perfect capital markets, a firm's investment decision is independent of its financial condition. The alternative research agenda proposed by Fazzari et al. (1988) was based on the burgeoning informational asymmetries literature: in an environment with informational asymmetries, external funds may be more costly and thus provide an imperfect substitute for internal capital. The difference arises to compensate lenders for the adverse selection and moral hazard problems associated with borrowers. If this is the case, then investment should respond positively to increases in internal funds available for investment.

The primary way of testing this hypothesis is to estimate the investment equation including a measure of the expected profitability of the firm along with a measure of its net worth. To the extent that the measure of net worth (usually cash flow) predicts investment behavior, researchers have concluded that financing constraints are present.

As our empirical strategy, we choose to estimate the traditional accelerator specification (see also Gelos and Werner 2002, Konings, Rizov and Vandenbussche, 2003). In our empirical model, the growth rate of sales is the accelerator variable, which should capture the short-term changes in expected profitability reasonably well. We include cash flow in order to capture liquidity constraints. Our specification is as follows:

[3] Our paper is also related to the literature on the relationship between country-level FDI inflows and firm-level financing constraints. In a cross-country study, Harrison, Love and McMillan (2004) show that FDI inflows are associated with a reduction in financing constraints. In contrast, in a firm-level analysis of Cote d'Ivoire, Harrison and McMillan (2003) find that borrowing by foreign firms exacerbates credit constraints of domestic firms. Our study can viewed as an examination of one of the many channels through which FDI inflows can affect financing constraints of domestic firms in host countries.

$$I_{it}/K_{it-1} = \beta_0 + \beta_1 \Delta S_{it}/S_{it-1} + \beta_2 CF_{it}/K_{it-1} + \beta_3 CF_{it}/K_{it-1}*Supplier_{it} + \beta_4 Supplier_{it} + \nu_i + \chi_t + \varepsilon_{it} \quad (1)$$

where I_{it} stands for gross investment defined as change in tangible fixed assets plus depreciation. K_{it} stands for real capital stock and is proxied by the level of tangible fixed assets. S_{it} represents real sales, and CF_{it} is the real cash flow. The cash flow is defined as the sum of profit (loss) after taxation, extraordinary profit (loss) and depreciation. Subscript i refers to firm, and subscript t refers to year. $Supplier_{it}$ is a time-varying dummy variable taking the value of one if firm i is an MNC supplier at time t. ν_i and χ_t and ε_{it} represent time-invariant firm specific effects, year fixed effects and the idiosyncratic error term. Year fixed effects capture aggregate conditions affecting cost of capital in a particular year, hence it is not necessary to control for interest rates or tax rates. To control for the unobserved heterogeneity across firms we estimate a model using firm fixed effects.

The coefficient β_2 captures the sensitivity of firms' level investment to internal funds. If a firm is liquidity constrained, that is if the desired investment level is constrained by the availability of internal finance, we expect the coefficient to be positive and statistically significant. A positive coefficient on cash flow is usually interpreted as an indication that firms are liquidity constrained since in a perfect capital markets the firm and lender would be indifferent between internal and external financing.

The goal of our analysis is to examine the link between access to credit and the MNC supplier status. *A priori* we would expect that having a contract from a well-known MNC may increase the creditworthiness of Czech suppliers and thus ease their financing constraints. Therefore, we would expect MNC suppliers to be less dependent on their internal cash flow than non-suppliers. To examine this effect we interact cash flow with the indicator variable for MNC suppliers. A negative and statistically significant value of the coefficient β_3 would confirm firms supplying MNCs are less liquidity constrained.

As mentioned before, it is possible that less liquidity constrained firms self-select into supplying relations with MNCs. Given the fact that MNC customers tend to have higher requirements in terms of quality, technological sophistication and on-time delivery of the product, especially when compared to domestic buyers in developing and transition economies, becoming an MNC supplier is likely to be associated with some fixed cost on the part of local firms. Thus, it may very well be the case that only less liquidity constrained firms may be able to become MNC suppliers. We will examine this possibility by checking whether MNC suppliers appear to be less liquidity constrained *before* they start their contract with MNCs. We will do so by estimating the following model:

$$I_{it}/K_{it-1} = \alpha_0 + \alpha_1 \Delta S_{it}/S_{it-1} + \alpha_2 CF_{it}/K_{it-1} + \alpha_3 CF_{it}/K_{it-1}*Supplier_{it} + \alpha_4 Supplier_{it} + \alpha_5 CF_{it}/K_{it-1}*Future\_supplier_{it} + \alpha_6 Future\_supplier_{it} + \nu_i + \chi_t + u_{it} \quad (2)$$

where $Future\_supplier_{it}$ equals one at time t if company i will become an MNC supplier at t+1, and zero otherwise. A negative and statistically significant α_5 would indicate that MNC suppliers were less credit constrained already one year *before* starting their relationship with an MNC and thus would suggest that self-selection took place. We will

repeat the above exercise asking the same question about two years before the supplying relationship started.

III. Data and Summary Statistics

The data used in this study come from two enterprise surveys conducted by the World Bank in the Czech Republic in 2003 and 2004. The surveys were conducted by a professional polling company by means of face-to-face interviews with senior managers taking place at respondents' workplaces. All respondents were guaranteed full anonymity. The data was collected for 857 Czech firms and 256 foreign owned firms operating in the country. The focus of the first survey was on manufacturing firms, i.e. firms operating in sectors 15-36 according to NACE classification, while the second one covered both manufacturing and services industries. About 1/5th of the respondents were located in the capital city of Prague, while the rest was distributed across all regions in the country.

The survey data allow us to identify firms making sales to MNCs operating in the Czech Republic, as well as information about the duration of these relationships and other information on company characteristics. In the 2003 survey, respondents were asked to indicate the year they became suppliers to multinationals. The 2004 survey distinguished between the date of signing the contract and the date of making the first delivery. When using the 2004 survey, we use the date of signing the contract as the date of becoming an MNC supplier. Out of 857 firms in the sample, 390 are suppliers to MNCs (331 suppliers operate in the manufacturing sector, while 59 are services firms).[4] As new investment in physical assets is more likely to be important for manufacturing firms wanting to become MNC suppliers than for services companies, our analysis focuses on the manufacturing sector. Including services firms in the sample would not change the conclusions of this study.

The results of the survey were supplemented with financial information on interviewed firms, which was taken from the Amadeus database compiled by Bureau van Dijk. The additional financial information including figures on sales, tangible fixed assets, depreciation, profit (loss), etc. is available for approximately 2/3 of firms in the sample. This remarkably rich database comprises detailed firm-level information for the period 1994-2003. After deleting incomplete or inconsistent data and extreme outliers[5] we are left with 2136 firm-year observations on 386 Czech manufacturing firms, 155 are MNC suppliers. As we are concerned about the self-selection of firms into supplying relationships, we do not include in the sample suppliers whom we cannot observe before they start their relationship with an MNC. This leaves us with 1,735 firm-year observations on 319 Czech firms, 88 of which are MNC suppliers. MNC suppliers are distributed across many industries, including: food products and beverages, machinery

[4] The high percentage of MNC suppliers in our dataset reflects deliberate oversampling, which was done through a phone pre-screening of potential survey respondents.

[5] Negative values of tangible fixed assets, sales, depreciation were replaced with missing. We also dropped the 1% tails of the following variables: sales growth, tangible fixed assets growth and CF_k from the sample.

and equipment, fabricated metal products, rubber and plastic products, just to name a few examples (see Table 1 for more details).

We normalize investment and cash flow variables by the capital stock in order to control for the size effect. We deflate sales and cash flow by wholesale price deflators specific to 3-digit NACE sectors, obtained from the Czech Statistical Office (CSO). In the case of tangible fixed assets and depreciation, we use a deflator for tangible fixed assets obtained from the CSO.

Several observations emerge from the examination of the summary statistics in Table 2. Suppliers to MNCs seem to invest more and have higher cash flow. They also tend to be larger. As the survey data indicate, there are also important differences between the two groups in terms of prevalence of having ISO certifications, the likelihood of exporting or manager's foreign education, experience as well as knowledge of foreign languages.

IV. Estimation Results

A. Baseline Specification

The estimation results from our baseline specification are presented in Table 3. In the first column, we test for the direct effect of cash flow on the investment decision. The results suggest that firms operating in the Czech Republic are liquidity constrained. The coefficient on the cash flow is positive and statistically significant at the one percent level, reflecting that internal funds are indeed an important determinant of the investment decision. As expected, the sales growth coefficient is also positive and statistically significant.

Next we examine the cash flow effect is different for firms that are suppliers to multinationals. We introduce in the regression a dummy that takes the value 1 in each year in which the firm is supplying a MNC operating in the Czech Republic and zero otherwise. We also interact this variable with cash flow. If firms having linkages with multinationals find it easier to obtain credit, then the coefficient on the interaction term should be negative and statistically significant. And indeed we find that the coefficient on the interaction between cash flow and MNC supplier dummy is negative and statistically significant at the five percent level. The magnitude of the coefficient is equal to more than a third of the cash flow coefficient suggesting that suppliers to MNCs find it much easier to finance their investments than non-suppliers. The supplier dummy itself is not statistically significant suggesting that MNC suppliers do not differ in their investment behavior from other firms.[6]

The magnitudes of the cash flow coefficient and its interactions are economically meaningful. A one-standard deviation increase in the ratio of cash flow to capital is associated with more than doubling of investment (I_{it}/K_{it-1}) in Czech firms relative to the average value of this variable in the sample. The corresponding figure for Czech suppliers of multinationals is 78%, which suggests that suppliers are less dependent on internal resources for financing investment.

[6] Though note that some differences may be captured by firm fixed effects included in the model.

Since our data set also provides information on the exporter status we want to make sure that our result is due to being an MNC supplier rather than an exporter, as one may expect that firms engaged in exporting may be less credit constrained thanks to a steady stream of income from more creditworthy foreign customers. We thus introduce in the regression a dummy variable that takes the value 1 for every year the firm exports abroad and zero otherwise. We also add an interaction term between the exporter status dummy and cash flow. The results suggest that exporters are no different from other firms in the sample in terms of the liquidity constraints they face. The likely explanation is that many Czech firms which continued to sell to their Slovak customers after the split of Czechoslovakia in 1993 are considered to be exporters, yet they never had to make a serious effort needed to enter a foreign market nor are their Slovak buyers likely to be more creditworthy than Czech buyers.[7] This also explains why such a high percentage (75%) of observations in the sample pertain to exporters. Introducing this additional interaction has no impact on the findings with respect to MNC suppliers.

B. Timing

As mentioned before, it is possible that only less liquidity constrained firms are able to afford investment needed to become MNC suppliers. Thus, to further investigate the relationship between financing constraints and supplying MNCs, we focus on the timing of changes. First we ask whether MNC suppliers were less liquidity constrained one year *before* they started their relationship with an MNC. We do so by including in the regression a dummy that takes the value of 1 in the year *preceding* becoming an MNC supplier (and 0 otherwise) as well as its interaction with cash flow. The results, presented in the first column of Table 4, indicate that this modification leads to a slightly higher coefficient on the interaction term between the supplier status and cash flow (relative to the baseline specification from column (3) in Table 3). The interaction between the dummy for the year *preceding* becoming an MNC supplier and cash flow is negative and statistically significant. Moreover, we cannot reject the hypothesis of equality of coefficients on both interaction terms. We interpret these findings as suggesting that Czech firms that become MNC suppliers are less liquidity constrained already one year *before* starting their relationship with the MNC. To take into account the possibility that future suppliers may exhibit different investment behavior one year *before* starting their relationship with the MNC, in column (2) we add to the specification a dummy for year *preceding* becoming an MNC supplier. The dummy itself is not statistically significant and its inclusion does not affect other coefficients.

Next we introduce an additional interaction between cash flow and a dummy for two years *prior* to becoming a supplier (and zero in all other periods). The dummy itself is also included in the regression in column (4) but not in column (3). As before, the results suggest that MNC suppliers are less liquidity constrained than non-suppliers and that this effect becomes visible one year before starting their relationship with an MNC. The interaction between the dummy for one year before becoming MNC supplier and cash flow is statistically significant, as is the interaction between the supplier dummy and

[7] Slovakia is the second largest export market for Czech firms. Source: https://www.cia.gov/cia/publications/factbook/print/ez.html

cash flow. Both bear a negative sign. There is no statistically significant difference between the two interaction terms. The interaction term between cash flow and the dummy for two years *prior* to becoming a supplier is negative but not statistically significant. However, there is no statistically significant difference between liquidity constraints (i.e., the interaction term) in the year *prior* to becoming a supplier and two years *prior* to becoming a supplier. Similarly, there no significant difference between liquidity constraints during the supplying period and two years *prior* to becoming a supplier.

In sum, our findings are suggestive of less liquidity constrained firms self-selecting into being MNC suppliers. This is consistent with the observation that in order to obtain contracts from MNCs firms need to meet stringent requirements of multinational customers and only firms with access to financing may be able to do so. The data collected in the surveys are in line with these conclusions. As illustrated in Figure 4, most suppliers make improvements within the 12-month period preceding signing a contract with an MNC. Only a minority of future suppliers engages in preparations earlier than a year in advance. Most frequent changes include improvements to product quality, staff training and increasing labor productivity. Many of them are probably done in connection with obtaining ISO certifications. Recall from Figure 2 that over 40 percent of suppliers were required by prospective MNC customers to obtain such a certification. As the certification process is quite costly, as it usually involves services of specialized consulting firms, it is not surprising that only firms that are less liquidity constrained may be able to do it.

C. Instrumental variable approach

Given the evidence on self-selection of less credit constrained firms into supplying relationships with MNCs and the possibility of the cash flow variable being endogenous, the final step in our analysis is the instrument variable approach. We use the GMM system estimation and instrument for sales growth, the supplier status, cash flow and the interaction between the two variables. Our instruments come from the survey and the Amadeus database. The results are presented in Table 5.

It is likely that firms whose managers speak foreign languages or have foreign experience are better positioned to obtain contracts from multinationals. Thus, as our instruments for the supplying status we use dummies if the firm manager is proficient in a foreign language or has foreign experience. The level of proficiency was determined by whether the manager is able to conduct business negotiations in this language or able to understand a business agreement written in the language. Both variables come from the survey. We also use the lagged supplier status and exporter status as instruments.

Second, it is likely that proximity to MNCs facilitates business relationships. Thus, our instrument set also includes proxies for the presence of multinationals in the same industry as well as in downstream industries. The proxy for the presence of MNCs in the same sector is defined as the share of the sector output produced by foreign firms. More specifically, it is calculated by weighting the output of each firm in sector j (Y_{ft}) by the share of the firm's equity owned by foreigners ($Foreign\ Share_{ft}$) and then dividing it by the total output of sector j:

$$\text{MNCs in the same sector}_{jt} = \frac{\sum_{\text{f for all f} \in j} \text{Foreign Share}_{ft} * Y_{ft}}{\sum_{\text{f for all f} \in j} Y_{ft}}$$

The proxy for the presence of multinationals in downstream sectors (i.e. sectors supplied by firm i operating in sector j) is defined following Javorcik (2004) as:

$$\text{Potential MNC customers}_{jt} = \sum_{\text{k if k} \neq j} \alpha_{jk} * \frac{\sum_{\text{f for all f} \in k} \text{Foreign Share}_{ft} * Y_{ft}}{\sum_{\text{f for all f} \in k} Y_{ft}}$$

That is we use α_{jk} the proportion of sector *j*'s output supplied to a downstream sector *k* calculated based on the 1999 input-output matrix of the Czech Republic to weight the MNC presence in each downstream sector *k*. As the formula indicates, inputs supplied within the sector are not included. Thus the greater the foreign presence in sectors supplied by industry *j* and the larger the share of output supplied to industries with a multinational presence, the higher the value of the variable.[8]

To instrument for cash flow and its interactions, we use its second lag as well as its interaction with the supplier status and proxies for the presence of potential MNC customers in the same industry as well as in downstream industries. As before our sample includes only Czech firms. The number of observations is smaller, as including second lags means that we lose two years of data.

Based on the reported specification tests listed in Table 7 we conclude that our instruments are reasonable predictors of the endogeneous variables. The Hansen test for overidentification shows that one cannot reject the null at conventional significance levels. The Arellano-Bond test shows that one cannot reject the null of no second-order serial correlation. These specification tests suggest that these baseline regressions yield consistent estimates.

The results from the instrumental variable approach suggest that the supplier status does not have a significant impact on firm's liquidity constraints. In none of the cases (and many other regressions estimated but not reported here to save space) is the interaction term between cash flow and the supplier status statistically significant. Further, as expected, the cash flow variable remains statistically significant in all regressions, suggesting that domestic firms are liquidity constrained, even after accounting for possible endogeneity problems. In summary, the evidence suggests that suppliers are different from non-suppliers in terms of liquidity constraints, but the effect appears to be due to self-selection rather than to a relationship with an MNC leading to easing of supplier's financial constraints.

[8] To illustrate the meaning of the variable, suppose that the sugar industry sells half of its output to jam producers and half to chocolate producers. If no multinationals are producing jam but half of all chocolate production comes from foreign affiliates, *Potential MNC customers*$_{jt}$ will be calculated as follows: ½*0 + ½*½ = ¼.

D. Robustness Checks

To eliminate the possibility that our findings could be driven by MNC extending credit to their potential suppliers, we remove from our sample 15 Czech firms reporting receiving some sort of financial help from their MNC customers. The results, presented in Table 6, confirm the earlier pattern. We find that MNC suppliers are less liquidity constrained already one year prior to serving an MNC customer and they remain less liquidity constrained while serving the MNC customer.

To examine the possibility that our findings could be due to future MNC suppliers presenting a lower credit risk thanks to having secured a contract from an MNC, we drop from the sample Czech suppliers reporting in the survey that having a supplying relationship with a MNC helped them obtain financing from a Czech or a foreign bank. As evident from Table 7, eliminating these 24 firms from the sample does not affect our results. We confirm that less credit constrained firms self select into becoming MNC suppliers.

To account for macroeconomic shocks, including changes in interest rates, that may affect industries differently, we also include in the regression an industry-year fixed effect. The results shown in Table 8, confirm the earlier pattern.

Finally, in the Appendix we show that dropping 4 firms with cases of negative cash flows does not affect our results.

V. Conclusions

Many countries around the world strive to attract FDI believing that foreign investors not only bring capital but also serve as a channel of knowledge transfer across international borders. As policy makers hope that some of this knowledge will result in externalities that will benefit domestic producers, they are willing to offer often very generous incentive packages to foreign investors. For instance, 59 of 108 countries surveyed by the World Bank reported offering some type of FDI incentives in 2004 (Harding and Javorcik 2007).

A recent survey of the empirical literature on FDI spillovers (Görg and Greenaway 2004) has concluded that such spillovers are most likely to take place between MNCs and their local suppliers. This means that understanding factors allowing local firms become suppliers to MNCs may have strong implications for knowledge spillovers and public policy choices with respect to treatment of FDI.

The results of this study, based on a unique data set from the Czech Republic which includes information on whether or not firms supply MNCs and the timing of the relationship, indicate that less liquidity constrained firms become MNC suppliers. This finding suggests that easing credit constraints may play an important role in facilitating spillovers from FDI and that well-developed financial markets may be needed in order to take full advantage of the benefits associated with FDI inflows.

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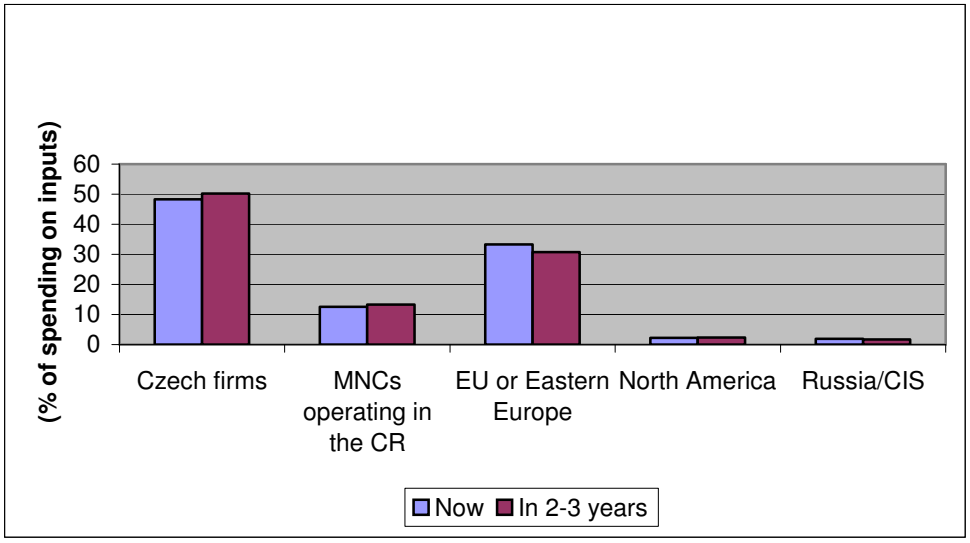
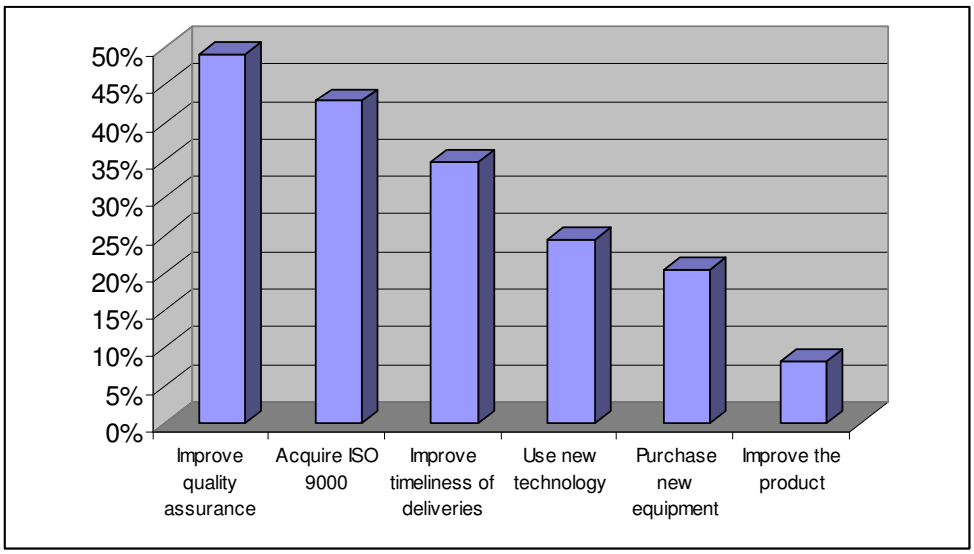
Figures

Figure 1. Share of intermediate inputs sourced by MNCs by supplier type. Czech Republic, 2003.



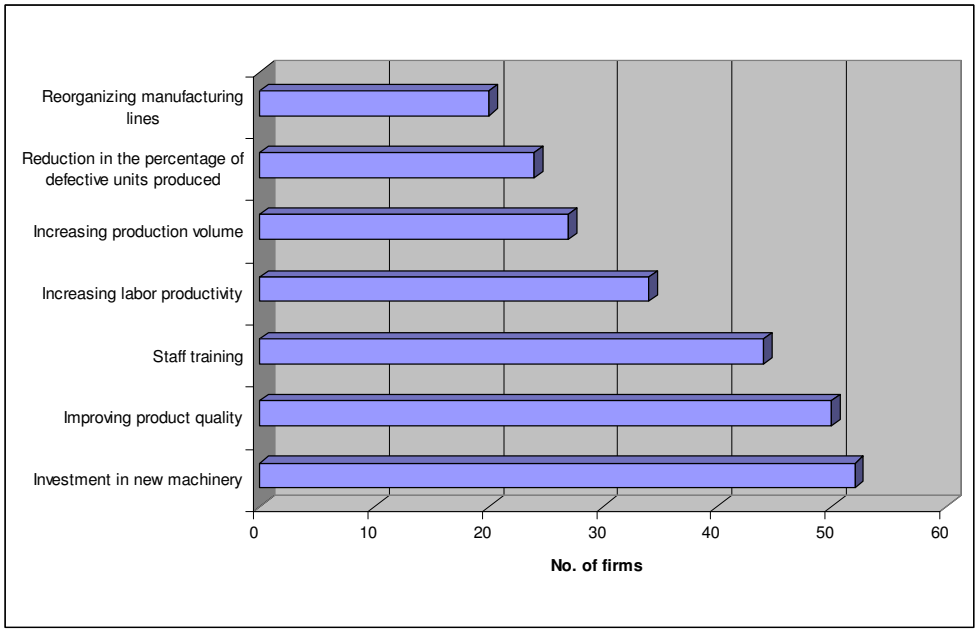
Source: Javorcik and Spatareanu (2005, Figure 3.8, p. 61).
Note: CIS stands for the Commonwealth of Independent States.

Figure 2. Types of changes required by multinationals from potential suppliers.



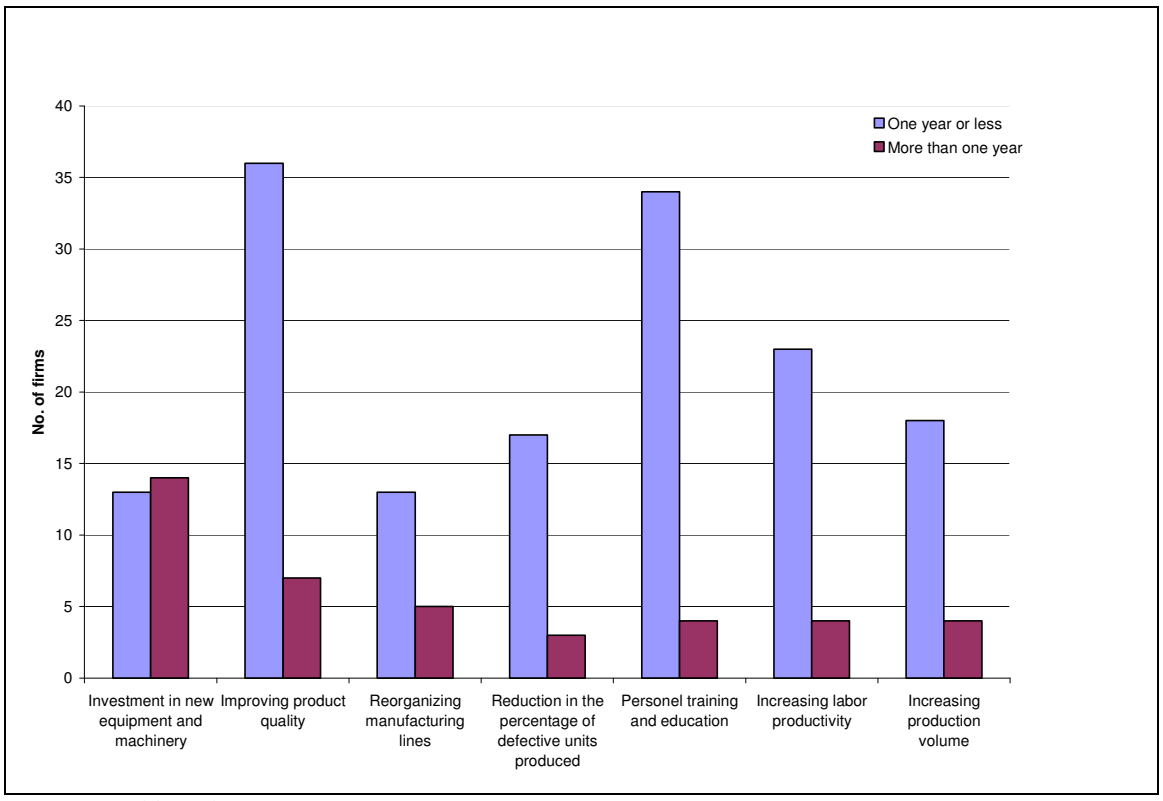
Source: Javorcik (2007). Values expressed as percentages of suppliers required to make improvements.

Figure 3. Improvements undertaken by Czech firms wanting to supply a multinational



Source: Javorcik (2007).

Figure 4. Improvements undertaken by Czech firms before signing a contract with an MNC



Source: World Bank surveys (2004).

Tables

Table 1. Distribution of Czech firms supplying MNCs, by industry

Industry	No. of suppliers
Manufacture of food products and beverages	21
Manufacture of machinery and equipment n.e.c	14
Manufacture of rubber and plastic products	8
Manufacture of fabricated metal products, except machinery and equipment	8
Manufacture of electrical machinery and apparatus n.e.c.	7
Manufacture of chemicals and chemical products	6
Manufacture of other non-metallic mineral products	5
Manufacture of basic metals	4
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	3
Manufacture of textiles	2
Manufacture of pulp, paper and paper products	2
Manufacture of radio, television and communication equipment and apparatus	2
Manufacture of motor vehicles, trailers and semi-trailers	2
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	1
Publishing, printing and reproduction of recorded media	1
Manufacture of medical, precision and optical instruments, watches and clocks	1
Manufacture of other transport equipment	1
Total	**88**

Table 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.
Czech firms supplying MNCs			
I_k	405	0.192	0.392
ΔSales	405	0.077	0.339
CF_k	405	0.281	0.537
No. of employees	405	339	550
LT Liabilities/Total Assets	405	0.123	0.166
Manager's Foreign Language	88	0.773	0.421
Manager's Foreign Education	88	0.080	0.272
Manager's Foreign Experience	88	0.227	0.421
ISO	88	0.739	0.442
Exporter	88	0.852	0.357
Czech firms not supplying MNCs			
I_k	1330	0.158	0.413
ΔSales	1330	0.082	0.386
CF_k	1330	0.257	0.573
No. of employees	1328	314	508
LT Liabilities/Total Assets	1330	0.115	0.163
Manager's Foreign Language	277	0.729	0.445
Manager's Foreign Education	277	0.112	0.316
Manager's Foreign Experience	277	0.231	0.422
ISO	277	0.628	0.484
Exporter	277	0.675	0.469

The first five variables listed in each panel of the table come from the Amadeus data base. The last five from World Bank 2003 and 2004 surveys.

Table 3. Fixed Effects Regressions

	(1)	(2)	(3)	(4)
ΔSales	0.087***	0.084***	0.088***	0.085***
	[0.027]	[0.027]	[0.027]	[0.027]
CF_k	0.325***	0.355***	0.371***	0.381***
	[0.024]	[0.027]	[0.042]	[0.042]
CF_k*Supplier		**-0.124****		**-0.115****
		[0.052]		**[0.054]**
Supplier		0.048		0.042
		[0.049]		[0.049]
CF_k*Exporter			-0.063	-0.037
			[0.050]	[0.051]
Exporter			0.09	0.08
			[0.068]	[0.068]
Constant	0.066**	0.060**	0.003	0.004
	[0.030]	[0.030]	[0.056]	[0.056]
No. of obs.	1735	1735	1735	1735
No. of firms	319	319	319	319
R-squared	0.14	0.15	0.14	0.15

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% . All models include firm and year fixed effects.

Table 4. Fixed Effects Regressions. Timing of Changes.

	(1)	(2)	(3)	(4)
ΔSales	0.087***	0.087***	0.087***	0.086***
	[0.027]	[0.027]	[0.027]	[0.027]
CF_k	0.370***	0.370***	0.371***	0.370***
	[0.027]	[0.027]	[0.027]	[0.028]
CF_k*2 yrs before			-0.350	-0.183
			[0.335]	[0.443]
CF_k*1 yr before	**-0.273****	**-0.271****	**-0.289****	**-0.275****
	[0.112]	**[0.118]**	**[0.113]**	**[0.118]**
CF_k*Supplier	**-0.158*****	**-0.158*****	**-0.161*****	**-0.159*****
	[0.054]	**[0.054]**	**[0.054]**	**[0.054]**
2 yrs before				-0.064
				[0.093]
1 yr before		-0.003		-0.037
		[0.066]		[0.072]
Supplier	0.022	0.02	0.008	-0.019
	[0.050]	[0.057]	[0.052]	[0.065]
Constant	0.066**	0.067**	0.068**	0.075**
	[0.030]	[0.031]	[0.030]	[0.032]
No. of obs.	1735	1735	1735	1735
No. of firms	319	319	319	319
R-squared	0.15	0.15	0.15	0.15
F tests				
CF_k*1 yr before = CF_k*Supplier	1.08	0.96	1.32	1.01
	0.299	0.328	0.252	0.317
CF_k*2 yrs before = CF_k*1 yr before			0.03	0.04
			0.857	0.839
CF_k*2 yrs before =CF_k*Supplier			0.32	0.001
			0.574	0.956
			0.574	0.956

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% . All models include firm and year fixed effects.

Table 5. GMM Systems Estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I_k (lagged)	0.103***	0.103***	0.106***	0.095***	0.095***	0.109***	0.112***
	[0.036]	[0.035]	[0.037]	[0.033]	[0.033]	[0.037]	[0.037]
ΔSales	0.04	0.04	0.038	0.046	0.045	0.035	0.035
	[0.082]	[0.081]	[0.081]	[0.081]	[0.082]	[0.082]	[0.082]
CF_k	0.417***	0.416***	0.425***	0.387***	0.387***	0.435***	0.444***
	[0.079]	[0.072]	[0.074]	[0.080]	[0.081]	[0.079]	[0.079]
CF_k*Supplier	**0.155**	**0.150**	**0.146**	**0.179**	**0.181**	**0.139**	**0.127**
	[0.115]	**[0.111]**	**[0.112]**	**[0.118]**	**[0.118]**	**[0.113]**	**[0.115]**
Supplier	-0.063*	-0.063*	-0.063*	-0.068**	-0.071**	-0.065*	-0.060*
	[0.033]	[0.033]	[0.033]	[0.033]	[0.034]	[0.034]	[0.034]
Arellano-Bond test for AR(1) in first differences (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in first differences (p-value)	0.64	0.64	0.62	0.70	0.69	0.60	0.58
Hansen test of overid. restrictions (p-value)	0.21	0.19	0.22	0.20	0.20	0.21	0.17
	Manager's foreign language*CF_k_{t-2} CF_k_{t-2}*Hor_{t-2} Hor_{t-2}	Manager's foreign language*CF_k_{t-2} CF_k_{t-2}*$Back_{t-2}$ $Back_{t-2}$	Manager's foreign language*CF_k_{t-2} CF_k_{t-2}*Hor_{t-2} Hor_{t-2} CF_k_{t-2}*$Back_{t-2}$ $Back_{t-2}$	Manager's foreign language*CF_k_t Hor_{t-2} $Back_{t-2}$	$Exporter_{t-2}$ Manager's foreign language*CF_k_t Hor_{t-2} $Back_{t-2}$	$Exporter_{t-2}$ CF_k_t*Hor_{t-2} CF_k_t*$Back_{t-2}$	$Exporter_{t-2}$ Manager's foreign language*CF_k_{t-2} CF_k_{t-2}*Hor_{t-2} Hor_{t-2} CF_k_{t-2}*$Back_{t-2}$ $Back_{t-2}$

Standard errors in brackets. All models contain a constant, which is not reported. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Fixed Effects Regressions. Excluding Suppliers Receiving Advance Payments from MNCs

	(1)	(2)	(3)	(4)	(5)	(6)
ΔSales	0.085***	0.082***	0.084***	0.085***	0.084***	0.082***
	[0.028]	[0.028]	[0.028]	[0.028]	[0.028]	[0.028]
CF_k	0.301***	0.320***	0.333***	0.333***	0.334***	0.332***
	[0.024]	[0.027]	[0.028]	[0.028]	[0.028]	[0.028]
CF_k*2 yrs before					-0.375	-0.142
					[0.374]	[0.471]
CF_k*1 yr before			**-0.237****	**-0.227***	**-0.252****	**-0.230***
			[0.114]	**[0.119]**	**[0.114]**	**[0.119]**
CF_k*Supplier		-0.085[#]	**-0.117****	**-0.116****	**-0.120****	**-0.116****
		[0.055]	**[0.057]**	**[0.057]**	**[0.057]**	**[0.057]**
2 yrs before						-0.105
						[0.097]
1 yr before				-0.022		-0.071
				[0.072]		[0.079]
Supplier		0.034	0.012	0.002	-0.003	-0.054
		[0.052]	[0.053]	[0.061]	[0.055]	[0.071]
Constant	0.074**	0.070**	0.075**	0.077**	0.077**	0.089***
	[0.031]	[0.031]	[0.031]	[0.031]	[0.031]	[0.032]
No. of obs.	1646	1646	1646	1646	1646	1646
No. of firms	304	304	304	304	304	304
R-squared	0.13	0.13	0.13	0.13	0.13	0.13
F tests						
CF_k*1 yr before = CF_k*Supplier			1.14	0.9	1.36	0.95
			0.286	0.343	0.245	0.323
CF_k*2 yrs before = CF_k*1 yr before					0.11	0.03
					0.743	0.855
CF_k*2 yrs before =CF_k*Supplier					0.46	0.00
					0.497	0.956

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All models include firm and year fixed effects.
[#] significant at 11.8%

Table 7. Fixed Effects Regressions. Excluding Suppliers Reporting Greater Ease with Obtaining Bank Loans due to their Contracts with MNCs

	(1)	(2)	(3)	(4)	(5)	(6)
ΔSales	0.098***	0.096***	0.099***	0.099***	0.100***	0.099***
	[0.029]	[0.029]	[0.028]	[0.028]	[0.028]	[0.029]
CF_k	0.317***	0.356***	0.370***	0.371***	0.371***	0.371***
	[0.025]	[0.027]	[0.028]	[0.028]	[0.028]	[0.028]
CF_k*2 yrs before					-0.446	-0.374
					[0.398]	[0.531]
CF_k*1 yr before			**-0.293****	**-0.306****	**-0.310*****	**-0.311****
			[0.117]	**[0.123]**	**[0.118]**	**[0.123]**
CF_k*Supplier		**-0.193*****	**-0.232*****	**-0.234*****	**-0.235*****	**-0.235*****
		[0.057]	**[0.059]**	**[0.059]**	**[0.059]**	**[0.059]**
2 yrs before						-0.021
						[0.108]
1 yr before				0.025		-0.001
				[0.074]		[0.081]
Supplier		0.072	0.041	0.052	0.025	0.021
		[0.054]	[0.055]	[0.064]	[0.057]	[0.074]
Constant	0.064**	0.056*	0.064**	0.062*	0.066**	0.067**
	[0.031]	[0.031]	[0.031]	[0.032]	[0.032]	[0.033]
No. of obs.	1599	1599	1599	1599	1599	1599
No. of firms	295	295	295	295	295	295
R-squared	0.14	0.15	0.15	0.15	0.15	0.15
F tests						
CF_k*1 yr before = CF_k*Supplier			0.28	0.36	0.41	0.39
			0.599	0.550	0.521	0.530
CF_k*2 yrs before = CF_k*1 yr before					0.11	0.01
					0.735	0.907
CF_k*2 yrs before =CF_k*Supplier					0.28	0.07
					0.599	0.794

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All models include firm and year fixed effects.

Table 8. Fixed Effects Regressions. Including nace*year effect

	(1)	(2)	(3)	(4)
ΔσελαΣ	0.087***	0.087***	0.087***	0.086***
	[0.027]	[0.027]	[0.027]	[0.027]
CF_k	0.370***	0.370***	0.371***	0.370***
	[0.027]	[0.027]	[0.027]	[0.028]
CF_k*2 yrs before			-0.35	-0.183
			[0.335]	[0.443]
CF_k*1 yr before	**-0.273****	**-0.271****	**-0.289****	**-0.275****
	[0.112]	**[0.118]**	**[0.113]**	**[0.118]**
CF_k*Supplier	**-0.158*****	**-0.158*****	**-0.161*****	**-0.159*****
	[0.054]	**[0.054]**	**[0.054]**	**[0.054]**
2 yrs before				-0.064
				[0.093]
1 yr before		-0.003		-0.037
		[0.066]		[0.072]
Supplier	0.022	0.02	0.008	-0.019
	[0.050]	[0.057]	[0.052]	[0.065]
Nace*year	-0.004	-0.004	-0.004	-0.004
	[0.007]	[0.007]	[0.007]	[0.007]
Constant	1.65	1.643	1.564	1.431
	[2.596]	[2.602]	[2.598]	[2.608]
Observations	1735	1735	1735	1735
Number of bvdid	319	319	319	319
R-squared	0.15	0.15	0.15	0.15
F tests				
CF_k*1 yr before = CF_k*Supplier	1.08	0.96	1.32	1
	0.2986	0.3276	0.2517	0.3172
CF_k*2 yrs before = CF_k*1 yr before			0.03	0.04
			0.8571	0.8392
CF_k*2 yrs before =CF_k*Supplier			0.32	0
			0.5743	0.9559

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix

Table A1. Fixed Effects Regressions. Dropping Observations with Negative Cash Flow

	(1)	(2)	(3)	(4)	(5)	(6)
ΔSales	0.075**	0.069**	0.073**	0.073**	0.073**	0.072**
	[0.032]	[0.032]	[0.031]	[0.031]	[0.031]	[0.032]
CF_k	0.506***	0.566***	0.589***	0.590***	0.590***	0.590***
	[0.029]	[0.034]	[0.034]	[0.035]	[0.034]	[0.035]
CF_k*2 yrs before					-0.311	-0.187
					[0.348]	[0.574]
CF_k*1 yr before			**-0.347*** **	**-0.368*** **	**-0.366*** **	**-0.369*** **
			[0.119]	**[0.134]**	**[0.121]**	**[0.135]**
CF_k*Supplier		**-0.206*** **	**-0.259*** **	**-0.261*** **	**-0.262*** **	**-0.262*** **
		[0.059]	**[0.062]**	**[0.062]**	**[0.062]**	**[0.062]**
2 yrs before						-0.031
						[0.120]
1 yr before				0.025		0
				[0.076]		[0.082]
Supplier		0.086	0.047	0.056	0.031	0.027
		[0.053]	[0.054]	[0.061]	[0.057]	[0.070]
Constant	-0.014	-0.031	-0.021	-0.023	-0.018	-0.017
	[0.033]	[0.033]	[0.033]	[0.034]	[0.034]	[0.035]
No. of obs.	1488	1488	1488	1488	1488	1488
No. of firms	315	315	315	315	315	315
R-squared	0.23	0.24	0.24	0.24	0.24	0.24
F tests						
CF_k*1 yr before = CF_k*Supplier			0.57	0.67	0.77	0.68
			0.452	0.412	0.382	0.411
CF_k*2 yrs before = CF_k*1 yr before					0.03	0.10
					0.874	0.756
CF_k*2 yrs before =CF_k*Supplier					0.02	0.02
					0.891	0.896

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All models include firm and year fixed effects.