

# Liquidity Constraints and Firms' Linkages with Multinationals

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Using a unique data set on the Czech Republic for 1994–2003, this article 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 multinationals are less credit constrained than are nonsuppliers. Closer inspection of the timing of the effect, however, suggests that the result is due to self-selection of less constrained firms into supplying multinationals rather than to the benefits derived from the supplying relationship. As the 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, this finding suggests that well-developed financial markets may be needed to take full advantage of the benefits associated with FDI inflows. JEL codes: F21, F23, F36

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The role of financial sector development in fostering economic growth has received considerable attention in recent years. In an influential paper, Rajan and Zingales (1998) demonstrate that industrial sectors that are relatively more in need of external finance grow disproportionately faster in countries with more-developed financial markets, suggesting that financial sector development reduces the costs of external finance to firms.

More recent research has argued that access to financing may promote economic growth by allowing firms to tap into new sources of knowledge from selling in foreign markets or becoming suppliers to multinational corporations (MNCs). In a theoretical contribution, Chaney (2005) shows that if firms must pay entry costs to sell in a foreign market and if they face liquidity constraints in financing these costs, only firms with sufficient liquidity will be able to export. While some other firms could profitably export, they are prevented from doing so by their lack of sufficient liquidity. Manova (2006)

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provides empirical support for this view by showing that countries with better developed financial systems tend to export relatively more in industries highly dependent on external capital and in sectors with fewer collateralizable assets. A theoretical model and a calibration exercise by Alfaro and others (2006) suggest that well-developed local financial markets are needed in order for host countries to benefit from spillovers from foreign direct investment (FDI). The reason is that access to financing allows local entrepreneurs to start supplying multinationals and thus to benefit from knowledge spillovers from FDI. In a cross-country growth regression, Alfaro and others (2004) find that FDI inflows contribute to faster economic growth only where financial markets are well developed.

The relationship between facing financing constraints and supplying MNCs could go either way. If a firm needs some investment in order to supply multinationals (say, to upgrade product quality or increase the scale of production), then the causality goes from the absence of liquidity constraints to becoming a supplier of multinationals. However, it is also possible that receiving a contract from a multinational increases a supplier's creditworthiness and thus makes it easier to obtain a loan or other outside financing.

This article uses the approach pioneered by Fazzari, Hubbard, and Petersen (1988) to examine the relationship between facing liquidity constraints and being a supplier to an MNC. The 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 make it possible to identify companies selling to multinationals operating in the country and provide detailed information about the duration and characteristics of these relationships. The survey responses are supplemented with panel data on firms' balance sheets and profit and loss statements from the commercial database AMADEUS (Bureau van Dijk Electronic Publishing 2005). The data set spans 1994–2003 and includes 319 Czech firms, 88 of which are suppliers of MNCs and are observed both before and after starting the relationship with multinationals.

The Czech Republic is a suitable place to study this question for several reasons. Since starting its transition from central planning to a free market economy, it has received large inflows of FDI. At the end of 2003 (the last year of the sample), its stock of FDI reached \$45.3 billion or \$4,439 per capita. Survey evidence suggests that multinationals are actively engaged in local sourcing in the Czech Republic, purchasing about half their intermediate inputs (in value terms) from Czech suppliers. The virtual absence of FDI before the beginning of transition also means that supply relationships between multinationals and Czech firms are of a relatively new vintage. Finally, as in all transition economies, 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 suppliers

surveyed in 2004.<sup>1</sup> The prospect of a contract from a multinational also induced Czech suppliers to undertake improvements on their own. Some 36 percent of suppliers reported making improvements with the explicit purpose of finding a multinational customer.<sup>2</sup> Also striking, 17 percent of Czech companies surveyed reported getting a quality certification (such as 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 multinationals may be more difficult or even impossible for potential suppliers without access to credit. And indeed credit constraints faced by Czech companies were mentioned by multinationals as one of the top factors preventing them from sourcing more inputs locally (Javorcik and Spatareanu 2005).

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

The results of the empirical analysis, presented in this article, indicate that Czech firms supplying multinationals tend to be less liquidity constrained than other firms. However, an examination of the timing suggests that the result is due to the self-selection of less liquidity constrained firms into supplying relationships rather than to suppliers benefiting from the links with multinational customers. The data suggest that suppliers of multinationals are less liquidity constrained before starting their relationship with a multinational and continue to be less liquidity constrained for the duration of the relationship.

This finding is not driven by multinationals extending credit to their future suppliers, as the results are robust to excluding from the sample suppliers that had received this type of assistance from their multinational customers. The results also hold after excluding from the sample firms reporting that a supply relationship with a multinational had helped them obtain financing from a Czech or a foreign bank. Further, a higher liquidity ratio is found to be a robust predictor of supplying status. Finally, the results from models instrumenting for supplying status show that firms doing business with multinationals do not differ from other firms in liquidity constraints.

Understanding how firms become suppliers to multinationals has important policy implications in the context of recent empirical findings that linkages between multinationals and their local suppliers are the key channel through

1. The most frequent requirements were improvements to the quality assurance process, acquisition of a costly quality certification, improvements to the timeliness of deliveries, use of a new technology, and purchase of new equipment.

2. These improvements included investing in new machinery and equipment, improving product quality, increasing staff training, raising production volume, reducing the share of defective units produced, and reorganizing manufacturing lines.

which indigenous firms benefit from inflows of FDI (Moran 2001; Javorcik 2004; Moran, Graham, and Blomström 2005; Blalock and Gertler 2008; Javorcik and Spatareanu 2008). The findings of this study suggest that in the absence of well-functioning credit markets, local firms may find it difficult to start business relationships with multinationals and thus may not be able to reap the benefits of productivity spillovers that such relationships can bring.

Caution is warranted, however, when interpreting these findings. While the results suggest that well-functioning credit markets are important in facilitating business relationships between local firms and multinationals, they do not suggest that a well-developed financial market is a sufficient condition for such relationships. Other factors, such as a certain level of sophistication of the local manufacturing sector, may be needed for these relationships to materialize.

This study is structured as follows. Section I presents the data and the summary statistics. Section II reviews the related literature. Section III discusses the estimation strategy and the results. Section IV presents some policy implications.

## I. DATA AND SUMMARY STATISTICS

Examining the questions asked by this study poses big data challenges. Information on the type of customers supplied by firms (and hence their supplying status for multinationals) is typically not collected by statistical agencies, tax authorities, or commercial databases. While time-varying information on relationships with multinational customers can be obtained through firm-level surveys, such surveys cannot be used to collect long spans of historical data on firm balance sheets and profit and loss statements. Thus to conduct this study, enterprise survey information was combined with historical firm-level data from a commercial database, creating a unique data set that can be used to examine the relationship between financial constraints and supplying multinationals.

The enterprise surveys were conducted in the Czech Republic in 2003 and 2004 by a professional polling company in face-to-face interviews with senior managers at respondents' workplaces. All respondents were guaranteed full anonymity. The data were collected for 857 Czech firms and 256 foreign-owned firms operating in the country. The first survey focused on manufacturing firms, and the second covered both manufacturing and services industries. About one-fifth of respondents were located in the capital city of Prague, while the rest were distributed across all regions of the country. As the primary interest of this article is the linkages between local firms and multinationals, the analysis relies on the data for Czech firms only.

The survey data identify firms that supply multinationals operating in the Czech Republic and contain information on the duration of these relationships and other company characteristics. The 2003 survey asked respondents to

indicate the year in which they became suppliers to multinationals. The 2004 survey distinguished between the date of signing the contract and the date of making the first delivery. The date of signing the contract is used in this study as the date of becoming a supplier to multinationals. Of 857 Czech firms in the sample, 390 are suppliers to multinationals (331 suppliers operate in the manufacturing sector, while 59 are services firms).<sup>3</sup> The analysis focuses on the manufacturing sector because new investment in physical assets is more likely to be important for manufacturing firms wanting to become suppliers to multinationals than for services companies.

The surveys are supplemented with financial information on interviewed firms, taken from the commercial database AMADEUS, compiled by Bureau van Dijk Electronic Publishing (2005). The additional financial information, including figures on sales, tangible fixed assets, depreciation, and profit (loss), is available for approximately two-thirds of surveyed firms. This rich database contains detailed firm-level information for 1994–2003. Deleting incomplete or inconsistent data and extreme outliers<sup>4</sup> leaves 2,136 firm-year observations on 386 Czech manufacturing firms, 155 of them were suppliers to multinationals. Because of concerns about the self-selection of firms into supplying relationships, suppliers that cannot be observed before they start their relationship with multinationals are excluded, leaving 1,735 firm-year observations on 319 Czech firms, 88 of them supplying to multinationals. All suppliers to multinationals are observed both before and after starting their relationship. Suppliers to multinationals are distributed across many industries, including food products and beverages, machinery and equipment, fabricated metal products, and rubber and plastic products.

Summary statistics on suppliers and nonsuppliers show that suppliers are somewhat larger in terms of employment, tend to invest more (relative to their capital stock), and have a higher debt to capital stock ratio and a higher liquidity ratio (table 1). They also tend to be older and have higher labor productivity. They are more likely to export, have an ISO certification, and employ managers speaking a foreign language. However, they tend to experience slower sales growth.

The Czech Republic is an ideal setting for this analysis for three reasons. First, as mentioned, the country has received large inflows of FDI. In the early years of transition, food, beverage, and tobacco sectors and some other consumer goods industries received large FDI inflows as many multinationals entered the country hoping to secure a first mover advantage in a newly open market. Because of the Czech Republic's central location, reputation for high-quality engineers, and the fast progress of reforms, the country also attracted many multinationals wishing to establish export platforms supplying the

3. The high percentage of suppliers to multinationals in the data set reflects deliberate oversampling, which was done through a phone prescreening of potential survey respondents.

4. Negative values of tangible fixed assets, sales, and depreciation were dropped, as were the 1 percent tails of the following variables: sales growth, tangible fixed assets growth, and cash flow deflated by tangible fixed assets.

TABLE 1. Summary Statistics on Czech Firms Supplying and Not Supplying Multinationals

Variable	Number of observations	Mean	Standard deviation
<i>Supplying firms</i>			
I/K (investment to capital stock ratio)	405	0.192	0.392
ΔSales	405	0.077	0.339
CF/K (cash flow to capital stock ratio)	405	0.281	0.537
Number of employees	405	339	550
Debt/K (debt to capital stock ratio)	405	0.123	0.166
Liquidity ratio	261	0.190	0.237
ln(Gross profit)	247	5.328	1.678
ln(Age)	394	1.939	0.702
ln(Value added per worker)	289	3.219	3.066
ln(Total factor productivity)	273	1.240	0.438
ln(Total factor productivity Olley–Pakes)	273	1.378	0.258
Exporter	405	0.874	0.332
State-owned enterprise	277	0.047	0.212
Manager's foreign language	88	0.773	0.421
Manager's foreign experience	88	0.227	0.421
ISO certificate	88	0.739	0.442
<i>Nonsupplying firms</i>			
I/K (investment to capital stock ratio)	1,330	0.158	0.413
ΔSales	1,330	0.082	0.386
CF/K (cash flow to capital stock ratio)	1,330	0.257	0.573
Number of employees	1,328	314	508
Debt/K (debt to capital stock ratio)	1,330	0.115	0.163
Liquidity ratio	628	0.144	0.239
ln(Gross profit)	597	4.922	1.354
ln(Age)	1,314	1.749	0.729
ln(Value added per worker)	1,070	2.969	3.282
ln(Total factor productivity)	873	1.231	0.404
ln(Total factor productivity Olley–Pakes)	873	1.352	0.254
Exporter	1,330	0.72	0.449
State-owned enterprise	1,082	0.059	0.236
Manager's foreign language	231	0.714	0.453
Manager's foreign experience	231	0.234	0.424
ISO certificate	231	0.602	0.491
Multinationals in the same sector	107	0.199	0.227
Potential multinational customers	107	0.026	0.023

Source: Authors' analysis based on data from two World Bank surveys of Czech firms in 2003 and 2004 and Bureau van Dijk Electronic Publishing (2005); see text for details.

neighboring European Union. By the end of the sample period (2003), 21 percent of manufacturing FDI stock was in the automotive industry; 14 percent in petroleum, chemical, rubber, and plastic products; and 12 percent in other nonmetallic products. The opening of services industries to FDI stimulated massive inflows into financial intermediation, real estate, and wholesale and retail trade. From the mid-1990s on FDI flows into services exceeded those into manufacturing.

Second, MNCs operating in the Czech Republic appear to be relying heavily on Czech suppliers. Most (90 percent) multinationals interviewed in the 2003 survey reported purchasing inputs from at least one Czech company.<sup>5</sup> The median MNC had a sourcing relationship with 10 Czech suppliers, while a multinational in the top quartile had such a relationship with at least 30. Asked about the share of inputs purchased from each type of supplier (in value terms), multinationals indicated sourcing on average 48.3 percent of inputs from Czech enterprises, 33.3 percent from firms in the European Union/Eastern Europe, and 12.6 percent from multinationals in the Czech Republic. The share of inputs sourced from other regions appeared to be negligible. Fifty-five of 114 MNCs that answered this question reported buying at least half of their inputs from Czech suppliers. More than one-tenth of respondents acquired all of their intermediates from Czech enterprises. Around 40 percent of multinationals expected to purchase more inputs from Czech suppliers in the future.<sup>6</sup>

Third, while the Czech Republic possessed reasonably developed financial markets during the period under study, their sophistication and the level of competition (at least in the first half of the sample period) were still below those in industrialized countries. For instance, during the first year covered by the sample (1994), the ratio of bank deposits to GDP, a common measure of financial intermediation, was 0.58 in the Czech Republic, much higher than the average of 0.36 for upper middle-income countries that same year but lower than the average of 0.67 for high-income economies (Beck, Demirgüç-Kunt, and Levine 1999). The Czech private bond market was much less well developed. The ratio of private bond market capitalization to GDP (the ratio of total outstanding domestic debt securities issued by private domestic entities to GDP) was 0.02, compared with 0.07 in upper middle-income countries and 0.34 in high-income countries. In the ratio of bank overhead costs to total assets, the Czech Republic ranked with high-income countries (0.03) and appeared much more efficient than an average upper middle-income economy (0.05). The banking sector in the Czech Republic appeared to be highly concentrated, however, with the ratio of the three largest banks' assets to total banking sector assets at 0.78, compared with 0.64 in high-income economies and 0.67 in upper middle-income economies. During the period under study, the Czech banking sector experienced significant restructuring, privatization, and entry of foreign investors.

5. The question specifically asked respondents not to include suppliers of services, such as catering and cleaning.

6. These figures are similar to those collected in other surveys. For instance, the Opinion Window survey commissioned by CzechInvest in 2002 found that multinationals in the Czech Republic sourced on average 32.2 percent of their inputs locally in 2000 and 34.7 percent in 2001. This share was expected to increase to 35.8 percent in 2002. Similarly, CzechInvest reported that 57 percent of multinationals indicated an ability to increase local content (CzechInvest 2002).

## II. THE ROLE OF CASH FLOW

Ever since the influential paper by Fazzari, Hubbard, and Petersen (1988), numerous studies have examined the effects of liquidity constraints on investment. These studies challenged the neoclassical theory of investment that posits that the decision to invest is driven solely by relative prices and that a firm's financial structure is irrelevant since external funds provide a perfect substitute for internal capital. Or, as Modigliani and Miller (1958) put it, with perfect capital markets, a firm's investment decision is independent of its financial condition. The alternative research agenda, proposed by Fazzari, Hubbard, and Petersen (1988), was based on the burgeoning literature on information asymmetries: in an environment with information 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, 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. Researchers have concluded that to the extent that the measure of net worth (usually cash flow) predicts investment behavior, financing constraints exist.

The link between investment and cash flow is a subject of ongoing debate. One thread of the literature—starting with Fazzari, Hubbard, and Petersen (1988) and followed by Hoshi, Kashyap, and Scharfstein (1991), Lizal and Svejnar (2002), and others—argues that investment sensitivities to cash flow can be interpreted as evidence of financial constraints. However, Kaplan and Zingales (1997, 2000) question that approach and provide evidence that because of nonmonotonicities investment sensitivity to cash flow is not a measure of liquidity constraints. Fazzari, Hubbard, and Petersen (2000) challenge that conclusion and derive the conditions under which the relationship between investment and cash flow is monotonic. They argue that if the a priori classification of firms is based on criteria that result in large differences in the marginal cost of external funds across groups, constrained firms with a large cost of external financing will have larger investment sensitivity to cash flow than the relatively unconstrained firms with very small cost of external funds. Although the debate is still unresolved, this study follows the Fazzari, Hubbard, and Petersen (1988) argument.<sup>7</sup>

7. This article 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 the credit constraints of domestic firms. This article can be viewed as an examination of one of the many channels through which FDI inflows can affect financing constraints of domestic firms in host countries.



## III. EMPIRICAL ANALYSIS

The empirical strategy for this study is to estimate the traditional accelerator specification (see also Gelos and Werner 2002; Konings, Rizov, and Vandenbussche 2003). The growth rate of sales is the accelerator variable, which is expected to be a reasonable proxy for short-term changes in expected profitability. Cash flow is included to capture liquidity constraints, and an interaction of cash flow with a multinational supplier dummy variable is included to examine whether multinational suppliers are subject to liquidity constraints that are different from those of other firms. The baseline specification is as follows:

$$\begin{aligned}
 (1) \quad I_{it}/K_{it-1} = & \alpha_0 + \alpha_1 \Delta S_{it}/S_{it-1} + \alpha_2 CF_{it}/K_{it-1} \\
 & + \alpha_3 CF_{it}/K_{it-1} * Supplier_{it} + \alpha_4 Supplier_{it} \\
 & + \alpha_5 CF_{it}/K_{it-1} * \ln(VA/L) + \alpha_6 \ln(VA/L) \\
 & + \alpha_7 CF_{it}/K_{it-1} * Exporter_{it} + \alpha_8 Exporter_{it} \\
 & + \alpha_9 CF_{it}/K_{it-1} * SOE_{it} + \alpha_{10} SOE_{it} \\
 & + \alpha_{11} \ln(Size_{it}) + \alpha_{12} \ln(Age_{it}) \\
 & + \alpha_{13} Debt/K_{it-1} + \alpha_i + \alpha_t + \varepsilon_{it}
 \end{aligned}$$

where  $I_{it}$  is gross investment by firm  $i$  at time  $t$  and is defined as a change in tangible fixed assets plus depreciation,  $K_{it}$  is real capital stock and is proxied by deflated tangible fixed assets,  $S_{it}$  is real sales, and  $CF_{it}$  is the real cash flow as reported in the AMADEUS database, which defines it as the sum of profit (or loss) after taxation, extraordinary profit (or loss), and depreciation (Bureau van Dijk Electronic Publishing 2005). Investment and cash flow variables are normalized by the capital stock to control for the size effect. Sales and cash flow are deflated by wholesale price deflators specific to three-digit NACE sectors, obtained from the Czech Statistical Office. A deflator for tangible fixed assets obtained from the Czech Statistical Office is used for tangible fixed assets and depreciation.  $Supplier_{it}$  is a time-varying dummy variable taking a value of 1 if firm  $i$  is a multinational supplier at time  $t$ , and 0 otherwise. It is defined based on the information obtained from enterprise surveys. The coefficient  $\alpha_2$  captures the sensitivity of firm-level investment to internal funds. If a firm is liquidity constrained (if the desired investment level is constrained by the availability of internal finance), the coefficient is expected to be positive and statistically significant. With perfect capital markets, the firm and lender would be indifferent between internal and external financing and hence the coefficient would be expected to equal 0.

The goal of the analysis is to examine the link between access to credit and multinational supplier status. A priori, having a contract from a well-known MNC would be expected to increase the creditworthiness of Czech suppliers and thus ease their financing constraints. Therefore, multinational suppliers

would be less dependent on their internal cash flow than nonsuppliers. To examine this effect, cash flow is interacted with the indicator variable for multinational suppliers. If firms supplying MNCs are not liquidity constrained, the sum of the coefficients  $\alpha_2$  and  $\alpha_3$  would be expected to equal 0.

It is also possible that firms' ability to obtain external financing and to become multinational suppliers is driven by other factors. For instance, more productive firms may be better positioned to become suppliers and may be identified by lenders as lower risk borrowers. To attenuate this concern, the analysis controls for labor productivity (defined as the log of the value added per worker) and its interaction with cash flow. Similarly, exporters may possess qualities that make it easier for them to obtain multinational contracts while their relationships with buyers abroad may make them lower risk borrowers. Therefore, survey data are used to control for the firm's exporting status and its interaction with cash flow. Finally, a dummy variable is used to capture different investment behavior of state-owned enterprises and an interaction of the dummy variable with cash flow is used to capture the possibility that state enterprises may enjoy soft budget constraints (for evidence, see Lizal and Svejnar 2002). State enterprises in the sample are identified by responses to survey questions on whether a company was established as a state enterprise and whether (and when) it was privatized.

The model also includes several firm-specific time-varying factors that might influence the level of investment. The analysis controls for a firm's size, measured by employment and expressed in log form, the log of a firm's age, and the level of long-term debt normalized by capital stock. To control for unobserved heterogeneity across firms, a model is estimated using firm fixed effects ( $\alpha_i$ ). Year fixed effects ( $\alpha_t$ ) are also included. They capture aggregate conditions affecting the cost of capital in a particular year, so controls for interest rates or tax rates are unnecessary.

A common concern with the cash flow sensitivity approach is that the cash flow variable may pick up more than pure liquidity effects. However, this article focuses on comparing cash flow sensitivity across firms, and so as long as such a bias does not vary systematically by multinational supplier status, it is not a major concern.

The estimation results from the baseline specification are presented in table 2. Regression 1 tests for the direct effect of cash flow on investment. The results suggest that firms operating in the Czech Republic are liquidity constrained. The coefficient on the cash flow variable is positive and statistically significant at the 1 percent level, reflecting that internal funds are an important determinant of the investment decision. As expected, the sales growth coefficient is also positive and statistically significant.

Regression 2 repeats the exercise using lagged cash flow. The conclusion is the same, although the magnitude of the coefficient is somewhat smaller. While it might be preferable to employ lagged rather than contemporaneous values of cash flow, doing so would have significantly reduced the sample size.

TABLE 2. Baseline Specification

Variable	(1)	(2)	(3)	(4)	(5)	(6)
ΔSales	0.087*** (0.027)	0.123*** (0.038)	0.081** (0.032)	0.074** (0.033)	0.073** (0.033)	0.074** (0.033)
CF/K	0.325*** (0.024)		0.446*** (0.047)	0.447*** (0.084)	0.395*** (0.050)	0.447*** (0.084)
CF/K lagged		0.205*** (0.025)				
CF/K * Supplier			-0.360*** (0.064)	-0.318*** (0.065)	-0.325*** (0.065)	-0.319*** (0.065)
Supplier			0.079 (0.061)	0.063 (0.061)	0.066 (0.061)	0.064 (0.061)
CF/K * ln(VA/L)			0.008 (0.007)	0.010 (0.008)	0.011 (0.008)	0.010 (0.008)
ln(VA/L)			-0.008 (0.005)	-0.012* (0.007)	-0.012* (0.007)	-0.012* (0.007)
CF/K * Exporter				-0.059 (0.075)		-0.059 (0.075)
Exporter				0.067 (0.083)		0.065 (0.083)
CF/K * SOE					-0.085 (0.310)	-0.075 (0.310)
SOE					-0.068 (0.217)	-0.057 (0.218)
Debt/K				0.011 (0.007)	0.011 (0.007)	0.011 (0.007)
ln(Employment)				-0.064 (0.059)	-0.064 (0.059)	-0.063 (0.059)
ln(Age)				-0.087 (0.070)	-0.085 (0.070)	-0.089 (0.070)
Intercept	0.066** (0.030)	0.122*** (0.028)	0.074 (0.089)	0.447 (0.331)	0.493 (0.328)	0.448 (0.332)
Number of observations	1735	1398	1382	1359	1359	1359
Number of firms	319	301	314	307	307	307
R-squared	0.14	0.07	0.18	0.15	0.15	0.15
F-test						
CF/K + CF/K * Supplier = 0			1.80	1.75	1.20	1.73
p-value			0.18	0.19	0.27	0.19
CF/K + CF/K * Exporter = 0				58.88		58.45
p-value				0.00		0.00
CF/K + CF/K * SOE = 0					1.00	1.37
p-value					0.32	0.24

Note: All specifications include firm and year fixed effects. Numbers in parentheses are standard errors.

\*Significant at the 10 percent level.

\*\*Significant at the 5 percent level.

\*\*\*Significant at the 1 percent level.

Source: Authors' analysis based on data from two World Bank surveys of Czech firms in 2003 and 2004 and Bureau van Dijk Electronic Publishing (2005); see text for details.

Regression 3 examines whether the link between cash flow and investment differs between multinational suppliers and other firms. The model includes a dummy variable that takes the value of 1 in each year in which the firm supplies an MNC operating in the Czech Republic and 0 otherwise. The dummy variable is also interacted with cash flow. If firms with linkages to multinationals find it easier to obtain credit, the sum of the coefficients on cash flow and the interaction term should not be statistically significant. While cash flow continues to bear a positive and statistically significant coefficient, the interaction term is negative and statistically significant at the 1 percent level. The *F*-test indicates that the hypothesis that the sum of the two coefficients is equal to 0 cannot be rejected, suggesting that, unlike nonsuppliers, multinational suppliers do not face liquidity constraints. Neither labor productivity nor its interaction with cash flow reaches conventional significance levels. The supplier dummy variable is not statistically significant, suggesting that multinational suppliers do not differ in their investment behavior from other firms.<sup>8</sup>

Next, the analysis tests for whether the finding that multinational suppliers are less credit constrained is due to firms being exporters rather than to their being multinational suppliers. Exporting firms may be less credit constrained because of a steady stream of income from more creditworthy foreign customers, and their experience dealing with foreign buyers may better position them to become multinational suppliers. Potential firm-level determinants of investment behavior (size, age, and debt level) are also controlled for.

The findings are robust to these additional controls. The coefficient on the interaction between the multinational supplier dummy variable and cash flow remains negative and statistically significant at the 1 percent level. As before, the *F*-test suggests that multinational suppliers do not face liquidity constraints. In contrast, exporters appear to be as liquidity constrained as other Czech firms. The interaction term is not statistically significant, and the *F*-test rejects the absence of a link between investment and cash flow.<sup>9</sup> The likely explanation is that many Czech firms that continued to sell to their Slovak customers after Czechoslovakia split in 1993 are considered to be exporters, yet their Slovak buyers are unlikely to be more creditworthy than Czech buyers. This also explains why such a high percentage of observations in the sample pertain to exporters.<sup>10</sup> The additional controls for size, age, and debt level do not appear to be statistically significant.

Lizal and Svejnar (2002) find that state enterprises in the Czech Republic were facing soft budget constraints in the 1990s. As there are only 19 state enterprises in the sample, many of which were privatized during the period considered, there is little concern that their presence affects the main findings. Nevertheless,

8. Some differences may be captured by firm fixed effects included in the model.

9. Excluding the supplier dummy variable and its interaction with cash flow from the model would not change this conclusion.

10. The Slovak Republic is the second largest export market for Czech firms.

regression 5 adds a state enterprise dummy variable and its interaction with cash flow. Neither variable appears to be statistically significant, but as expected the *F*-test cannot reject the hypothesis that state enterprises are not credit constrained. The finding on multinational suppliers remains unchanged.

The last column in table 2 includes all the controls listed in equation (1) and confirms the earlier conclusions. The cash flow variable has a positive and statistically significant coefficient, and its interaction with the multinational supplier dummy variable is negative and significant at the 1 percent level. Based on these coefficients and the *F*-test, Czech firms in general appear to be liquidity constrained, but multinational suppliers do not. As before, the results suggest that state enterprises may be subject to soft budget constraints.

*Are Future Multinational Suppliers Less Credit Constrained?*

As mentioned, it is possible that less liquidity constrained firms self-select as suppliers to MNCs. Because multinational customers tend to have higher requirements for quality, technological sophistication, and on-time delivery than domestic buyers in developing and transition economies, becoming a multinational supplier is likely to be associated with some fixed cost for local firms. Thus, it may well be the case that only firms not facing liquidity constraints are able to become multinational suppliers. This possibility is examined by checking whether multinational suppliers appear to be less liquidity constrained than other firms before they start their contracts with multinationals, as estimated by the following model:

$$\begin{aligned}
 I_{it}/K_{it-1} = & \beta_0 + \beta_1 \Delta S_{it}/S_{it-1} + \beta_2 CF_{it}/K_{it-1} \\
 & + \beta_3 CF_{it}/K_{it-1} * Supplier_{it} + \beta_4 Supplier_{it} \\
 & + \beta_5 CF_{it}/K_{it-1} * 1 \text{ yr before}_{it} + \beta_6 1 \text{ yr before}_{it} \\
 (2) \quad & + \beta_7 CF_{it}/K_{it-1} * 2 \text{ yrs before}_{it} + \beta_8 2 \text{ yrs before}_{it} \\
 & + \beta_9 CF_{it}/K_{it-1} * \ln(VA/L) + \beta_{10} \ln(VA/L) \\
 & + \beta_{11} \ln(Size_{it}) + \beta_{12} \ln(Age_{it}) \\
 & + \beta_{13} Debt \text{ ratio}_{it} + v_i + v_t + u_{it}
 \end{aligned}$$

where 1 yr before<sub>it</sub> equals 1 at time *t* if firm *i* will become a multinational supplier at *t* + 1, and 0 otherwise, and 2 yrs before<sub>it</sub> equals 1 at time *t* if firm *i* will become a multinational supplier at *t* + 2, and 0 otherwise. A sum of  $\beta_2$  and  $\beta_7$  equal to 0 would indicate that multinational suppliers were not credit constrained two years before starting their relationship with an MNC. A sum of  $\beta_2$  and  $\beta_5$  equal to 0 would suggest that multinational suppliers were not facing credit constraints one year before starting their relationship with an MNC. Either or both findings would suggest self-selection of unconstrained firms into becoming multinational suppliers.

The estimation results of equation (2) are presented in table 3. Regression 1 looks at whether multinational suppliers were liquidity constrained one year

TABLE 3. Current Suppliers, Future Suppliers and Nonsuppliers

Variable	(1)	(2)	(3)	(4)	(5)
$\Delta$ Sales	0.085*** (0.032)	0.084*** (0.032)	0.078** (0.033)	0.078** (0.033)	0.063* (0.034)
CF/K	0.482*** (0.048)	0.482*** (0.048)	0.432*** (0.051)	0.432*** (0.051)	-0.326 (0.636)
CF/K * 2 yrs before		-0.26 (0.506)	-0.234 (0.506)	-0.232 (0.507)	-0.258 (0.498)
CF/K * 1 yr before	-0.510*** (0.133)	-0.515*** (0.133)	-0.465*** (0.134)	-0.465*** (0.134)	-0.622*** (0.164)
CF/K * Supplier	-0.439*** (0.067)	-0.440*** (0.067)	-0.399*** (0.068)	-0.400*** (0.069)	-0.395*** (0.111)
2 yrs before		-0.048 (0.102)	-0.065 (0.102)	-0.065 (0.102)	-0.061 (0.100)
1 yr before	0.02 (0.079)	-0.014 (0.087)	-0.037 (0.087)	-0.037 (0.087)	-0.023 (0.086)
Supplier	0.03 (0.073)	-0.01 (0.084)	-0.032 (0.084)	-0.032 (0.088)	-0.034 (0.083)
CF/K * ln(VA/L)	0.008 (0.007)	0.008 (0.007)	0.011 (0.008)	0.011 (0.008)	-0.015* (0.009)
ln(VA/L)	-0.009* (0.005)	-0.009 (0.005)	-0.013** (0.007)	-0.013** (0.007)	-0.002 (0.007)
Debt/K			0.011 (0.007)	0.011 (0.007)	0.015** (0.007)
ln(Employment)			-0.069 (0.059)	-0.069 (0.059)	-0.028 (0.058)
ln(Age)			-0.072 (0.070)	-0.073 (0.070)	-0.064 (0.069)
Supplier * Year 1999				-0.009 (0.066)	
Supplier * Year 2000				0.010 (0.072)	
					Includes interactions of CF/K with two-digit industry fixed effects
Number of observations	1382	1382	1359	1359	1359
Number of firms	314	314	307	307	307
R <sup>2</sup>	0.19	0.19	0.16	0.16	0.22
F-test					
CF/K + CF/K * Supplier = 0	0.46	0.44	0.26	0.25	1.25
p-value	0.50	0.51	0.61	0.62	0.26
CF/K + CF/K * 1 yr before = 0	0.04	0.06	0.06	0.06	2.09
p-value	0.83	0.80	0.80	0.80	0.15
CF/K + CF/K * 2 yrs before = 0		0.19	0.15	0.16	0.53
p-value		0.66	0.70	0.69	0.47

Note: All specifications include firm and year fixed effects and a constant. Numbers in parentheses are standard errors.

\*Significant at the 10 percent level.

\*\*Significant at the 5 percent level.

\*\*\*Significant at the 1 percent level.

Source: Authors' analysis based on data from two World Bank surveys of Czech firms in 2003 and 2004 and Bureau van Dijk Electronic Publishing (2005); see text for details.

before they started their relationship with an MNC. As before, the coefficient on cash flow is positive, though slightly larger, and statistically significant at the 1 percent level. The interaction terms between the multinational supplier dummy variable and cash flow and between future supplier and cash flow are both negative and statistically significant at the 1 percent level. *F*-tests suggest that, unlike Czech firms in general, neither current nor future multinational suppliers face liquidity constraints.

Regression 2 considers the two-year period before starting a relationship with an MNC. The interactions of cash flow with 1 yr before and supplier remain negative and statistically significant. The coefficient on the interaction with 2 yrs before is negative, though not statistically significant. *F*-tests cannot reject the hypothesis that multinational suppliers are not liquidity constrained and that this lack of constraints is already present in the two-year period before becoming a supplier.

Regression 3 shows that the findings are robust to controlling for firm size, age, and debt level. In sum, the findings are suggestive of unconstrained firms self-selecting into becoming multinational suppliers.

To take into account a currency crunch that took place in the Czech Republic in 1999–2000 following a banking crisis (see Pruteanu 2004), an interaction of the supplier dummy variable with a dummy variable for year 1999 (and 2000) is added to the specification. Doing so will shed light on whether multinational suppliers were affected differently by the credit crunch: multinationals with their global distribution networks are less affected by changes in the Czech market and thus less likely to adjust their relationships with their suppliers. As evident from regression 4, however, there is no indication of any different investment behavior among multinational suppliers than among other firms during the credit crunch period. Neither interaction term is statistically significant. Other conclusions remain unchanged.

To account for the possibility that firms in growing sectors might be more likely to be both multinational suppliers and not liquidity constrained, interactions between dummy variables for two-digit NACE codes (18 in total) and the cash flow variable are added. Only two of these interaction terms are statistically significant (furniture; computer, electronic, and optical products). The results confirm the previous findings that suppliers to MNCs are not liquidity constrained and that the effect is already present two years before signing a contract with an MNC. This specification also finds a significant positive coefficient on the debt variable and a significant negative coefficient on the interaction between cash flow and labor productivity.

One may wonder about the results of *F*-tests based on the interaction of cash flow and labor productivity as well as the interaction of cash flow and current (or future) supplying status. *F*-tests taking into account the average labor productivity among current (or future, as appropriate) suppliers support the earlier conclusions: both current and future multinational suppliers do not appear to be credit constrained.

Finally, additional robustness checks (not reported to save space) show that the conclusions are not affected by dropping observations with negative values for cash flow or by including industry-year fixed effects.

Another way to shed light on the link between credit constraints and multinational supplying status is to estimate a probit model that aims to explain the supplying status with the lagged liquidity ratio, gross profit (logged), and debt (normalized by capital).  $Supplier_{it}$  is the dependent variable. Liquidity ratio is defined as the difference between current assets and current liabilities divided by total assets. This specification also controls for firm size (number of employees), age, and labor productivity (all in logs) as well as three-digit industry and year fixed effects.

The results show a positive and statistically significant link between lagged liquidity ratio, lagged gross profit, and the probability of being a multinational supplier (table A-1). Coefficients on debt, employment, and labor productivity are not statistically significant. As this last finding is somewhat puzzling, firm performance was also measured using total factor productivity estimated by the sector-specific production function (ordinary least squares or the Olley–Pakes 1996 method). Once liquidity ratio, gross profit, and debt are controlled for, firm productivity is not a statistically significant predictor of supplying status. Finally, the data also indicate that younger firms are more likely to supply MNCs.<sup>11</sup>

In sum, the findings suggest that firms not facing liquidity constraints self-select into becoming multinational suppliers. This is consistent with the observation that to obtain contracts from MNCs firms need to meet the stringent requirements of multinational customers and that only firms with access to financing may be able to do so. The survey data are in line with these conclusions. Most suppliers make improvements within the 12-month period before signing a contract with an MNC. The most frequent changes include improvements to product quality, staff training, and productivity enhancements. Many of these changes are probably made to obtain ISO certifications. More than 40 percent of suppliers reported being required by prospective multinational customers to obtain ISO certification. As the certification process is quite costly, usually involving the services of a specialized consulting firm, it would not be surprising if only firms that were not liquidity constrained were able to complete it.

### *Robustness Checks*

To eliminate the possibility that the findings could be driven by MNCs extending credit to future suppliers, the 15 Czech firms that reported receiving some financial help from their multinational customers were removed from the

11. In a probit model predicting the decision of Czech firms to become multinational suppliers rather than the decision to supply MNCs in a given year, liquidity ratio and firm size were the main predictors of the decision to become a multinational supplier.



sample. The results confirm the earlier pattern. Multinational suppliers were not liquidity constrained two years before supplying an MNC, and they remained unconstrained while supplying the multinational (table 4, regressions 1 and 2).

To examine whether the findings are due to the possibility that future multinational suppliers have a lower credit risk because of a contract with an MNC, Czech suppliers that reported that having a relationship with an MNC helped them obtain financing are dropped from the sample. Eliminating these 24 firms does not affect the results (regressions 3 and 4). The finding that multinational suppliers are less credit constrained is thus confirmed, and the evidence suggests that less constrained firms self-select into becoming multinational suppliers.

### *Instrumental Variable Approach*

With the evidence suggesting self-selection by less credit constrained firms into supply relationships with MNCs and the possibility that some explanatory variables are endogenous, the final step is to apply an instrumental variable approach. The analysis uses the generalized method of moments (GMM) system estimation (proposed by Blundell and Bond 1998) and instruments for sales growth, labor productivity, supplier status, cash flow, and cash flow interactions with supplier status and with labor productivity. The GMM estimator combines a differenced and a level equation. Lagged levels of endogenous variables are used as instruments for contemporary differences, and lagged differences are used as instruments for the level equation.

Several additional instruments are also used. Firms whose managers speak a foreign language or who have worked for foreign companies before are likely to be better positioned to obtain contracts from multinationals. Thus, dummy variables reflecting these two characteristics are used as instruments for supply status. Level of language proficiency was determined by whether the manager can conduct business negotiations in a foreign language or can understand a business agreement in a foreign language, as reported in surveys. As exporters may find it easier to become multinational suppliers because of their experience of dealing with foreign customers, the second lag of exporting status is also used as an instrument.

As it is also likely that proximity to MNCs facilitates business relationships, the instrument set includes proxies for the presence of multinationals in the same industry and in downstream industries. The share of sector output produced by foreign firms is the proxy for the presence of MNCs in the same sector. It is calculated by weighting the output of each firm  $f$  in sector  $j$  ( $Y_{ft}$ ) by the share of the firm  $f$ 's equity owned by foreigners (Foreign share $_{ft}$ ) and dividing it by the total output of sector  $j$ :

$$(3) \quad \text{MNCs in the same sector}_{jt} = \frac{\sum_{f \text{ for all } f \in j} \text{Foreign share}_{ft} * Y_{ft}}{\sum_{f \text{ for all } f \in j} Y_{ft}}.$$

TABLE 4. Excluding Suppliers Benefiting from Multinational Assistance

Variable	Excluding firms receiving financial assistance from multinational corporations		Excluding firms reporting easier access to credit because of their relationship with multinational corporations	
	(1)	(2)	(3)	(4)
ΔSales	0.076** (0.033)	0.068** (0.035)	0.104*** (0.034)	0.098*** (0.035)
CF/K	0.419*** (0.049)	0.353*** (0.052)	0.492*** (0.049)	0.442*** (0.052)
CF/K * 2 yrs before	-0.23 (0.505)	-0.193 (0.505)	-0.45 (0.631)	-0.46 (0.631)
CF/K * 1 yr before	-0.471*** (0.134)	-0.411*** (0.134)	-0.530*** (0.135)	-0.480*** (0.136)
CF/K * Supplier	-0.410*** (0.071)	-0.358*** (0.072)	-0.454*** (0.069)	-0.416*** (0.070)
2 yrs before	-0.091 (0.106)	-0.11 (0.106)	-0.002 (0.121)	-0.018 (0.121)
1 yr before	-0.059 (0.094)	-0.083 (0.094)	0.028 (0.099)	0.002 (0.099)
Supplier	-0.05 (0.088)	-0.074 (0.088)	0.038 (0.097)	0.012 (0.098)
CF/K * ln(VA/L)	0.01 (0.007)	0.014* (0.007)	0.007 (0.008)	0.01 (0.008)
ln(VA/L)	-0.008 (0.005)	-0.012* (0.006)	-0.008 (0.005)	-0.015** (0.007)
Debt/K		0.007 (0.007)		0.012 (0.007)
ln(Employment)		-0.065 (0.058)		-0.110* (0.062)
ln(Age)		-0.056 (0.071)		-0.088 (0.075)
Intercept	0.103 (0.092)	0.511 (0.327)	0.061 (0.099)	0.742** (0.346)
Number of observations	1311	1288	1267	1244
Number of firms	299	292	290	283
R <sup>2</sup>	0.16	0.13	0.21	0.17
<i>F</i> -test				
CF/K + CF/K * Supplier = 0	0.02	0.01	0.32	0.15
<i>p</i> -value	0.90	0.94	0.57	0.70
CF/K + CF/K * 1 yr before = 0	0.15	0.19	0.08	0.08
<i>p</i> -value	0.70	0.66	0.78	0.78
CF/K + CF/K * 2 yrs before = 0	0.14	0.10	0.00	0.00
<i>p</i> -value	0.71	0.75	0.95	0.98

*Note:* All specifications include firm and year fixed effects. Numbers in parentheses are standard errors.

\*Significant at the 10 percent level.

\*\*Significant at the 5 percent level.

\*\*\*Significant at the 1 percent level.

*Source:* Authors' analysis based on data from two World Bank surveys of Czech firms in 2003 and 2004 and Bureau van Dijk Electronic Publishing (2005); see text for details.

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

$$\text{Potential MNC customers}_{it} = \sum_{k \text{ if } k \neq j} \alpha_{jk} * \frac{\sum_{f \text{ for all } f \in k} \text{Foreign share}_{ft} * Y_{ft}}{\sum_{f \text{ for all } f \in k} Y_{ft}}. \tag{4}$$

The proportion of sector  $j$ 's output supplied to a downstream sector  $k$  based on the 1999 input–output matrix of the Czech Republic ( $\alpha_{jk}$ ) is used to weight multinational 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 is the value of the variable.<sup>12</sup> The calculations are based on all firms included in the AMADEUS database, not just the firms in the sample. Cash flow interactions with the instruments mentioned above are used to instrument for the interaction of cash flow with the multinational supplier dummy variable. Table 5 lists the instruments included in a given specification.

The number of observations in GMM regressions is smaller than in the previous specifications. Because the model is expressed in first differences an additional year of data is lost. Further years of data are lost because the instruments are based on second and further lags.

While the results should be treated with caution because of the small number of observations, they are nevertheless informative. The Hansen test for overidentification restrictions shows that the null hypothesis cannot be rejected at conventional significance levels (see table 5). The Arellano–Bond test shows that the null hypothesis of no second-order serial correlation also cannot be rejected. These specification tests suggest that the regressions yield consistent estimates.

The GMM results suggest that supplier status has no significant impact on a firm's liquidity constraints, once self-selection is taken into account. The interaction term between cash flow and supplier status is not statistically significant in any of the regressions (or in many other regressions estimated but not reported here to save space). In all specifications, the  $F$ -test rejects the absence of a relationship between cash flow and investment for multinational suppliers. As expected, the cash flow variable remains statistically significant in all regressions, suggesting that domestic firms are liquidity constrained. In summary, the evidence suggests that suppliers differ from nonsuppliers in liquidity constraints, but the effect appears to be due to self-selection rather than to a relationship with an MNC leading to an easing of the supplier's financial constraints.

12. 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<sub>it</sub> will be calculated as follows:  $\frac{1}{2} * 0 + \frac{1}{2} * \frac{1}{2} = \frac{1}{4}$ .

TABLE 5. Generalized Method of Moments Regressions

Variable	(1)	(2)	(3)	(4)	(5)
<i>I/K</i> lagged	0.119** (0.051)	0.119** (0.051)	0.111** (0.050)	0.121** (0.051)	0.124** (0.052)
$\Delta$ Sales	0.021 (0.054)	0.017 (0.055)	0.010 (0.055)	0.015 (0.053)	0.017 (0.054)
CF/K	0.322*** (0.067)	0.323*** (0.066)	0.336*** (0.068)	0.324*** (0.066)	0.323*** (0.066)
CF/K * Supplier	0.121 (0.100)	0.121 (0.100)	0.11 (0.104)	0.123 (0.100)	0.124 (0.099)
Supplier	0.034 (0.032)	0.03 (0.032)	0.033 (0.031)	0.028 (0.032)	0.028 (0.031)
CF/K * ln(VA/L)	0.017* (0.010)	0.017* (0.010)	0.016 (0.010)	0.017* (0.010)	0.017* (0.010)
ln(VA/L)	-0.015*** (0.005)	-0.015*** (0.005)	-0.016*** (0.005)	-0.015*** (0.005)	-0.015*** (0.005)
Debt/K	0.013 (0.012)	0.013 (0.012)	0.012 (0.012)	0.013 (0.012)	0.012 (0.011)
ln(Employment)	-0.016 (0.021)	-0.018 (0.022)	-0.019 (0.020)	-0.012 (0.021)	-0.01 (0.021)
ln(Age)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Intercept	0.238 (0.166)	0.246 (0.166)	0.241 (0.153)	0.201 (0.149)	0.195 (0.145)
Number of observations	728	728	728	728	728
Number of firms	243	243	243	243	243
Additional instrumental variables	CF/K <sub><i>t-2</i></sub> *Manager's foreign language	CF/K <sub><i>t-2</i></sub> *Manager's foreign language	CF/K <sub><i>t-2</i></sub> *Manager's foreign language	CF/K <sub><i>t-2</i></sub> *Potential MNC customers <sub><i>t-2</i></sub>	CF/K <sub><i>t-2</i></sub> *Manager's foreign experience
	CF/K <sub><i>t-2</i></sub> *Potential MNC customers <sub><i>t-2</i></sub>	CF/K <sub><i>t-2</i></sub> *Potential MNC customers <sub><i>t-2</i></sub>	Potential MNC customers <sub><i>t-2</i></sub>	Potential MNC customers <sub><i>t-2</i></sub>	CF/K <sub><i>t-2</i></sub> *Potential MNC customers <sub><i>t-2</i></sub>
	Potential MNC customers <sub><i>t-2</i></sub>	Potential MNC customers <sub><i>t-2</i></sub>	MNCs in the same sector <sub><i>t-2</i></sub>	CF/K <sub><i>t-2</i></sub> *MNCs in the same sector <sub><i>t-2</i></sub>	Potential MNC customers <sub><i>t-2</i></sub>
		CF/K <sub><i>t-2</i></sub> *MNCs in the same sector <sub><i>t-2</i></sub>	Exporter <sub><i>t-2</i></sub>	MNCs in the same sector <sub><i>t-2</i></sub>	CF/K <sub><i>t-2</i></sub> *MNCs in the same sector <sub><i>t-2</i></sub>
		MNCs in the same sector <sub><i>t-2</i></sub>		Exporter <sub><i>t-2</i></sub>	MNCs in the same sector <sub><i>t-2</i></sub>
					Exporter <sub><i>t-2</i></sub>
<i>F</i> -test					
CF/K + CF/K * Supplier = 0	17.58	17.75	17.64	18.3	18.27
<i>p</i> -value	0.00	0.00	0.00	0.00	0.00
AR(1) test <i>p</i> -value	0.03	0.03	0.03	0.03	0.03
AR(2) test <i>p</i> -value	0.94	0.95	0.98	0.93	0.93
Hansen test <i>p</i> -value	0.91	0.91	0.94	0.92	0.92

Note: Numbers in parentheses are standard errors.

\*Significant at the 10 percent level.

\*\*Significant at the 5 percent level.

\*\*\*Significant at the 1 percent level.

Source: Authors' analysis based on data from two World Bank surveys of Czech firms in 2003 and 2004 and Bureau van Dijk Electronic Publishing (2005); see text for details.

#### IV. POLICY IMPLICATIONS

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. Policymakers, expecting some of this knowledge to result in externalities that benefit domestic producers, are willing to offer often generous incentive packages to foreign investors. For instance, 59 of 108 countries surveyed by the World Bank reported offering some type of incentives for FDI in 2004 (Harding and Javorcik 2007).

A recent survey of the empirical literature on spillovers from FDI concludes that such spillovers are most likely between MNCs and their local suppliers (Görg and Greenaway 2004). Thus, understanding what factors allow local firms to become suppliers to MNCs could have strong implications for understanding knowledge spillovers and public policy choices.

Two main findings emerge from the study. First, in contrast to Czech firms in general, which face financial constraints, multinational suppliers do not appear to be liquidity constrained. Second, the data suggest that the lack of liquidity constraints is present before firms enter into a supplier relationship with MNCs, which is consistent with unconstrained firms self-selecting into supplying multinationals.

Caution is required, however, in interpreting these findings. While the findings are robust to a number of controls that may be driving both access to credit and the ability of firms to supply multinationals, the possibility remains that the list of controls is incomplete. Further, even though the results suggest that well-functioning credit markets are important in facilitating business relationships between local firms and MNCs, they do not suggest that a well-developed financial market is a sufficient condition for such relationships. Many other factors, such as a certain level of sophistication of the local manufacturing sector, a match between the skill endowment of the host economy and the sourcing needs of MNCs, and a good business environment, may be needed in order for these relationships to materialize. Thus, the findings could plausibly be generalized to other upper middle-income economies, but probably not to low-income economies.

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## APPENDIX A

TABLE A-1. Probit Model Predicting a Firm's Supplying Status

Variable				
Liquidity ratio lagged	0.743*** (0.191)	0.830*** (0.223)	0.823*** (0.248)	0.809*** (0.253)
ln(Gross profit) lagged	0.079** (0.037)	0.083* (0.049)	0.151** (0.061)	0.129** (0.057)
Debt/K lagged	0.131 (0.236)	0.074 (0.248)	0.446 (0.317)	0.428 (0.325)
ln(Employment) lagged	0.095* (0.050)	0.075 (0.069)	0.094 (0.066)	0.106 (0.067)
ln(Age) lagged	-0.054 (0.086)	-0.035 (0.090)	-0.470*** (0.132)	-0.480*** (0.135)
ln(VA/L) lagged		0.014 (0.019)		
ln(Total factor productivity) lagged			0.105 (0.320)	
ln(Total factor productivity Olley-Pakes) lagged				0.27 (0.195)
Intercept	-0.561 (0.604)	-1.444** (0.677)	-1.223 (0.823)	-1.983*** (0.725)
Number of observations	1350	1051	949	887

Note: All specifications include industry and year fixed effects. Numbers in parentheses are robust standard errors.

\*Significant at the 10 percent level.

\*\*Significant at the 5 percent level.

\*\*\*Significant at the 1 percent level.

Source: Authors' analysis based on data from two World Bank surveys of Czech firms in 2003 and 2004 and Bureau van Dijk Electronic Publishing (2005); see text for details.

## REFERENCES

- Alfaro, Laura, Areendam Chanda, Sebnem Kalemli-Ozcan, and Selin Sayek. 2004. "FDI and Economic Growth: The Role of Local Financial Markets." *Journal of International Economics* 65(2):89-112.
- . 2006. *How Does Foreign Direct Investment Promote Economic Growth?* NBER Working Paper 12522. Cambridge, MA: National Bureau of Economic Research.
- Beck, Thorsten, Asli Demirguc-Kunt, and Ross Levine. 1999. "A New Database on Financial Development and Structure." World Bank Policy Research Working Paper 2146. World Bank, Washington, D.C.
- Blalock, Garrick, and Paul J. Gertler. 2008. "Welfare Gains from Foreign Direct Investment through Technology Transfer to Local Suppliers." *Journal of International Economics* 74(2):402-21.

- Blundell, Richard, and Steve Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87(1):115–43.
- Bureau van Dijk Electronic Publishing. 2005. AMADEUS: A Pan-European Database of Comparable Financial Information for 9 Million Public and Private Companies. Brussels.
- Chaney, Thomas. 2005. *Liquidity Constrained Exporters*. Working Paper, Department of Economics, University of Chicago.
- CzechInvest Factsheet No. 3, January 2002. Prague: CzechInvest.
- Fazzari, Steven M., R. Glenn Hubbard, and Bruce C. Petersen. 1988. "Financing Constraints and Corporate Investment." *Brookings Papers on Economic Activity* 1:141–95.
- . 2000. "Financing Constraints and Corporate Investment: Response to Kaplan and Zingales." *Quarterly Journal of Economics* 115(2):695–705.
- Gelos, R. Gaston, and Alejandro Werner. 2002. "Financial Liberalization, Credit Constraints, and Collateral: Investment in the Mexican Manufacturing Sector." *Journal of Development Economics* 67(1):1–27.
- Görg, Holger, and David Greenaway. 2004. "Much Ado about Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment?" *World Bank Research Observer* 19(2):171–97.
- Harding, Torfinn, and Beata S. Javorcik. 2007. "Developing Economies and International Investors: Do Investment Promotion Agencies Bring Them Together?" Policy Research Working Paper 4339. World Bank, Washington, D.C.
- Harrison, Ann, and Margaret McMillan. 2003. "Does Direct Foreign Investment Affect Domestic Firms' Credit Constraints?" *Journal of International Economics* 61(1):73–100.
- Harrison, Ann E., Inessa Love, and Margaret S. McMillan. 2004. "Global Capital Flows and Financing Constraints." *Journal of Development Economics* 75(1):269–301.
- Hoshi, Takeo, Anil Kashyap, and David Scharfstein. 1991. "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups." *Quarterly Journal of Economics* 106(4):33–60.
- Javorcik, Beata S. 2004. "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages." *American Economic Review* 94(3): 605–27.
- Javorcik, Beata S., and Mariana Spatareanu. 2005. "Disentangling FDI Spillover Effects: What Do Firm Perceptions Tell Us?" In Theodore Moran, Edward Graham, and Magnus Blomström, eds., *Does Foreign Direct Investment Promote Development?* Washington, D.C.: Institute for International Economics.
- . 2008. "To Share or Not To Share: Does Local Participation Matter for Spillovers from FDI?" *Journal of Development Economics* 85(1–2):194–217.
- Kaplan, Steven, and Luigi Zingales. 1997. "Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?" *Quarterly Journal of Economics* 112(1):169–215.
- . 2000. "Investment-Cash Flow Sensitivities Are Not Valid Measures of Financing Constraints." *Quarterly Journal of Economics* 115(2):707–12.
- Konings, Josef, Marian Rizov, and Hylke Vandenbussche. 2003. "Investment and Credit Constraints in Transition Economies: Micro Evidence from Poland, the Czech Republic, Bulgaria and Romania." *Economic Letters* 78(2):253–58.
- Lizal, Lubomir, and Jan Svejnar. 2002. "Investment, Credit Rationing, and the Soft Budget Constraint: Evidence from Czech Panel Data." *Review of Economics and Statistics* 84(2):353–70.
- Manova, Kalina. 2006. *Credit Constraints in Trade: Financial Development and Export Composition*. Cambridge, MA: Harvard University, Department of Economics.
- Modigliani, Franco, and Merton Miller. 1958. "The Cost of Capital, Corporation Finance, and the Theory of Investment." *American Economic Review* 48(3):261–97.
- Moran, Theodore. 2001. *Parental Supervision: The New Paradigm for Foreign Direct Investment and Development*. Washington, D.C.: Institute for International Economics.

- Moran, Theodore, Edward Graham, and Magnus Blomström. 2005. *Does Foreign Direct Investment Promote Development?* Washington, D.C.: Institute for International Economics.
- Olley, Steven G., and Ariel Pakes. 1996. "The Dynamics of Productivity in the Telecommunications Equipment Industry." *Econometrica* 64(6):1263–97.
- Pruteanu, Anca. 2004. "Was There Evidence of Credit Rationing in the Czech Republic?" *Eastern European Economics* 42(5):58–72.
- Rajan, Raghuram, and Luigi Zingales. 1998. "Financial Development and Growth." *American Economic Review* 88(3):559–86.