DO FOREIGN FIRMS CROWD OUT DOMESTIC FIRMS? EVIDENCE FROM THE CZECH REPUBLIC

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Abstract—I examine how foreign presence affects the growth and survival of domestic firms. Separating a negative crowding out and positive technology spillovers, I analyze whether the crowding out effect is dynamic, that is, domestic firms cut production over time as foreign firms grow, or a static effect realized on foreign entry into the industry. Using 1994–2001 firm-level Czech data, I find evidence of both technology spillovers and crowding out. However, crowding out is only short term; after initial entry shakeout, growing foreign sales increase domestic firm growth and survival, indicating domestic demand creation effect. However, I find no such benefits from domestic competition.

I. Introduction

With increasing globalization, opening up of economies, and deregulation of markets, the role of FDI in the world economy has increased rapidly. MNCs became key drivers of the world GDP, and the total FDI stock raised from 8% to 26% of world GDP between 1990 and 2006 (OECD, 2008). Since the mid-1990s, FDI has become the main source of external finance for developing countries and is more than twice as large as official development aid. FDI has been playing an important role as well in the transitional countries of central and eastern Europe, such as the Czech Republic, where domestic mass privatization failed in the restructuring process of the formerly state-owned enterprises (Kočenda & Svejnar, 2003). The expansion of FDI, as a major source of financial capital and new technologies especially in emerging markets, raised expectations about its potential contributions to the economic growth and development. Hence, many countries not only liberalized their markets, but started to offer generous investment packages, such as tax holidays, import duty exemptions, or preferential loans (UNCTAD, 2003) to attract FDI. However, the evidence of the impact of FDI on host economies is mixed. This issue is important not only to academics and policymakers, but also to managers of MNCs, because it a affects their reputation and bargaining position in the host countries (Meyer, 2004).

Theory on technology diffusion advocates that FDI will promote growth as MNCs confer technology spillovers to domestic firms.[1] This view, supported by early case studies and industry-level findings (Caves, 1974; Blomström, 1986), emphasizes that activities of MNCs should generate knowledge externalities, that is, facilitate the transfer of more efficient technology and management practices from foreign to domestic firms. Macroeconomic studies (Borensztein, Gregorio & Lee 1998; Alfaro et al., 2004) provide supporting evidence, but only under some conditions, and Carkovic and Levine (2005) find no evidence of a positive impact of FDI on economic growth. Firm-level panel studies, for example, Haddad and Harrison (1993) and Aitken and Harrison (1999), have found negative or no spillover effects. Studies in transitional economies show similar results: negative FDI spillovers were found in the Czech Republic (Djankov and Hoekman, 2000; Kinoshita, 2000; Sabirianova et al., 2005), Bulgaria, and Romania, but no spillovers were found in Poland (Konings, 2001). Using data for seventeen emerging markets, Gorodnichenko Svejnar, and Terrell (2007) suggest that the presence of spillovers may depend on various firm, industry, and institutional characteristics.

Aitken and Harrison (1999) explain these contradictory findings as "market stealing" or the crowding-out effect. They argue that even though technology spillovers exist, more efficient foreign firms may draw demand from domestic firms, so the negative competitive effect may outweigh positive technology spillovers. Caves (1996) and Blomström, Kokko, and Zejen (2000) also argue that the likelihood that MNCs will crowd out local firms is larger in developing than in developed countries because of a higher technology gap between domestic and foreign firms.[2] From a policy perspective, these results and arguments raise concern as to whether FDI incentives are justified, especially in developing or transitional countries. Another concern is that the fear of being crowded out and a popular belief that MNCs will monopolize domestic markets complicates the restructuralization process in many transitional countries.[3] Indeed, the protectionist backlash against FDI has recently arisen not only in emerging markets, such as Russia and Latin America, but in developed countries, including the United States and Europe (Economist, 2008; UNCTAD, 2006). However, if crowding out is just a short-run effect and positive spillovers dominate in the long run, as suggested by Aitken and Harrison, these actions may impede growth in many transitional and developing countries.

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[1] See Findlay (1978) and the survey by Keller (2004). Technology in this context includes products, production process, distribution networks, management, and marketing, for example.

[2] Dawar and Frost (1999) discuss that in emerging markets, FDI often represents a "death sentence" for local firms because they usually cannot compete with MNCs that possess technological and financial advantages.

[3] Cordonnier (2002) discusses this issue during the restructuring of the banking industry in Russia.

TABLE 1.—NET FDI INFLOWS IN CEECS, 1989–2004 (MILLIONS OF USD)

	1989	1990	1991	1992	1993	1994	1995	1996
Czech Republic	257	132	513	983	563	749	2,526	1,276
Croatia	0	0	0	13	102	110	109	486
Hungary	0	311	1,459	1,471	2,328	1,097	4,410	2,279
Poland	11	0	117	284	580	542	1,134	2,741
Slovak Republic	0	24	82	100	107	236	194	199
Slovenia	NA	−2	−41	113	111	129	161	167
Estonia	NA	NA	NA	80	156	212	199	111
Latvia	NA	NA	NA	29	50	279	245	379
Lithuania	NA	NA	NA	8	30	31	72	152
Bulgaria	0	4	56	41	40	105	98	138
Romania	0	−18	37	73	87	341	417	415
EU	42,282	58,480	48,053	54,595	49,034	47,082	68,814	70,696
	1997	1998	1999	2000	2001	2002	Cumulative:	1989–2004
Czech Republic	1,275	3,591	6,234	4,943	4,820	8,226		40,831
Croatia	347	835	1,445	1,086	1,424	1,000		7,630
Hungary	1,741	1,555	1,720	1,123	2,255	598		23,635
Poland	3,041	4,966	6,348	8,171	6,928	3,700		44,552
Slovak Republic	84	374	701	2,058	1,460	4,007		11,626
Slovenia	303	221	59	71	371	1,790		3,683
Estonia	130	574	222	324	343	185		2,736
Latvia	515	303	331	400	151	388		3,420
Lithuania	328	921	478	375	439	714		4,098
Bulgaria	507	537	789	1,003	641	430		5,289
Romania	1,267	2,079	1,025	1,051	1,154	1,080		10,108
EU	75,204	145,563	206,428	401,868	NA	NA		1,225,816

Source: William Davidson Institute data tables.

To provide new evidence on these issues, I use data for a transitional country, the Czech Republic, and ask the following questions: Is there evidence of a crowding-out effect in a transitional country? Are there technology spillovers? What is the mechanism of crowding out? - Is it a dynamic effect, where domestic firms continue to cut production over time as foreign firms grow in the domestic industry, or is it a short-term static effect realized on foreign entry into the industry? In the end, is the impact of foreign competition really different from that of domestic competition?

While previous firm-level studies analyzed the impact of FDI on domestic firm productivity, I address these questions by analyzing the impact of foreign presence on the growth and survival of domestic firms. Firm growth and exit are the underpinnings of job creation and destruction. Knowing how FDI affects these variables will help us not only better assess the impact of FDI on domestic firm performance but better understand the impact on the entire economy.

I use theoretical and empirical methodology that overcomes several shortcomings in the literature. First, I separate the crowding out from the technology spillover effect. Previous studies usually used only one measure for FDI presence and as such can provide only the short-run net FDI impact, that is, whether the positive technology transfer outweighs the negative competitive effect within the same time period. However, if the estimated effect is zero, as it is in several studies, we do not know whether spillover and competitive effects exist at all or whether they are just perfectly balanced. Moreover, if these effects have different timing, mixing them into one measure may bias the overall picture. From a theoretical and a policy perspective, it is important to separate these effects to better understand how domestic firms adjust to FDI and how institutions or market forces could affect the size of each effect. Second, I incorporate firm exit into the analyses. Most research on FDI spillovers has neglected the possibility that domestic firms may exit as a result of foreign competition. Then the positive evidence on FDI spillovers might be overestimated. Interestingly, the impact of FDI on domestic firm survival has not received much attention in the literature. Görg and Strobl (2000) and De Backer and Sleuwaegen (2003) are to my knowledge the only studies that analyze the impact of FDI on domestic firm survival, but they do so for developed countries. Third, my framework allows analyzing the FDI impact on firm performance without input measurement. So one can avoid the input endogeneity problems in productivity estimations.[4]

Theoretically, I rely on a model that combines a dominant firm and competitive fringe framework with a Jovanovic-type model of firm and industry dynamics (Jovanovic, 1982; Sun, 2002). The model gives predictions for the growth and exit of domestic firms, which I test using a unique 1994–2001 panel data set on foreign and domestic firms in the Czech Republic. I focus on this country for several reasons. First, a single country helps to avoid the empirical difficulties with controlling for cross-country differences that affect FDI inflows. Second, as table 1 shows, the Czech Republic is one of the countries with the highest FDI inflows in central and eastern Europe, so there should be a sufficient foreign presence to address my

[4] Though several studies (e.g., Blalock, 2002; Javorcik, 2004) used the Olley-Pakes (1996) or Levinsohn-Petrin (2003) method to correct for the endogeneity of inputs, Haskel et al. (2007) discuss that the assumptions of these methods might be unsuitable for analyses of FDI spillovers.

questions. Third, unlike other transitional countries with high FDI inflows, such as Hungary or Poland, the Czech Republic was virtually closed until transition started in 1989, so it provides almost a natural experiment environment for my study. Finally, being a model for countries that started transition later, such as Bulgaria, Romania, and the former Soviet Union, the results might be generalizable to other countries. Compared to many other studies, my data provide an extensive coverage of firms of different sizes, including small firms and single entrepreneurs, whose presence is important to fully capture the FDI impact. Moreover, firm-level data for eight years of transition, almost double time the period of most previous studies, allow me to control for all kinds of fixed effects as well as firm self-selection and thus avoid potential endogeneity problems with FDI inflows.

My results show evidence of both technology spillover and crowding-out effects. However, crowding out appears to be a short-term or static phenomenon. Initial foreign entry increases the exit rate of domestic firms; subsequently, however, the sales growth of the foreign firms in the industry increases both the growth rate and the survival of domestic firms. Dividing industries between low- and high-export oriented suggests that this positive foreign growth effect represents domestic demand creation, not export spillovers. My estimates also suggest that the positive externalities due to demand creation and technology spillovers offset the static crowding-out effect within two years. These results are robust across different specifications. Including measures for the entry and growth of other domestic firms, together with subsample analyses according to the level of FDI presence, further confirms my findings and provides compelling evidence that the impact of foreign firms is indeed different from that of domestic firms. Although, while there are long-run benefits from foreign competition, there are no such benefits from other domestic firms. Further analyses also show that domestic firms in the technologically advanced industries are the primary beneficiaries of technology spillovers.

My paper brings several contributions to the literature. First, it extends the literature on FDI, economic growth, and development. Second, it links FDI literature with studies on firm and industry dynamics. Only recently have these studies started to consider the impact of trade liberalization on firm sizes and industry evolution.[5] My results show that FDI liberalization can also initiate industry shakeout and affect domestic firm sizes. Third, it relates to the literature on product market regulation. Schiantarelli (2005) points out that "there is little evidence on the effect of regulatory changes on firm outcomes in developing countries." My paper shows how removing FDI entry barriers in a small, closed economy affects domestic firm performance. It also indicates that regulation should not discriminate against MNCs since foreign competition in emerging markets can generate much larger long-run benefits than domestic competition can.

As on anecdotal example, I discuss the case of the Czech auto industry, one of the most successful industries in attracting FDI. By 2000 one-third of the top 100 European auto parts firms operated in the industry, with a total foreign market share of 81%.[6] In 2005 cars represented 20% of the Czech industrial output and employed more than 130,000 people. As *BusinessWeek* noted, "The auto-driven boom is also changing the landscape. Roads are being paved and widened, new hyperstores are being built and factories are mushrooming" ("Detroit East," 2005). This boom started in 1991 when German Volkswagen privatized a major state-owned car company, Škoda. The success of new Škoda cars, the central location of the Czech Republic, with an easy access to all European markets, cheap and high-skilled labor, and generous FDI incentives attracted other MNCs, mostly into the auto parts segments; among them are Ford (car lighting systems), Robert Bosch (diesel engine components), Daewoo (engines), and Hayes Lemmerz (wheel assembly). In 2005 another big car company, a Toyota-PSA Peugeot Citroën, joint plant, entered the industry. Today the Czech Republic is called the "Hub of Detroit East."[7] Foreign production also boosted domestic auto parts producers that had suffered huge output declines in the early 1990s due to market liberalization. In particular, Škoda's training program helped many of them, including Gumotex (rubber parts and seat upholstery), Karsit (seat parts), and Brisk Tábor (spark plugs), to increase quality and expand sales to other car producers.[8] However, not all domestic firms were so lucky. Military-based Vojenský Opravárenský Podnik 081 Přelouč (production and repairs of trucks and special heavy machinery) ended operations in 1994 and was liquidated. Another big firm, Tatra, which during socialism also produced popular luxury cars, closed such production as a result of foreign competition. Since 1998 Tatra has focused only on truck production, which also suffered from a major decline—almost 90% in 1994—and several plants went into bankruptcy. Similarly, Avia Karoseria Brno (production of parts and accessories for commercial vehicles and trucks), struggled for survival in 1997–1998, but it found its market niche and started to grow.

The paper is organized as follows. Section II presents the theoretical model. Section III discusses the technology spillovers. Sections IV and V describe data and variable measurement. Section VI describes the empirical methodology. The remaining sections discuss my findings and conclude.

II. Theoretical Model

Aitken and Harrison (1999) argue that though technology spillovers may exist, MNCs can draw demand from less efficient domestic firms and force them to cut production. They

[5] See, for example, Nocke and Yeaple (2006) and Ederington and McCalman (2005).

[6] http://www.factbook.net/countryreports/cz/Cz_AutoParts_mkt.htm.

[7] "Detroit East" (2005).

[8] See Pavlínek (2003) and http://www.factbook.net/countryreports/cz/Cz_AutoParts_mkt.htm. As part of the training, Škoda held workshops to educate domestic firms about quality standards and how to achieve them.

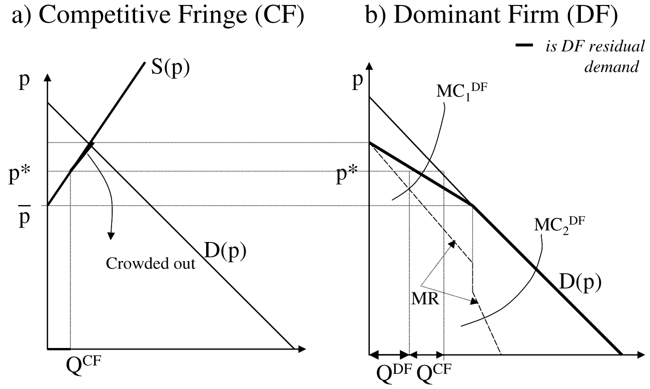
refer to this competitive or crowding-out effect as market stealing. However, this effect may also induce firm exit, so I consider both outcomes as evidence of crowding out. Moreover, this effect can be just a one-time phenomenon, realized at the time of foreign entry, or it can arise over time as MNCs expand their production. I refer to the first one as static and to the latter as dynamic crowding-out effect. Analyzing how crowding out works helps us understand whether the adjustment to FDI inflows is a shock therapy or a gradual process. If crowding out is a dynamic effect, given the demand, foreign sales growth should reduce the sales of domestic firms over time and thus reduce their growth rates and threaten their survival. If it is a static effect, then only foreign entry should have a negative effect on domestic firm growth rates and survival. Afterward, the demand of both domestic and foreign firms should be driven only by common shifts in aggregate demand.

A. *Dominant Firm-Competitive Fringe Structure and Theory on MNCs*

I assume that a domestic market with foreign firms resembles a dominant firm–competitive fringe (DF/CF) industry structure. For simplicity, foreign firms as a group are represented by a single dominant firm (DF), and domestic firms form the competitive fringe (CF, henceforth, "fringe").[9] In the standard DF/CF model, a dominant firm has a higher market share than a single firm on the fringe (though collectively, fringe firms may have a substantial market share), thanks to better management or technology, early entry into the market and learning by doing, economies of scale, or a favorable public policy, such as subsidies. Thanks to these cost advantages, a dominant firm behaves like a market leader and sets the market prices that fringe firms take as given.[10]

The assumptions about dominant firm are quite consistent with the characteristics of MNCs found in the empirical studies[11] and the ownership advantages emphasized by Dunning's (1988) theory on MNCs.[12] Hymer (1960) also argued that scale economies, knowledge, and credit advantages of MNCs help them to increase their market power. One can expect that in transitional countries such as the Czech Republic, where domestic firms operated for years without market competition, prices and quantities were centrally determined and firms often received subsidies without any incentives to improve their efficiency, MNCs with advanced technologies, long-term experience in competitive markets, and generous FDI incentives[13] can easily gain market dominance.[14]

FIGURE 1.— DOMINANT FIRM AND COMPETITIVE FRINGE



B. *Static Crowding Out*

Figure 1 shows the static crowding-out effect due to foreign entry. Figure 1a shows the market demand $D(p)$, total fringe supply $S(p)$, and the shut-down price $\bar{p}$ of the fringe firms. Figure 1b introduces the dominant firm, where the residual demand of the dominant firm is a horizontal distance between $D(p)$ and $S(p)$. The dominant firm behaves as a market leader and chooses output Q^{DF} s.t. $MR = MC^{DF}$, which sets the market price and thus the quantity that the fringe can sell on the market, Q^{CF}. As a result, some domestic firms produce less and some exit. The extent of crowding out depends on the difference between the marginal costs of the dominant and the fringe firms. If the marginal cost of a dominant firm is very low, say MC_2^{DF}, the new market price is below $\bar{p}$, and all domestic firms exit. If the dominant firm's marginal cost is higher, say MC_1^{DF}, the equilibrium price is p^*, and the domestic firms with shut-down prices below p^* survive but produce less.

C. *Dynamic Crowding-Out Effect*

To analyze the impact of foreign presence on domestic firms over time, I incorporate the DF/CF industry structure into a model of firm and industry dynamics (Jovanovic, 1982; Sun, 2002). I assume that domestic firms (i.e., fringe) follow Jovanovic's setup: they are heterogeneous firms that operate in a competitive industry with incomplete information about their cost efficiency and learn about it only while operating

[9] However, the main implications of the model would hold even under other forms of imperfect competition or if MNCs behaved competitively. The key point is that more efficient foreign firms reduce the market price and thus decrease output (or induce exit) of domestic firms. So even without a dominant firm assumption, the main result in equation (6) would hold.

[10] See Carlton and Perloff (2000) for more details on the DF/CF model.

[11] MNCs usually have high levels of R&D, intangible assets, patents, and new or technically complex products (Markusen, 1995). Morck and Yeung (1991) also find that firm age is highly correlated with multinationality.

[12] According to Dunning's ownership advantages, MNCs must possess product, process, or technology that local firms cannot gain access to, due to protection by a patent or trademark, for example, and that confers sufficient market power or a cost advantage that outweighs the uncertainty from doing business abroad.

[13] In the Czech Republic the incentives for foreign investors include up to ten years' tax holidays, duty-free imports, and financial support by government for training and job creation (European Bank for Reconstruction and Development, 2003).

[14] For example, in the Czech chemical industry, the International Center for Economic Growth report (2003) notes, "concentration is being controlled by a closed number of great MNCs. . . The need of capital can arise some problems for small and medium sized enterprises due to their less economic power, insufficient legal, economic, technical and management capacities."

in the industry. As a result, efficient firms grow and survive, while inefficient firms decline and exit. The exit-generating mechanism is missing in productivity-based studies of FDI spillovers.[15] Adding Sun's technology shocks allows us to incorporate technology spillovers. The model is solved backward. First, given the prices, the fringe firms choose output and decide whether to stay or exit. Second, given the total fringe supply, the dominant firm chooses the equilibrium prices that (for simplicity) are perfectly forecastable.

Domestic firms–competitive fringe. Many domestic firms are on the competitive fringe, each too small to affect price. Each period a firm chooses output q_t to maximize its expected profit

$$\pi_t^e = \max_{q_t} \left[p_t q_t - C(q_t) T_t x_t^e\right], \tag{1}$$

where $p \equiv \{p_t\}_0^\infty$, is a price sequence, $C(q_t)T_t x_t^*$ are firm total costs, and $C(q_t)$ is a convex function that satisfies $C(0) = 0$, $C\prime(0) = 0$, $lim_{q\to\infty} C'(q) \to \infty$, and $\frac{C'}{qC''} = k > 0$. x_t is the inverse of firm production efficiency, where $x_t = f(\delta_t)$, $\delta_t = \theta + \varepsilon_t$, and x_t^e is an expectation of x_t conditional on information at time t. The function f is positive, strictly increasing, and continuous with $lim_{\delta_t \to -\infty} A_1 > 0$ and $lim_{\delta_t \to \infty} A_2 \leq \infty$. Parameter θ is the firm's true cost efficiency (or firm type) normally distributed with mean $\bar{\theta}$ and variance σ_θ^2. A firm does not know its θ but learns about it while operating in the industry by Bayesian updating through productivity shocks, $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$, independent across firms and time.[16] A firm learns its productivity shock at the end of a period from realized profits and updates its expectation for the next period, x_{t+1}^e.[17] Like Sun (2002), I assume that besides productivity shocks, a firm also receives technology shocks, $u_t \sim N(\bar{u}, \sigma_u^2)$ independent and identically distributed that cumulate over time, so $T_t = \prod_{j=t-n}^{t}(1 - u_j)$ represents a firm's technology level and reflects all the shocks a firm received up to time t (n represents firm age). $u_t > 0$ represents a plausible (marginal costs decreasing) shock, bounded from above by 1 to prevent negative costs, and $\bar{u}$ is the technological trend. I assume that on entry, a firm does not have any technology improvements yet, so $T_0 = 1$. u_t can represent any shock that has a persistent effect on firm costs: innovation, management changes, or firm-specific adjustments to a macroeconomic shock. Since FDI inflows represent a sort of macroeconomic shock for the domestic firms and the technology spillovers are basically a firm's specific adjustments to FDI that persistently affect firm costs, I use u_t to represent technology spillovers.

A firm chooses q_t before it observes x_t but after it observes u_t. The optimal output, $q_t^* = q(p_t, T_t, x_t^e)$, solves the FOC: $p_t = C'(q_t^*)T_t x_t^e$ and the firm's discrete growth rate is given by

$$\frac{q_{t+1}^* - q_t^*}{q_t^*} = k\left(\frac{p_{t+1} - p_t}{p_t} - \frac{x_{t+1}^e - x_t^e}{x_t^e} + u_{t+1}\right). \tag{2}$$

So the firm's growth rate increases with prices (I explain below how prices are affected by the dominant firm) and positive technology shock, but decreases with its expected inefficiency. The firm's updating process implies that both firm age and size should reduce firm growth rate. All else equal, older firms have smaller revisions in their expectations and thus smaller growth rates. For firms old enough, x_t^e converges to a constant, as they have already learned their true efficiency. Regarding firm size, for each type θ, there is an optimal size. So if we take two firms of the same type but different sizes, a larger firm should be closer to its optimal size and thus grow more slowly than a smaller firm.

Every period, a firm also decides whether to stay or exit. (The exit decision follows the Jovanovic setup, details can be provided on request.) There is a critical value of expected efficiency, $\overline{x_t}$, that gives a critical output, $\overline{q_t}(p_t, T_t, \overline{x_t})$ at which the firm exits. If a firm decides to exit at the beginning of period $t + 1$, then q_{t+1}^* must be smaller than $\overline{q}_{t+1}$. This implicitly determines the exit growth rate, $\widetilde{g}_{t+1} = (\frac{\overline{q}_{t+1} - q_t^*}{q_t^*})$. So if the firm's optimal growth rate would be less than $\widetilde{g}_{t+1}$, a firm exits, $q_{t+1}^* = 0$, and the observed growth rate is -1. So the same variables that affect firm growth should also affect firm exit. Firm exit should decrease with prices (with a convex cost function, a firm can produce more and grow at higher prices), positive technology shock, and expectations of higher efficiency, so larger and older firms should have lower exit rates.

Dominant firm behavior and equilibrium. As in Jovanovic (1982), I assume that every period, there is a deterministic downward-sloping market demand, $Q_t^m(p_t)$, so all the demand changes are foreseen and prices are perfectly forecastable. In equilibrium, the residual demand of the dominant firm, $Q_t^{DF}(p)$, can be written as the total market demand, $Q_t^m(p_t)$, minus the total supply of competitive fringe, $Q_t^{CF}(p)$:

$$Q_t^{DF}(p) = Q_t^m(p_t) - Q_t^{CF}(p). \tag{3}$$

Although fringe firms face individual uncertainty, there is no aggregate uncertainty, so $Q_t^{CF}(p)$ is deterministic in each period.[18] Given $Q_t^{CF}(p)$, the equilibrium price sequence,

[15] Blomström et al. (2000) also argue that competition between MNCs and domestic firms should be analyzed from the perspective of industry dynamics, not total factor productivity.

[16] Upon entry, all entrants have the same prior beliefs about their efficiency, $x_0 = E_0(f(\theta + \varepsilon_t))$. Each entrant considers itself to be a random draw from $N(\bar{\theta}, \sigma_\theta^2)$. This prior distribution is updated as a firm gets productivity shocks and infers δ_t. At any time t, firm expectations are formed as $x_t^e = E(x \mid \bar{\delta}_n, n) = \int f(\delta) dP(\delta \mid \bar{\delta}_n, n)$, where $P(\delta \mid \bar{\delta}_n, n)$ is the normal posterior distribution of δ conditional on the information at time t, n is firm age and $\bar{\delta}_n = \sum_{i=1}^n \delta_i / n$ (see Jovanovic, 1982).

[17] Realized profit at the end of period t is $\pi_t = p_t q_t - C(q_t) T_t x_t$. Since a firm observes T_t at the beginning of time t, it can derive x_t and infer δ_t. (However, it cannot separate θ from ε_t). The expectations for the next period, x_{t+1}^e, are formed as described in note 16. Comparison of realized and expected profit, $\pi_t - \pi_t^e = -C(q_t)T_t(x_t - x_t^e)$, implies that if $\pi_t > \pi_t^e$, then $x_{t+1}^e < x_t^e$ and more profitable firms have a higher growth rate between $t + 1$ and t.

[18] Since u_t in this model is i.i.d., it can be integrated out, so the derivation of the total supply of competitive fringe follows market supply derivation in Jovanovic (1982).

$p = \{p_t\}_{t=0}^{\infty}$, must maximize the dominant firm's net present value of profits:

$$NPV(p) = \max_{\{p_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \delta^t \{p_t[Q_t^m(p_t) - Q_t^{CF}(\{p_t\}_{t=0}^{\infty})] - TC(Q_t^m(p_t) - Q_t^{CF}(\{p_t\}_{t=0}^{\infty}))\}, \quad (4)$$

where $TC(Q_t^m(p_t) - Q_t^{CF}(\{p_t\}_{t=0}^{\infty})) \equiv TC(Q_t^{DF}) = c(Q_t^{DF}) f(\theta^{DF})$ represents the total cost of the dominant firm, $c(.)$ is a convex cost function, f is the same function as in case of fringe firms, and δ is the discount factor. I assume that the dominant firm knows its true efficiency, θ^{DF}, so $f(\theta^{DF})$ is deterministic. This follows the earlier discussion that while domestic firms operate in the competitive environment only after the transition has started, MNCs have already operated in the competitive markets for a long time and could learn their true efficiency. I also assume that at each output level $c'(q) < C'(q)$ and $f(\theta^{DF}) < x_0$, since the dominant firm has better technology (recall that $C(q)$ and x_0 are the cost function and the prior expectation of the fringe firms). Without uncertainty about production efficiency and perfectly forecastable prices, the optimization problem of the dominant firm simplifies into time-separable one-period optimization problems, so each period a price p_t solves

$$\frac{\partial NPV}{\partial p_t} = p_t\left(\frac{\partial Q_t^m}{\partial p_t} - \frac{\partial Q_t^{CF}(p)}{\partial p_t}\right) + Q_t^m(p_t) - Q_t^{CF}(p) - \frac{\partial TC}{\partial Q_t^{DF}}\left(\frac{\partial Q_t^m}{\partial p_t} - \frac{\partial Q_t^{CF}(p)}{\partial p_t}\right) = 0. \quad (5)$$

This implies $\left(p_t - \frac{\partial TC}{\partial Q_t^{DF}}\right)\left(\frac{\partial Q_t^m}{\partial p_t} - \frac{\partial Q_t^{CF}(p)}{\partial p_t}\right) = -Q_t^{DF}(p_t)$. Total differentiation of condition (3) yields $\left(\frac{\partial Q_t^m}{\partial p_t} - \frac{\partial Q_t^{CF}(p)}{\partial p_t}\right) = \frac{dQ_t^{DF}(p_t)}{dp_t} < 0$. Substitution into the last result and expanding by p_t gives

$$\frac{dp_t}{p_t} = \frac{-(p_t - TC')}{p_t}\frac{dQ_t^{DF}}{Q_t^{DF}}, \quad (6)$$

where $TC' = \frac{\partial TC}{\partial Q_t^{DF}} > 0$. Equation (6) is a standard price cost margin or Lerner index: $\frac{p-MC}{p} = -\frac{1}{elasticity\ of\ residual\ demand\ of\ DF}$. Rewriting it in discrete time gives $\frac{p_{t+1}-p_t}{p_t} = -m_t\frac{(Q_{t+1}^{DF}-Q_t^{DF})}{Q_t^{DF}}$, where m_t is the dominant firm price markup. Substitution into equation (2) gives the domestic firm growth rate as

$$\frac{q_{t+1}^* - q_t^*}{q_t^*} = -km_t\frac{(Q_{t+1}^{DF} - Q_t^{DF})}{Q_t^{DF}} - k(age_t, size_t) + ku_{t+1} + industry \times trend. \quad (7)$$

So given the markup, the larger the growth rate is in the output of dominant firm, the lower the prices and thus the smaller growth rates of domestic firms. Also, the industry-trend cross product is added to account for changes in demand, $Q_t^m(p_t)$, over time. Due to the convex costs function of domestic firms, higher foreign growth rates should also increase domestic firm exit. Empirically, the growth rate in the output of the dominant firm captures a dynamic crowding-out effect, and the term $-km_t$ represents the output elasticity of domestic firm, q_t^*, with respect to the foreign output, Q_t^{DF}.

III. Technology Spillovers and Technology Shock u_{t+1}

While the competitive/crowding-out effect enters the model by foreign output changes, the technology spillovers enter by technology shock u_{t+1} in the costs of domestic firm. Since spillovers or externalities are by definition unintended, u_{t+1} is not a choice variable of the dominant or domestic firm.[19] So I proxy u_{t+1} as a function of firm and industry characteristics discussed in the technology transfer and the FDI spillovers literature (the next section explains the variable measurement).

Technology can be transferred from foreign to domestic firms through different channels, such as business contracts, training domestic workers, employing workers who used to work for an MNC, or a demonstration effect as domestic firms observe and learn from the successes and failures of MNCs.[20] Regardless of the channel, though, the larger the foreign presence is, the more opportunities there are for spillovers (Keller, 2004). Wang and Blomström (1992) also argue that spillovers are proportional to the extent of foreign presence in the industry. I proxy intraindustry technology spillovers by foreign employment share (*FORempl.sh*), where the higher share should bring larger technology shocks. Sinani and Meyer (2004) use different measures of foreign presence—employment share, market share, and foreign equity share in the industry—and find the strongest impact from foreign employment share. Haskel, Pereira, and Slaughter (2007) point to the two advantages of this measure: it shows how prevalent MNCs are relative to the overall size of the industry, and it reflects the interpersonal contact emphasized by the spillover theories (Findlay, 1978). Intuitively, the more people who work in MNCs, the more people who can demonstrate or discuss what MNCs do and how, train other domestic workers, start own business, or come to work for a domestic firm. Thus, my measure of technology spillovers captures all of these and other channels that involve some interpersonal contact between a domestic firm and MNC employees. Based on Czech enterprise surveys, Deardorff and Djankov (2000) document the technology transfer by subcontracting. Javorcik and Spatareanu (2004) also note that most Czech firms learn from MNCs through employee training (often free of charge) or getting help with such business practices as quality control, organization of production lines, or inventory.[21] The case of the Czech auto industry is direct evidence of this. In addition, I also consider intrafirm technology spillovers

[19] The technology spillovers enter the optimization problem of dominant firm only indirectly through total fringe supply.

[20] See Blomström et al. (2000, chap. 8) for a discussion.

[21] Unfortunately I have no data to separate these individual channels.

as domestic firms that have some foreign shareholders (*FORdirect*) can gain easier access to foreign technology or crucial resources by direct ownership ties (Aitken & Harrison, 1999; Blomström & Sjöholm, 1999; Meyer, 2004).

Several studies (including Audretsch, 1991) have shown that firm innovation increases growth and survival. It also determines a firm's absorptive capacity—its ability to recognize valuable knowledge, integrate it, and use it productively (Cohen & Levinthal, 1990). The FDI literature suggests that in order to benefit from technology spillovers, local firms need a certain level of technological (in-house) expertise. So to control for firm absorptive capacity, I use firm's intangible asset ratio (*intang*). Firms with a higher proportion of intangibles should be able to adopt or imitate new technologies more easily and benefit thus from a larger technology shock u_{t+1}. The literature also suggests that the extent of technology spillovers may depend on the technology gap (henceforth, *gap*)—the difference in the technological capabilities between domestic and foreign firms.[22] The technology transfer literature argues that a larger gap raises the transfer costs and reduces the chances the transfer will happen. However, in Findlay's (1978) model, a larger technology gap increases the room for spillovers. So I include the technology gap and its interaction with foreign employment share into the u_{t+1} function to allow the possibility that the technology gap stimulates or inhibits intraindustry technology spillovers.

Since in my model u_{t+1} is firm specific, I allow in the estimations firm effects μ_i. Also, given it is observed only at the beginning of $t + 1$, I measure all the above variables at time t. Assuming linear functional form, the technological shock of a domestic firm i in industry j can then be written as:

$$u_{ijt+1} = \alpha_1 FOREmpl.sh_{jt} + \alpha_2 FORdirect_{ijt} + \alpha_3 intang_{ijt} + \alpha_4 gap_{ijt} + \alpha_5 FOREmpl.sh \times gap_{ijt} + \mu_i. \tag{8}$$

IV. Data Description

I use 1994–2001 firm-level panel data for the Czech Republic from the Amadeus database, which covers firms in western, central, and eastern Europe and Russia. It includes firm registration (firm ID, date of incorporation, city, region, and other firm characteristics), balance sheets, profit and loss accounts, various industry classifications, and firm ownership information. The Czech data are based on firm accounts filed with the tax office or business register. Since all registered firms have to file, firms of all sizes are included, and there is also a large number of entrepreneurs. So the database gives a good representation of the economy.[23] Also, to maximize firm coverage in my sample (Amadeus dropped some small firms later on), I combine data across several Amadeus versions obtained at different dates: a DVD version for 1993–1998 and online downloads in March 2002 and January and February 2003.[24] This also helped to increase data on firm ownership (see note 26).

In my analyses, I use three-digit primary USSIC industry codes. The Czech Republic is a small country (population around 10 million), so there are very few firms with higher-digit codes. My initial sample contained 11,545 firms. Excluding agriculture, government, legal, education, religion, health services, and other nonprofit entities, mostly government owned, left 10,335 firms. Dropping data miscodings left 10,157 firms. Balance sheet cleaning, missing data filing, and outlier exclusions gave a sample of 9,986 firms (details provided on request). Among these, 5,235 firms are classified as domestic, 1,398 as foreign and 3,353 as nonclassified. Comparing classified and nonclassified firms showed that nonclassified firms operate at zero profit margin and are significantly smaller in market share, total assets, sales, and other measures of size, so I consider them to be small Czech start-ups and thus domestic firms.

The model assumes that domestic firms behave competitively, so I restrict my analyses to 141 competitive industries (at least ten domestic firms per industry before data cleaning). Among these, 11 industries are without foreign presence, so including them makes the analyses more representative for the entire economy. Tables 9 and 10 list all the industries divided into high- and low-export oriented. The final samples I use to estimate the growth and exit equation contain 5,705 (20,462 observations) and 6,291 (24,733 observations) domestic firms, respectively, and 1,304 foreign firms (unbalanced).[25]

I classify a firm as foreign if its ultimate owner (a firm at the top of the ownership chain) is not Czech (see Appendix). I prefer ultimate ownership to the sum (or total) of foreign direct ownerships used in previous studies, since the sum does not reflect who has ultimate control or a final word on a firm (see also La Porta, Lopez-de-Silanes, & Shleifer, 1999).[26] Table 2 compares the performance of domestic and foreign firms and confirms that the key assumptions of the DF/CF

[22] For example, Findlay (1978), Sjöholm (1999), and Haddad and Harrison (1993).

[23] Desai, Gompers, and Lerner (2005) discuss data collection by Amadeus and conclude that country-wise, the database represents the entire economies quite well. Klapper, Laeven, and Rajan (2004) also point to its large coverage compared to other data sources.

[24] I exclude 1993 from my analyses because of a large proportion of missing data. In this year, the Czechoslovak Republic split into the Czech and Slovak Republics, so there is also a high chance of data miscoding.

[25] The exit sample is larger because some domestic firms have missing sales in some years and thus missing growth rates. Re-estimating the exit equation with a smaller growth sample did not change the results, so data should be randomly missing.

[26] However, Amadeus does not provide time series on firm ownership for data before 2003; only ownership per the firm's last balance sheet is available. Yet comparisons across my different data versions show that ultimate owners do not change very much over time. So although many firms have the ultimate owner missing in each data version, having multiple data versions allowed me to increase firm ownership data by combining the information across time. As a result, the status of foreign versus domestic firm does not vary in my sample.

TABLE 2.—PERFORMANCE COMPARISON: DOMESTIC VERSUS FOREIGN FIRMS, 141 INDUSTRIES, 1994–2001.

Variable	Domestic Firms, Means	Difference in Means: Foreign to Domestic	Domestic Observations	Foreign Observations
Growth rate	0.087**	0.097**	21,007	4,425
Market share (three-digit USSIC)	0.027**	0.021**	26,954	5,606
Market share (two-digit USSIC)	0.007**	0.009**	26,954	5,606
Employment	224**	142**	26,137	5,340
Operating revenue (in 000s $)	10773**	14366**	26,917	5,581
K/L (fixed assets/employment)	108.154**	29.634**	25,934	5,282
Intangible assets (in 000s $)	85.951**	197.761**	27,668	5,747
Total assets (in 000s $)	12482**	14364**	27,750	5,754
Intangible asset ratio	0.008**	−0.0001	27,668	5,747
Sales (in 100 mil. $)	0.100**	0.141**	26,954	5,606
Value added	3822**	13008**	25,748	5,392
Return on assets (in %)	1.568**	1.029**	27,251	5,650
Liquidity ratio	1.941**	−0.005	27,415	5,672
Solvency ratio	0.393**	−0.024**	27,750	5,754
Cash flow ratio (cashflow/total assets)	0.051**	0.020*	26,953	5,617
Profit margin (in %)	0.076	0.414**	26,154	5,430

**Significant at 5%. *Significant at 10%. Domestic firms include both classified firms (known ultimate owner) and nonclassified firms (firms with unknown ultimate owner treated as domestic). A comparison between foreign and classified domestic firms gave the same results. The comparisons do not change when eleven industries without foreign presence are excluded. The following variables are defined as follows: *value added* = taxation + profit (loss) per year + costs of employees + depreciation + interest paid; *liquidity ratio* = (current assets − stocks)/current liabilities; *return on assets* = profit (loss) before taxation/total assets; *solvency ratio* = shareholders' funds (capital + other shareholders' funds and retained profit)/total assets; *profit margin* = [(operating revenues − costs of good sold − other expenditures) + (financial revenues − financial expenditures)]/operating revenues.

model hold in my data: on average, foreign firms have significantly larger market shares; higher value-added, growth rates and K/L ratios; more intangible assets; and better financial performance in terms of return on assets and cash flow than domestic firms do. Moreover, while domestic firms operate on zero profit margin, foreign firms show positive profits.

V. Variable Definitions and Empirical Specifications

Substituting equation (8) into equation (7) and including other controls that I explain below gives the empirical equation for the domestic firm growth rate (i indexes a domestic firm, j an industry, and t year). The same variables also enter domestic firm exit and survival analyses:

$$\begin{aligned} Growth_{ijt+1} = {} & \beta_0 + \beta_1 FORgrowth_{jt+1} + \beta_2 FORentry_{jt} \\ & + \beta_3 ageT_{ijt} + \beta_4 sales_{ijt} + \beta_5 ageT^2_{ijt} \\ & + \beta_6 sales^2_{ijt} + \beta_7 ageT \times sales_{ijt} \\ & + \beta_8 FOREmpl.sh_{jt} + \beta_9 FORdirect_{ijt} \\ & + \beta_{10} intang_{ijt} + \beta_{11} gap_{ijt} \\ & + \beta_{12} FOREmpl.sh \times gap_{ijt} + \beta_{13} solvency_{ijt} \\ & + \beta_{14} pre\text{-}1989_i + \sum_t d_t + \sum_j d_j + \sum_r d_r \\ & + \sum_j d_j * trend + (\mu_i + e_{ijt+1}). \end{aligned}$$

$Growth_{ijt+1}$: Domestic firm sales growth rate, measured as $(\frac{sales_{t+1} - sales_t}{sales_t})$. If a firm exits between $t+1$ and t, the growth rate is set equal to -1.

$FORgrowth_{jt+1}$: Foreign sales growth rate, $\frac{\sum_k^F sales_{kjt+1} - \sum_k^F sales_{kjt}}{\sum_k^F sales_{kjt}}$, where $k = 1, 2, \ldots, F$ denotes foreign firms in the industry j.[27] Measuring the dynamic crowding-out effect, it should negatively affect both domestic firm growth rates and survival.

$FORentry_{jt}$: Dummy = 1 in the first year I observe a foreign firm in the industry j, to measure static crowding out. It should negatively affect both domestic firm growth and survival. Though it is not an exact measure of foreign entry—in most industries, foreign firms are already "in" around the beginning of my sample—it is very close to the true entry year. As table 11 shows, most MNCs entered during the privatization process between 1991 and 1995.[28]

$ageT_{ijt}$: Firm age calculated from the start of the transition in 1989. If a firm was founded later, I use a true age. Before 1989, there was no competition, so firms did not face the risk of market exit. So the pretransitional experience should not affect a firm's learning process about its efficiency, incorporated in the model.

$sales_{ijt}$: Sales revenues to measure firm size. Both firm age and size should have a negative impact on firm growth but a positive impact on survival. I also include the cross-effect $ageT \times sales_{ijt}$ and the squared terms of firm size and age to allow nonlinear effects.[29]

$FOREmpl.sh_{jt}$: Foreign employment share in the industry j, $\frac{\sum_k^F employment_{kjt}}{\sum_h^{All\ firms} employment_{hjt}}$.

[27] All foreign-level variables are computed before data cleaning to obtain a precise representation of the industry. Also, when foreign entry occurs during my sample period, the growth rate in the entry year would be infinite, so in that year, I set $FORgrowth = 2$, as per the alternative formula $(y_{t+1} - y_t)/(y_{t+1} + y_t)/2$.

[28] There were two privatization waves in the Czech Republic: 1991–1992 (small scale) and 1991–early 1995 (large scale). By 1995, the major privatization process was completed, and stable ownership shares were determined (Kočenda & Svejnar, 2003).

[29] The nonlinear terms also control for possible heteroskedasticity of growth rates due to firm age and size.

$FORdirect_{ijt}$: Firm percentage of foreign direct ownership (summed across all foreign shareholders). Both *FORempl.sh.* and *FORdirect* should have a positive impact on growth and survival.

$intang_{ijt}$: Firm intangible asset ratio, $\left(\frac{intangible\ assets_{ijt}}{total\ assets_{ijt}}\right)$. Measuring firm absorptive capacity, it should have a positive effect on firm growth and survival.[30]

gap_{ijt}: Firm technology gap, measured as: $|intang_{ijt} - \frac{\sum_k^F intangible\ assets_{kjt}}{\sum_k^F total\ assets_{kjt}}|$. The absolute value reflects how much the technology of domestic firm is (dis)similar from the technology of foreign firms ($k = 1, 2, \ldots, F$) in industry j. As discussed, it can have a positive or negative impact.[31]

$FORempl.sh \times gap_{ijt}$: If a larger technology gap between domestic and foreign firms makes technology spillovers more costly, this cross-effect should have a negative impact on firm growth and survival. However, if a larger gap increases room for spillovers, the impact should be positive.[32]

$solvency_{ijt}$: Firm solvency ratio, $\left(\frac{shareholders\ funds_{ijt}}{total\ assets_{ijt}}\right)$. The numerator is the sum of shareholders' capital and other funds, including retained profits. Finance studies suggest that growth, especially of small firms, depends on the availability of internal finance or retained profits.[33] I have no data on retained profits, so I use a solvency ratio to control for firm internal finance.[34] It should have a positive impact on firm growth only if firms are financially constrained. Otherwise it should have no effect. I also expect a positive effect on firm survival, since larger internal funds can prevent firm exit.

$pre\text{-}1989_i$: Dummy = 1 if the firm was founded before 1989. These are former state-owned enterprises, often subsidized and facing soft budget constraints even after 1989 (Lízal & Svejnar, 2002). I expect a positive effect on firm survival, since the subsidies were given to prevent firm exit and unemployment, but no or negative effect on firm growth. These firms are often less profitable and in Jovanovic's setup, smaller profits lead to smaller growth rates.[35]

d_t, d_j, and d_r: Year, industry, and eight regional dummies, respectively. Year dummies control for the business cycles, inflation, aggregate demand, or institutional reforms adopted in certain years. Industry and region dummies control for industry and region fixed effects, including regulation, industry structure, specific input requirements, and location. Including these dummies helps to avoid bias due to the potential endogeneity of FDI inflows. MNCs may target more profitable industries or regions with larger FDI incentives, or enter in a certain year, after some political or institutional changes.

$d_j \times trend$: Industry-specific time trends to control for time-varying industry effects (such as changes in the industry structure) and changes in the industry demand. Keller (2004) discusses the importance of industry-trend effects in the FDI spillover studies to avoid endogeneity issues.

Also, in the growth equation, I include four *exit-type dummies* (liquidation, bankruptcy, both, and out of the register) to control for possible differences in the growth rates due to different types of exit.

I define domestic firm exit as the year when a firm enters a liquidation or bankruptcy process, whichever started earlier.[36] Also, I allow for a two-year prior exit window to incorporate the reporting delays or mismatch between calendar and fiscal years. For example, if a firm started a liquidation process in 1999 but the last reported sales are in 1997, I assume that a firm exits in 1997. Then $Exit_{ijt} = 1$ in the year when a firm exits and 0 in all prior years. Firms that survive until 2001 have $Exit_{ijt} = 0$. There were 554 exits across 141 industries in my data, but due to missing covariates, 273 exits remain in my final sample. Table 3 shows summary statistics for all the variables.

VI. Empirical Methodology

A. *Estimation of Firm Growth*

For robustness, I estimate the growth equation by several methods. First, I use fixed and random effects that control

[30] I scale intangible assets by total assets since larger firms also usually have larger intangible assets.

[31] In industries without foreign presence, the variables *FORgrowth*, *FORempl.sh*, and *gap* are set equal to 0.

[32] This cross-effect implicitly controls also for the cross-effect $FORempl.sh \times intang$. So there is a high correlation (0.934) between the two cross-effects. When I included $FORempl.sh \times intang$ instead, the results did not change.

[33] See Carpenter and Petersen (2002) and Lízal and Svejnar (2002) for evidence among the Czech firms.

[34] The solvency ratio is basically the inverse measure of debt-to-assets ratio, often used to measure financial constraints. When I used an alternative measure, cash flow to assets, the results were similar, but Kaplan and Zingales (1997) question whether this is a reliable measure of firm financial constraints.

[35] In my data, firms founded before 1989 are larger in total assets, employees, or K/L ratio, but they are less profitable than firms founded after 1989 and show on average negative growth rates.

[36] I rely on the start (rather than the end) of these processes, since when a firm enters any such process, it no longer freely operates in the market; all firm decisions are transferred to an outside person supervised by a court. I collected these dates from the Czech Business Register. I took as the pool of potential exiters 3,399 firms (before data cleaning) that filed the last balance sheet to Amadeus in 1999 or earlier and verified their status—active, in liquidation or bankruptcy, in both processes, or out of the register—in the Business Register. (Random checking showed that missing balance sheets in 2000–2001 are mostly due to delayed filings.) If a firm was out of the register, it must have already been liquidated and its record deleted from the register. So I assign firm exit in the year in which it reports the last sales or the last balance sheet if sales are missing. At the end, I added to the list of exiters 100 firms that filed the last balance sheet after 1999, but their name included the phrase *v likvidaci* (in liquidation). By law, a firm must add this phrase to its name when starting the liquidation process. I have no data on mergers or acquisitions. These, however, do not represent proper exits, because though firms change the ownership, they continue producing.

TABLE 3.—SUMMARY STATISTICS: GROWTH AND EXIT SAMPLES, 141 INDUSTRIES, 1994–2001.

Variable Name		Growth		Exit			
		Mean	s.d.	Mean	s.d.	Minimum[a]	Maximum[a]
growth	Domestic firm sales growth rate between $t + 1$ and t	0.094	0.589			−1	4.97
Exit	1 in a year a domestic firm exits, 0 otherwise			0.011	0.104	0	1
FORgrowth	Growth rate in sales of all foreign firms in the industry between $t + 1$ and t	0.237	1.360	0.185	1.480	−1	42.14
FORgrowth-cl	FORgrowth × (NCL = 0), where NCL = 1 if firm with unknown ultimate owner treated as domestic	0.186	1.263	0.140	1.327	−1	42.14
FORgrowth-ncl	FORgrowth × (NCL = 1)	0.051	0.522	0.045	0.663	−1	21.14/42.14
FORentry	1 in the year of first foreign entry into the industry; 0 otherwise	0.085	0.280	0.086	0.280	0	1
FORentry-cl	FORentry × (NCL = 0)	0.063	0.243	0.060	0.237	0	1
FORentry-ncl	FORentry × (NCL = 1)	0.022	0.147	0.026	0.160	0	1
ageT	Domestic firm age since 1989	5.471	2.383	5.667	2.485	1	12
ageT × ageT		35.609	27.963	38.289	30.013	1	144
sales	Firm sales revenues	0.105	0.501	0.098	0.468	3.33e-07	22.55
sales × sales		0.262	7.303	0.228	6.676	1.11e-13	508.34
ageT × sales		0.598	3.017	0.573	2.866	2.00e-06	138.07
FORempl.sh.	Foreign employment share per industry-year	0.213	0.166	0.211	0.162	0	0.98
FORdirect	% of foreign direct ownership in a domestic firm	2.013	10.575	2.024	10.650	0	100
intang	Firm intangible assets/total assets	0.007	0.035	0.007	0.038	0	0.96/0.99
gap	Firm technology gap (see text)	0.010	0.037	0.010	0.039	0	0.94/0.98
FORempl.sh × gap		0.003	0.011	0.003	0.012	0	0.4/0.85
pre-1989	1 if a firm founded before start of transition 1989	0.056	0.229	0.053	0.223	0	1
solvency	shareholder funds/total assets	0.388	0.331	0.380	0.335	−1	1
NoForeign	1 if no foreign firms present in industry-year	0.179	0.132	0.018	0.131	0	1
Indust.Growth	Industry sales growth rate between $t + 1$ and t			0.076	0.824	−0.995	23.67
DOMentry	1 in every year when other domestic firms enter the industry	0.842	0.365	0.813	0.39	0	1
DOMentry-cl	DOMentry × (NCL = 0)	0.642	0.484	0.545	0.491	0	1
DOMentry-ncl	DOMentry × (NCL = 1)	0.217	0.413	0.218	0.413	0	1
DOMgrowth	Growth rate in sales among other domestic firms in the industry between $t + 1$ and t	0.005	0.195			−0.94	1.19
DOMgrowth-cl	DOMgrowth × (NCL = 0)	0.005	0.168			−0.94	1.19
DOMgrowth-ncl	DOMgrowth × (NCL = 1)	0.0001	0.098			−0.94	1.18
Observations:		20,462		24,733			
Exits:		273		273			
Domestic firms:		5,705		6,291			

In the growth sample, there are 3,982 classified (dummy NCL = 0, 15,173 observations) and 1,723 nonclassified (NCL = 1, 5,289 observations) domestic firms, for a total of 5,705 domestic firms. Similarly in the exit sample, there are 4,278 classified (NCL = 0, 18,114 observations) and 2,013 nonclassified (NCL = 1, 6,619 observations) domestic firms.
[a] If not the same in both samples, then the statistics are reported first for growth sample and (after the slash) for exit sample.

for firm unobserved heterogeneity.[37] Then I estimate a Tobit model to control for data censoring. Though linear models provide inconsistent estimates when the dependent variable is censored, they provide a useful benchmark for the marginal effects near the population means (Wooldridge, 2002). A random effects model assumes that firm unobserved heterogeneity μ_i is part of the error, so the estimates are inconsistent if μ_i is correlated with the regressors. In such a case, a fixed effects estimator is appropriate. I verify such correlation by a Hausman test.

Although exit observations ($Growth_{ijt+1} = -1$) are included in the linear models, they ignore that the dependent variable is censored at −1. To control for censoring, I estimate both pooled and random effects tobit. At the end, I also use GEE (generalized estimating equations). While a random effects model provides efficient estimates under the assumptions of homoskedasticity and equal correlation structure, the GEE method corrects for heteroskedasticity and is robust to any misspecification in the correlation structure (Liang & Zeger, 1986).

Controlling for firm unobserved correlated heterogeneity (self-selection). A Hausman test rejected the random effects model; moreover, the sales and solvency coefficients were very different in fixed effects and other models, pointing to the endogeneity problem due to firm unobserved heterogeneity. Since tobit and survival models are nonlinear, μ_i cannot be differenced out as in the fixed effects model. Wooldridge (1995, 2002) suggests using Mundlak's (1978) idea of modeling firm unobserved correlated heterogeneity as a function of a firm-level means of firm variables, $\overline{X_i}'$, such that $\mu_i = \overline{X_i}'\xi + a_i$, where a_i is the part of firm heterogeneity that is uncorrelated with $\overline{X_i}'$ and X'_{ijt}. The means exclude all the dummies, industry-trend effects, and other variables that do not vary across firms or time (Wooldridge, 2002). However, since foreign firms may affect firm unobserved heterogeneity by spillovers, I include the means of foreign employment share and foreign growth rate. Adding $\overline{X_i}'$ as controls,

[37] OLS with robust standard errors corrected for firm clusters produced results similar to the random effects model.

I estimate firm growth by random effects, GEE, and pooled and random effects tobit.

B. Estimation of Firm Exit and Survival

Several data issues affected my estimations. In my sample, there are 273 exits, but other observations are right censored. The data are also left truncated, that is, there are firms that operated for years (and thus occurred under the risk of exit) before entering my sample. Using *ageT* as a measure of firm survival, if a firm enters my sample at, say, $ageT = 6$, it is only because it did not exit before I observe it, so there is a survivorship bias. I control for both survivorship bias and data censoring by conditioning the maximum likelihood function on *ageT* at which a firm enters the sample and the dummy whether observation is censored or not. Also, due to the "perfect success determination" problem, I had to regroup some year and industry dummies[38] and use industry sales growth rate between $t+1$ and t instead of industry-trend cross effects to control for industry demand.

I analyze firm exit using two approaches. First, I use continuous survival analyses: a parametric log-normal model and, for robustness, a nonparametric Cox model, because firm survival is a continuous variable (a firm can exit after two and a half years). However, since data are grouped by years due to balance sheet reporting, I also estimate firm exit by a discrete method: probit.[39] Though the theoretical model implies decreasing hazard rates, my data showed rather nonmonotonic exit rates, so I use a log-normal model. As in growth, I include firm-level means to model the firm's unobserved correlated heterogeneity. However, now the means exclude *ageT* (and its polynomials), since it is used to construct the outcome variables. In addition, in all estimations, I adjust the standard errors for heteroskedasticity and firm clusters. I also tried the industry-year clusters, but the results were similar.[40]

Firm survival: Log-normal model. Due to the nonmonotonicity of hazard rates, the log-normal model can be estimated only in accelerated failure time form as $\ln(T) = X'_{ijt}\beta + \omega_{ijt}$. T denotes firm survival measured by *ageT* ($\widetilde{t}$ indexes a particular value), X'_{ijt} is the vector of regressors, and the error term ω_{ijt} follows a normal distribution. I assume that $\omega_{ijt} = \mu_i + e_{ijt}$, where μ_i is firm unobserved heterogeneity and e_{ijt} is idiosyncratic error. The density of firm survival time $f(\widetilde{t})$, and the probability that a firm survives up to time $\widetilde{t}$, $S(\widetilde{t})$, follow log-normal distribution: $f(\widetilde{t}) = \frac{1}{\widetilde{t}\sigma\sqrt{2\pi}}\exp[\frac{-1}{2\sigma^2}(\ln(\widetilde{t}) - X'\beta)]$ and $S(\widetilde{t}) = 1 - \Phi(\frac{\ln(\widetilde{t}) - X'\beta}{\sigma})$. The maximum likelihood function I estimate is then

$$lnL = \sum_{i=1}^{N}\{d_i \ln[f(\widetilde{t}_i|X_i;\beta)] + (1-d_i)\ln S(\widetilde{t}_i|X_i;\beta) - \ln S(\widetilde{t}_i^{entry}|X_i;\beta)\},$$

where $d_i = 1$ if an observation is uncensored (0 if censored) and $\widetilde{t}_i^{entry}$ is *ageT* at which a firm enters my sample (to correct for left truncation).[41]

Exit hazard rates: Cox model. In the Cox model, exit hazard rate $h(\widetilde{t})$, or the rate at which a firm exits given it survived up to time $\widetilde{t}$, can be written in the proportional form: $h(\widetilde{t}) = h_0(\widetilde{t})e^{X'\beta}$. Then covariates X' predict the shifts in the baseline hazard $h_0(\widetilde{t})$. In tables, I report the exponentiated coefficients, e^{β}, as these directly show how covariates affect the exit hazard (Cox) or survival time (log-normal) ratio.[42] Across the two models, the same variables should be significant, but the coefficients should have the opposite signs. Unlike the log-normal model, however, the Cox model does not assume any distribution. Without exit ties (firms exit at different time), the partial likelihood function has the form $l = \prod_i \frac{h_0(\widetilde{t}_i)e^{X'\beta}}{\sum_{j\in R(\widetilde{t}_i)} h_0(\widetilde{t}_i)e^{X'\beta}} = \prod_i \frac{e^{X'_i\beta}}{\sum_{j\in R(\widetilde{t}_i)} eX'_j\beta}$. The numerator is the hazard that a firm exits at $\widetilde{t}_i$. The denominator is the sum of hazards for all firms in the risk set $R(\widetilde{t}_i)$, that is, all firms that could exit at $ageT = \widetilde{t}_i$ and already entered my sample. Since data are grouped, many firms exit in the same year, so I use the Effron method to handle the exit ties.[43]

Discrete regression analysis of hazard rates. I also estimate domestic firm exit by probit model.[44] Controlling for survival time (*ageT*), it approximates the exit hazard rates. Since estimates from pooled and random effects probit were almost identical, I report only pooled probit results.

VII. Results

A. Domestic Firm Growth Rates

The results are in table 4, cols. 1 to 5. All specifications but fixed effects include firm-level means to control for firm-correlated unobserved heterogeneity. Now the Hausman test does not reject the random effects model, and the estimates are very similar across all methods. In tobit, I report the estimated coefficients, since the marginal effects (at means)

[38] There are no exits in the years 1995–1996, so the coefficients of these dummies would be minus infinite. I group years 1994–1995 together and 1996–1997 together. Similarly, I group several industry dummies into bigger categories.

[39] Results from the logit model were similar and are not reported.

[40] Moulton (1990) explains that when the dependent variable is at a microlevel and the regressor is aggregated, the OLS standard errors might be underestimated. Since similar problem may arise in nonlinear models, I used industry-year clusters as well. However, such clustering assumes that firm observations are uncorrelated over time, which I find much more restrictive, so I rely on firm clusters.

[41] I also tried the frailty versions of the log-normal model, but in most cases, they did not converge.

[42] If we increase variable X_k by 1 unit, the hazard ratio is $\frac{h(t,X_{k+1})}{h(t,X_k)} = \frac{h_0(\widetilde{t})e^{(X_k+1)\beta^*}}{h_0(\widetilde{t})e^{X_k\beta^*}} = e^{\beta^*}$.

[43] See Hosmer and Lemeshow (1999, p. 107) for more details.

[44] Since probit estimates are inconsistent under heteroskedasticity, I compared the uncorrected and robust standard errors in pooled probit (see also Evans, 1987). The errors were similar, so heteroskedasticity should not be a problem.

TABLE 4.—DOMESTIC FIRM GROWTH RATES AND SURVIVAL: 141 INDUSTRIES, 1994–2001

	Growth					Survival		
Model	Fixed effects	Random effects	GEE	Tobit		Cox (exit rate)	Log-Normal (survival time)	Probit (exit = 1)
FORgrowth	0.007*	0.008**	0.010**	0.010**	0.010**	0.695***	1.233***	−0.162***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.053)	(0.048)	(0.027)
FORentry	−0.027	−0.023	−0.024	−0.022	−0.023	10.984***	0.214***	1.116***
	(0.047)	(0.044)	(0.034)	(0.047)	(0.047)	(2.488)	(0.030)	(0.092)
ageT	−0.252***	−0.269***	−0.274***	−0.274***	−0.274***			0.129***
	(0.017)	(0.015)	(0.011)	(0.011)	(0.011)			(0.047)
ageT × ageT	0.014***	0.014***	0.014***	0.014***	0.014***			−0.010**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)			(0.004)
sales	−0.948***	−0.936***	−0.955***	−0.929***	−0.929***	0.001***	19.514***	−3.108***
	(0.067)	(0.065)	(0.163)	(0.069)	(0.069)	(0.002)	(20.700)	(1.107)
sales × sales	0.039***	0.038***	0.039***	0.038***	0.038***	5.622***	0.494***	0.698***
	(0.003)	(0.003)	(0.008)	(0.003)	(0.003)	(3.354)	(0.108)	(0.208)
ageT × sales	0.022***	0.022***	0.022**	0.021***	0.021***			0.024
	(0.007)	(0.006)	(0.011)	(0.007)	(0.007)			(0.110)
FORempl.sh.	0.088	0.120	0.122	0.141	0.142	0.089*	3.831**	−1.233**
	(0.123)	(0.116)	(0.136)	(0.122)	(0.122)	(0.118)	(2.456)	(0.531)
FORdirect	0.001	0.001	0.001	0.001	0.001	1.011	0.991	0.005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.016)	(0.008)	(0.007)
intang	−0.405	−0.402	−0.414	−0.371	−0.372	372.663	0.051	2.487
	(0.417)	(0.393)	(0.434)	(0.414)	(0.414)	(1481)	(0.129)	(1.853)
gap	0.043	0.130	0.091	0.096	0.096	1.968	1.445	0.289
	(0.465)	(0.436)	(0.474)	(0.460)	(0.460)	(10.4)	(4.142)	(2.207)
FORempl.sh × gap	1.474	1.308	1.490	1.285	1.284	0.0001 b	23 b	−8.737
	(1.178)	(1.145)	(1.293)	(1.224)	(1.224)	(0.001)	(205)	(8.069)
pre-1989		−0.062*	−0.058***	−0.054**	−0.054**	0.669	1.946***	−0.137
		(0.032)	(0.021)	(0.025)	(0.025)	(0.321)	(0.368)	(0.162)
solvency	−0.012	−0.010	−0.015	0.010	0.010	0.080***	5.446***	−1.264***
	(0.033)	(0.032)	(0.050)	(0.035)	(0.035)	(0.027)	(1.645)	(0.189)
NoForeign (dummy)					0.055	3.045*	0.409**	0.540**
					(0.330)	(1.732)	(0.145)	(0.242)
Observations	20,462	20,462	20,462	20,462	20,462	24,733	24,733	24,733
Firms	5,705	5,705	5,705	5,705	5,705	6,291	6,291	6,291
Exits	273	273	273	273	273	273	273	273
Log-ML				−16,407	−16,407	−1,856	−761	−1,198
sigma-a		0.239						
sigma-e		0.513		0.544	0.538			
				(0.003)	(0.003)			
R^2	0.18	0.18		0.12	0.12			0.20
Hausman test		183						
p-value		(0.324)						

All specifications but fixed effects include firm-level means to model firm unobserved correlated heterogeneity (see text for details). In the Cox and log-normal models, the exponentiated coefficients and standard errors calculated by the Delta method are reported. Standard errors in parentheses: in GEE, Cox, log-normal, and probit, adjusted for heteroskedasticity and firm clusters. *Significant at 10%, **at 5%, ***at 1%. All regressions include constant, industry, year, and regional dummies. The growth regressions also include industry-trend cross effects (in the survival model, the industry growth rate is included instead) and four exit-type dummies (see text for details). The Cox model uses the Efron method for ties. For presentation purposes, the coefficients denoted by "b" are divided (multiplied) by 1000 in the log-normal (Cox) model.

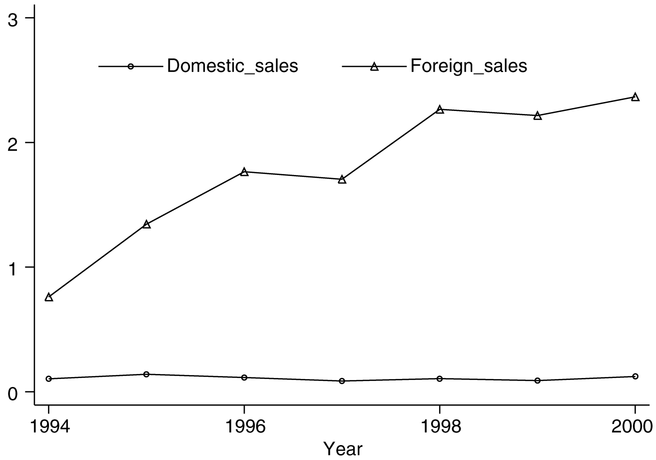
were very similar. Also, since the random effects tobit and pooled tobit estimates were almost identical and the variance of uncorrelated heterogeneity (a_i) was insignificant, I report only the pooled tobit results.

Focusing on the variables of interest, foreign growth rate always has a positive and significant impact on domestic firm growth rates, rejecting the dynamic crowding-out effect. To the contrary, the estimate 0.01 shows that increasing foreign growth rate by 1 standard deviation (1.36) raises a domestic firm growth rate on average by 1.4% (or the elasticity of domestic firm sales with respect to foreign sales is 0.01). This is a relevant increase given that the mean growth rate of domestic firms is 9.4%. However, foreign entry has a negative but insignificant impact. No dynamic crowding out is also suggested by figure 2. On average, larger foreign sales do not seem to reduce domestic firm sales. *FORempl.sh* is always positive but insignificant, as is its cross-effect, *FORempl.sh* × *gap*. Hence, technology spillovers might be present, but they are too small to significantly affect domestic firm growth rates. The estimate of *FORdirect* turns insignificant when controlling for firm unobserved heterogeneity. This rejects the intrafirm technology spillovers and suggests that foreign shareholders probably target firms with higher growth potential. The results remain if I include dummy *NoForeign* (column 5) for the industry years without foreign firms and the dummy is insignificant.

B. Domestic Firm Survival and Exit

The results are in table 4, columns 6 to 8. In the Cox model, the estimates larger (smaller) than 1 increase (decrease) the exit hazard. The opposite holds in the log-normal model, which shows the impact on firm survival time. Probit estimates support the results in the Cox and log-normal model,

FIGURE 2.— AVERAGE DOMESTIC AND FOREIGN INDUSTRY SALES



and the positive and declining effect of *ageT* on exit confirms the nonmonotone hazard rates. So the results are robust.

The estimate of *FORgrowth* in the log-normal model shows that a foreign growth rate larger by 1 standard deviation (1.48) raises firm survival by 36%.[45] The Cox model also implies exit rates lower by 42%. These results, similar to the growth analysis, reject dynamic crowding out but show evidence for the static crowding-out effect. *FORentry* reduces firm survival by around 80% (1–0.214) and increases exit in the Cox and probit models. So there is a shakeout of domestic firms on foreign entry, but domestic firms subsequently benefit from a larger foreign growth. Moreover, *FORempl.sh* significantly increases firm survival (or reduces exit) and provides evidence for intraindustry technology spillovers. The log-normal model shows that a foreign employment share larger by 1 standard deviation (0.162) raises firm survival by 24%. But there is no evidence of intra-firm technology spillovers; *FORdirect* is always insignificant.

Given these opposing FDI effects, how soon would the positive externalities offset the negative entry effect? Assessing the long-run net impact on domestic firm survival time, when all three effects are significant—initial *FORentry* (−80%), *FORgrowth* between $t + 1$ and t (+36%), and technology spillovers each period t (+24%)—implies that positive externalities offset the initial foreign entry shock in 2 years. Similarly, when looking on the impact on domestic firm growth rates, *FORgrowth* increases domestic firm growth rates by 1.4% (while the other two effects are insignificant), so again domestic firms benefit from positive spillovers as soon as in 2 years.

C. Robustness Checks

The results also remain if I drop exit-type dummies in the growth equation, analyze exit using a smaller growth sample or using firm true age instead of *ageT* (this supports an earlier discussion that firm learning about its efficiency from the model starts with the transition). To verify that my results are not driven by measurement issues, I conduct the additional unreported robustness checks, but the results still hold: (a) split the coefficients of *FORgrowth* and *FORentry* across classified and nonclassified domestic firms. The results show that the positive foreign growth effect is driven by the classified (for sure) domestic firms; (b) use shorter time periods when most foreign firms have data on sales balanced; and (c) drop the year 2001 with the most missing sales observations and repeat analyses using *FORgrowth* constructed only across foreign firms that have complete times series on sales. Finally, I repeat the analyses across subsamples with different levels of firm foreign direct ownership. Aitken and Harrison (1999) and Djankov and Hoekman (2000) find positive FDI impact only on the joint ventures. However, I find that domestic firms without foreign shareholders benefit most from foreign growth and technology spillovers, but the static crowding out remains across all firms. To further explore how to explain the positive foreign growth effect, I test alternative hypotheses in the next section.

VIII. How to Explain No Dynamic Crowding-Out Effect?

A. Are Foreign Firms Different, or Do They Pick Up a General Entry or Growth Effect?

Although in all estimations I control for year, industry, and regional dummies to avoid potential endogeneity biases due to aggregate demand shocks or industry or regional differences, and I include three-digit industry-specific time trends (industry growth in survival) to control for time-varying industry changes that may affect both domestic and foreign firms, my controls might not fully capture these effects. Or despite significant differences in size and profits (table 2), MNCs in my data may not actually be so different in their production efficiency from domestic firms as assumed in the model, so my results may just be picking up a general entry or growth effect, common to foreign and domestic firms. To verify that my results truly show the impact of FDI and that foreign firms have a different impact from other domestic firms, I include in my specification controls for the dynamics in the domestic sector *DOMentry* − dummy = 1 if other domestic firms (than firm i) enter the industry in year t; and *DOMgrowth*−growth rate (between $t+1$ and t) in the domestic part of the industry captured by the sales of other domestic firms (than firm i) in the same three-digit industry.[46] Due to missing sales among several domestic firms, however, I could

[45] The impact is calculated as follows: $\exp\{1.48 \times \ln 1.233\} - 1 = 36\%$, where 1.233 is the estimated coefficient and 1.48 is the standard deviation of *FORgrowth* in the exit sample (see table 3).

[46] A domestic firm is an entrant if it is one year (or less) old. Also note that since domestic firms were "always" present in the industry, *DOMentry* measures the impact from any new inflow of domestic firms into the industry, while *FORentry* measures the initial shock when foreign firms entered the industry the first time. However, if the production efficiency of domestic entrants improves over time, which is likely, then *DOMentry* is a proper analog to *FORentry* dummy. Both *DOMentry* and *DOMgrowth* were constructed before data cleaning to get the best coverage of the industry.

TABLE 5.—DOMESTIC FIRM GROWTH AND SURVIVAL: FOREIGN VERSUS OTHER DOMESTIC FIRMS.

Model	Growth (Tobit)			Survival (Log-Normal)		
FORgrowth	0.010**	0.010**	0.010**	1.228***	1.217***	1.213***
	(0.004)	(0.004)	(0.004)	(0.048)	(0.046)	(0.046)
FORentry	−0.022	−0.022	−0.021	0.216***	0.192***	0.195***
	(0.047)	(0.047)	(0.047)	(0.031)	(0.028)	(0.028)
DOMentry	−0.016		−0.015	0.753**		0.739**
	(0.016)		(0.016)	(0.087)		(0.088)
DOMgrowth		0.018	0.016		1.363	1.373
		(0.033)	(0.033)		(0.305)	(0.304)
ageT	−0.274***	−0.274***	−0.274***			
	(0.011)	(0.011)	(0.011)			
ageT × ageT	0.014***	0.014***	0.014***			
	(0.001)	(0.001)	(0.001)			
sales	−0.929***	−0.929***	−0.929***	18.283***	10.690**	10.172**
	(0.069)	(0.069)	(0.069)	(18.859)	(10.032)	(9.222)
sales × sales	0.038***	0.038***	0.038***	0.502***	0.588***	0.595***
	(0.003)	(0.003)	(0.003)	(0.107)	(0.099)	(0.096)
ageT × sales	0.021***	0.021***	0.021***			
	(0.007)	(0.007)	(0.007)			
FORempl.sh.	0.141	0.138	0.137	3.337*	3.024*	2.706
	(0.122)	(0.123)	(0.123)	(2.159)	(1.916)	(1.722)
FORdirect	0.001	0.001	0.001	0.991	0.991	0.991
	(0.001)	(0.001)	(0.001)	(0.008)	(0.008)	(0.008)
intang	−0.395	−0.374	−0.397	0.053	0.106	0.105
	(0.415)	(0.414)	(0.415)	(0.131)	(0.251)	(0.245)
gap	0.128	0.094	0.125	1.125	0.420	0.355
	(0.461)	(0.460)	(0.461)	(3.131)	(1.076)	(0.885)
FORempl.sh. × gap	1.261	1.298	1.274	52 b	72 b	162 b
	(1.225)	(1.225)	(1.225)	(451)	(633)	(1406)
pre-1989	−0.053**	−0.054**	−0.053**	1.911***	2.023***	1.984***
	(0.025)	(0.025)	(0.025)	(0.359)	(0.379)	(0.370)
solvency	0.010	0.010	0.010	5.320***	6.620***	6.482***
	(0.035)	(0.035)	(0.035)	(1.591)	(2.183)	(2.116)
NoForeign	0.055	0.053	0.053	0.377***	0.407**	0.372***
(dummy)	(0.330)	(0.330)	(0.330)	(0.135)	(0.146)	(0.134)
Observations	20,462	20,462	20,462	24,733	20,462	20,462
Firms	5,705	5,705	5,705	6291	5,705	5,705
Exits	273	273	273	273	273	273
Log-ML	−16,406	−16,406	−16,406	−758	−686	−682
sigma-e	0.538	0.538	0.538			
	(0.003)	(0.003)	(0.003)			
Pseudo-R^2	0.12	0.12	0.12			

All specifications include firm-level means to model firm unobserved correlated heterogeneity (see text for details). Standard errors in parentheses. In the log-normal model, the exponentiated coefficients and standard errors (adjusted for heteroskedasticity and firm clusters) calculated by the Delta method reported. *Significant at 10%, **at 5%, ***at 1%. All regressions include constant, industry, year, and regional dummies. The growth regressions also include industry-trend cross effects (in the survival model, the industry growth rate is included instead) and four exit-type dummies (see text for details). For presentation purposes, the coefficients (and standard errors) denoted by "b" are divided by 1,000.

not reliably calculate *DOMgrowth* for all industry years in my exit sample. So when controlling for *DOMgrowth*, the sample is the same as when estimating the growth equation.[47]

Table 5 shows the results from the tobit and log-normal models when gradually adding these controls. Including any of these variables does not change my previous findings. In particular, the estimated impacts of foreign firms in table 5 are basically the same as those estimated in table 4 (columns 5 and 7).[48] In both tables, tobit results show $FORgrowth = 0.01$ being significant and *FORentry* insignificant. In survival, $FORgrowth = 1.233$ in table 4 (column 7), while the estimates in table 5 are about the same: 1.228, 1.217, and 1.213, despite the smaller sample size. Similarly, when comparing the effect of *FORentry*, log-normal estimates in both tables are around 0.2, implying a reduction in domestic firm survival by 80%. Such similarities hold also in the unreported regressions when I split the coefficients of foreign and other domestic firms across classified and nonclassified domestic firms.

Moreover, the growth of other domestic firms, *DOMgrowth*, has an insignificant impact on both growth rate and survival of a focal domestic firm. *DOMentry* shows a significant impact only on survival, but unlike foreign entry, other domestic entrants represent a much weaker threat, reducing firm survival by about 25% according to the estimates in table 5.[49] However, even this effect goes away when I

[47] Gaps in sales can create huge jumps in domestic output and thus growth rates, especially when aggregating across a small number of firms. To avoid this mismeasurement I took all the observations (before data cleaning) with nonmissing firm growth rates and calculated *DOMgrowth* as the sum of other domestic firm growth rates weighted by their shares in the total three-digit domestic production at time *t*. When I calculated *DOMgrowth* within two-digit industry, the results were the same as the ones I report.

[48] The results do not change if in the survival, I exclude overall industry growth rate as a control.

[49] The difference between *FORentry* and *DOMentry* was statistically significant at 1%.

divide the industries into those with high versus low FDI stock (see below). So the impact of foreign firms is different from other domestic firms, supporting the discussion in section IIA.[50]

It might be that domestic and foreign dynamics work differently across industries with and without foreign presence and my results are actually driven by eleven industries without foreign firms (the industries that only domestic firms enter). So in unreported regressions, I drop these eleven industries. The results confirm all my previous findings and reject such an explanation.

B. *Industries with Foreign Firms: High versus Low FDI Stock*

I further divide 130 industries with foreign firms into those with high versus low FDI stock. The first subsample includes industries that primarily foreign firms enter, while the latter includes industries that both domestic and foreign firms enter. If my results reflect FDI impact rather than the impact of some other unobserved factors, one would expect stronger effects in industries with high FDI stock.

The Czech National Bank (2003) reports that by 2001, the highest FDI accumulated the following eight two-digit NACE sectors: 34: Motor Vehicles (6.3%); 26: Nonmetallic Mineral Products (5.3%); 23–25: Petroleum, Chemical Products (5.5%); 40–41: Electricity, Gas and Water (6.1%); 50–52: Trade and Repairs (15.1%); 65–67: Financial Intermediation (14.8%); 70–74: Real Estate and Business Activities (11.4%); 60–64: Transport and Communications (10.4%). The remaining 25.2% of FDI stock was distributed among other industries. Using Amadeus concordance tables, I translated these eight sectors into three-digit USSICs and define 65 matching industries in my data as high-FDI stock subsamples. The other 65 industries (out of 130) in my data represent low-FDI stock subsamples. Also, to maximize sample sizes, especially when analyzing firm survival, I drop *DOMgrowth* because it was never significant in the previous analyses, and I thus use the full exit sample of 24,733 observations.

The results in table 6 again confirm my findings of static but no dynamic crowding-out effect, and both *FORgrowth* and *FORentry* show stronger impacts in high- than in low-FDI industries. *FORgrowth* (larger by 1 standard deviation) raises domestic firm growth rates by around 1.7% in high-FDI industries but is insignificant in low-FDI industries, and it raises firm survival by 43% in high- versus 35% in low-FDI industries. The same is true for *FORentry* effect. Interestingly also, *FORempl.sh* shows a much higher importance of technology spillovers on domestic firm survival in low-FDI industries. And, *DOMentry* shows and insignificant impact (at the 5% level) on both growth and survival.

[50] Aghion et al. (2009) analyze the impact of entry on incumbents' innovation and productivity in the U.K. They also find a significant impact from foreign entry, but no impact from domestic entry.

TABLE 6.—INDUSTRIES WITH FOREIGN FIRMS: HIGH VERSUS LOW FDI STOCK

	Growth (Tobit)		Survival (Log-Normal)	
Model	High FDI	Low FDI	High FDI	Low FDI
FORgrowth	0.012**	0.001	1.257***	1.238***
	(0.005)	(0.007)	(0.086)	(0.069)
FORentry	−0.079	0.064	0.074***	0.230***
	(0.066)	(0.069)	(0.018)	(0.047)
DOMentry	−0.017	−0.017	0.715*	0.788
	(0.024)	(0.021)	(0.123)	(0.115)
ageT	−0.290***	−0.234***		
	(0.015)	(0.017)		
ageT × ageT	0.016***	0.011***		
	(0.001)	(0.001)		
sales	−0.966***	−1.435***	30.787*	12.494*
	(0.091)	(0.133)	(58.665)	(17.394)
sales × sales	0.038***	0.101***	0.517**	0.233*
	(0.004)	(0.011)	(0.164)	(0.180)
ageT × sales	0.023**	0.009		
	(0.009)	(0.010)		
FORempl.sh.	0.145	0.104	1.760	13.623***
	(0.157)	(0.197)	(1.506)	(12.207)
FORdirect	0.000	0.002	0.979*	1.004
	(0.001)	(0.001)	(0.011)	(0.004)
intang	−0.581	−0.796	0.008	0.009
	(0.909)	(0.560)	(0.026)	(0.036)
gap	0.830	−0.150	0.735	172.697
	(0.979)	(0.565)	(2.498)	(663.442)
FORempl.sh. ×	0.117	2.124	$3.23e+08$*	0.0003
gap	(1.680)	(1.851)	($3.55e+09$)	(0.003)
pre-1989	−0.070**	−0.023	1.713**	2.529***
	(0.033)	(0.038)	(0.404)	(0.769)
solvency	0.014	−0.015	5.913***	4.899***
	(0.046)	(0.051)	(2.189)	(2.385)
Observations	12,715	7,406	15,520	8,805
Firms	3,635	1,970	4,023	2,156
Exits	171	95	171	95
Log-ML	−10,953	−4,975	−476	−263
sigma-e	0.571	0.471		
	(0.004)	(0.004)		
Pseudo-R^2	0.10	0.17		

All specifications include firm-level means to model firm unobserved correlated heterogeneity (see text for details). Standard errors in parentheses. In the log-normal model, the exponentiated coefficients and standard errors (adjusted for heteroskedasticity and firm clusters) calculated by the Delta method reported. *Significant at 10%, **at 5%, ***at 1%. All regressions include constant, industry, year, and regional dummies. The growth regressions also include industry-trend cross effects (in the survival model, the industry growth rate was included instead) and four exit-type dummies (see text for details).

Overall, this section confirms the robustness of my original specification and all the findings and provides compelling evidence that the impact of foreign firms is different from other domestic firms. In particular, although there are long-run benefits from foreign firms—positive externalities offset the negative shakeout effect due to initial foreign entry within two years (see section VII)—there are no such benefits from other domestic firms. At a macrolevel, Borensztein et al. (1998) also find that across 69 developing countries, FDI contributes to overall growth much more than domestic investment does. Below I use my original empirical specification, as it also allows me to use my full sample, and explore the alternative hypotheses that could explain positive *FORgrowth* and dynamic crowding-in effect.

C. *Technology Leaders versus Technology Laggards*

Blomström et al. (2000), Keller (2004), and Aghion et al. (2009) suggest that we should see the crowding-out effect

TABLE 7.—DOMESTIC FIRM GROWTH RATES AND SURVIVAL: TECHNOLOGY LAGGARDS VERSUS LEADERS

	Growth (Tobit)		Survival (Log-Normal)	
Model	Laggards	Leaders	Laggards	Leaders
FORgrowth	0.002	0.010**	1.314**	1.208***
	(0.008)	(0.005)	(0.148)	(0.047)
FORentry	−0.011	−0.016	0.174***	0.196***
	(0.068)	(0.067)	(0.056)	(0.032)
ageT	−0.232***	−0.289***		
	(0.019)	(0.014)		
ageT × ageT	0.012***	0.015***		
	(0.001)	(0.001)		
sales	−1.456***	−0.815***	5.579	45.067***
	(0.140)	(0.083)	(11.186)	(64.981)
sales × sales	0.063***	0.032***	0.471	0.422**
	(0.006)	(0.004)	(0.262)	(0.164)
ageT × sales	−0.003	0.014*		
	(0.017)	(0.008)		
FORempl.sh.	−0.214	0.321**	3.626	3.238*
	(0.212)	(0.155)	(5.101)	(2.226)
FORdirect	0.002	0.0003	1.005	0.985
	(0.001)	(0.001)	(0.007)	(0.010)
intang	−0.058	−5.011***	0.175	0.265
	(0.721)	(1.498)	(2.570)	(2.451)
gap	0.008	4.776***	889 b	0.166
	(0.691)	(1.564)	(8585)	(1.578)
FORempl.sh. × gap	0.658	1.547	249 b	412 b
	(2.683)	(1.441)	(9587)	(3655)
pre-1989	−0.062	−0.053*	4.325***	1.481**
	(0.042)	(0.031)	(1.919)	(0.292)
solvency	0.117**	−0.040	16.241***	4.067***
	(0.059)	(0.043)	(9.538)	(1.406)
Observations	6,374	13,747	7,631	16,694
Firms	1,717	3,891	1,873	4,308
Exits	77	189	77	189
Log-ML	−4,486	−11,537	−238	−510
sigma-e	0.487	0.586		
	(0.004)	(0.003)		
Pseudo-R^2	0.14	0.11		

All specifications include firm-level means to model firm unobserved correlated heterogeneity (see text for details). Standard errors in parentheses. In the log-normal model, the exponentiated coefficients and standard errors (adjusted for heteroskedasticity and firm clusters) calculated by the Delta method reported. *Significant at 10%, **at 5%, ***at 1%. All regressions include constant, industry, year, and regional dummies. The growth regressions also include industry-trend cross effects (in the survival model, the industry growth rate is included instead) and four exit-type dummies (see text for details). For presentation purposes, the coefficients (and standard errors) denoted by "b" are divided by 1,000.

mostly in industries where domestic firms are technologically behind foreign firms. Similarly, studies on technology spillovers often find positive spillovers only in high-tech industries.[51]

To assess how technological differences affect my results, I divide industries into technology leaders and laggards. Technology leaders are industries in which the technology difference between domestic and foreign firms (mean of *gap* variable without absolute value) is greater than or equal to zero. Technology laggards are industries with technology difference less than zero. Among 130 industries with foreign presence in my sample, 83 are defined as technology leaders and 47 as laggards.

Table 7 shows the results from the tobit and log-normal models. They confirm my previous findings of no dynamic, but the presence of the static crowding out effect. While *FORentry* raises the exit hazard in both groups by around 80% (the same as in the overall sample), *FORgrowth* larger by 1 standard deviation raises firm survival by 35% for leaders and 41% for laggards. Moreover, *FORgrowth* increases domestic firm growth rates by a similar magnitude as in the aggregate sample (0.01) for technology leaders, but it has on insignificant impact for laggards. Similarly, foreign employment share (larger by 1 standard deviation) raises firm growth by 5% and survival by 21%, but again only for technology leaders. These results support the arguments in the literature that intraindustry technology spillovers are more likely to appear in the technologically advanced industries. However, I do not find any evidence for intrafirm technology spillovers (*FORdirect* is always insignificant).

[51] See, for example, Kokko, Tasini, and Zejan (1996), Haddad and Harrison (1993), or Görg and Strobl (2000).

TABLE 8.—DOMESTIC FIRM GROWTH RATES AND SURVIVAL: INDUSTRY EXPORT ORIENTATION, 1994–2000

	Growth (Tobit)		Survival (Log-Normal)	
Model	High Export	Low Export	High Export	Low Export
FORgrowth	0.004	0.013**	1.211**	1.140**
	(0.008)	(0.006)	(0.102)	(0.071)
FORentry	0.027	−0.039	0.427***	0.171***
	(0.080)	(0.065)	(0.055)	(0.045)
ageT	−0.225***	−0.347***		
	(0.018)	(0.017)		
ageT × ageT	0.011***	0.020***		
	(0.001)	(0.001)		
sales	−1.243***	−1.009***	6.284*	17.526**
	(0.137)	(0.101)	(7.202)	(24.902)
sales × sales	0.088***	0.037***	0.377	0.444***
	(0.011)	(0.005)	(0.241)	(0.129)
ageT × sales	0.032***	0.027**		
	(0.010)	(0.011)		
FORempl.sh.	−0.030	0.102	0.441	7.495*
	(0.222)	(0.158)	(0.328)	(7.861)
FORdirect	0.002	−0.0002	1.004	0.982*
	(0.001)	(0.001)	(0.004)	(0.011)
intang	−0.978	−0.322	6.581	0.005
	(0.710)	(0.585)	(11.943)	(0.027)
gap	0.151	0.723	0.150	0.006
	(0.858)	(0.618)	(0.347)	(0.033)
FORempl.sh × gap	2.736*	−1.537	$1.82e+08$*	$9.5e+09$
	(1.533)	(1.955)	($2.12e+09$)	($1.57e+11$)
pre-1989	−0.062	−0.088**	2.166***	1.560
	(0.038)	(0.037)	(0.620)	(0.429)
solvency	0.044	0.016	3.445***	11.304***
	(0.057)	(0.050)	(1.569)	(5.118)
NoForeign (dummy)	−0.035		0.397***	
	(0.295)		(0.109)	
Observations	6,546	12,113	7,036	13,198
Firms	1,781	3,686	1,928	3,984
Exits	79	158	79	158
Log-ML	−4,017	−10,698	−222	−438
sigma-e	0.445	0.584		
	(0.004)	(0.004)		
Pseudo-R^2	0.19	0.10		

All specifications include firm-level means to model firm unobserved correlated heterogeneity (see text for details). Standard errors in parentheses. In the log-normal model, the exponentiated coefficients and standard errors (adjusted for heteroskedasticity and firm clusters) calculated by the Delta method reported. *Significant at 10%, **at 5%, ***at 1%. All regressions include constant, industry, year, and regional dummies. The growth regressions also include industry-trend cross effects (in the survival model, the industry growth rate was included instead) and four exit-type dummies (see text for details). NoForeign dummy is dropped in low-export industries, since they all have foreign presence.

TABLE 9.—HIGH-EXPORT INDUSTRIES

USSIC	Industry Description	USSIC	Industry Description
201	meat products	328	cut stone and stone products manufacturing
202	dairy products	331	still works, blast furnaces and rolling and fishing manufacturing
203	canned, frozen, and preserved fruits; vegetables; and food specialties manufacturing	*332	iron and steel foundries
204	grain mill products	333	primary smelting and refining of nonferrous metals
205	bakery products manufacturing	339	miscellaneous primary metal products
206	sugar and confectionary products	341	metal cans and shipping containers
208	beverages	342	cutlery, hand tools, and general hardware
209	miscellaneous food preparations and kindred products	343	heating equipments, except electric and warm air
221	broad woven fabric mills	344	fabricated structural metal products
225	knitting mills manufacturing	345	screw machine products, bolts, nuts, screws rivets, washers
228	yarn and thread mills manufacturing	346	metal forging and stamping
229	miscellaneous textile goods manufacturing	*347	coating, engraving and allied services
232	men's and boy's furnishings, work clothing	349	miscellaneous fabricated metal products
239	miscellaneous fabricated textile products	*351	engines and turbines
242	sawmills and planning mills	352	farm and garden machinery
243	millwork, veneer, plywood, and structural wood members	353	construction, mining and materials handling machinery
244	wood containers	354	metal working machinery and equipment
251	household furniture manufacturing	355	special industry machinery
*252	office furniture manufacturing	356	general industrial machinery and equipment
265	paperboard containers and boxes manufacturing	359	miscellaneous industrial and commercial machinery equipment
267	converted paper and paperboard products	362	electrical industrial apparatus
271	newspapers publishing	363	household appliances
273	books	364	electric lighting and wiring equipment
275	commercial printing	365	household audio and video equipment
281	industrial inorganic chemical manufacturing	366	communication equipment
283	drugs	367	electronic components and accessories
284	soap, detergents and cleaning preparations, perfumes, cosmetics	371	motor vehicles and motor vehicles manufacturing
285	paints, varnishes, lacquers, enamels	372	printed circuit boards
289	miscellaneous chemical products manufacturing	374	railroad equipment manufacturing
302	rubber and plastic footwear manufacturing	*375	motorcycles, bicycles, and parts manufacturing
308	miscellaneous plastic product manufacturing	382	laboratory apparatus and furniture manufacturing
317	handbags and other personal leather	384	surgical, medical and dental instruments and supplies
322	glass and glassware	*391	jewelry, silverware and plated ware
325	structural clay products manufacturing	394	dolls, toys, games
326	pottery and related products manufacturing	399	miscellaneous manufacturing industries
327	concrete, gypsum, and plaster products manufacturing	753	automotive repair shops

*Denotes industries without foreign presence.

D. *Export Spillovers versus Demand Creation Effect?*

Alternatively, the positive foreign growth effect can represent export spillovers[52] or domestic demand creation within three-digit industries.[53] MNCs can increase demand for local inputs or initiate demand for new goods and services not produced by the local firms before (for example, consulting and various other business services occurred in the Czech Republic only with the arrival of MNCs). Moreover, MNCs may bring higher-quality or previously unavailable inputs and thus enhance the production of local firms. Under both hypotheses—export spillovers or demand creation—larger foreign sales should increase the growth rates and survival of domestic firms. As table 11 shows, more domestic firms enter than exit during my sample period.[54] This is possible only if firms see more business opportunities on domestic or export market. However, if the positive foreign growth effect represents export spillovers, it should be observed only among export-intensive domestic firms. Since Amadeus does not provide firm-level exports, I test this by dividing 141 industries into high- and low-export-oriented.

I take 1996–2000 exports at the two-digit CPA industry classification (Classification of Products by Activity) from the Czech Statistical Office.[55] I define the 23 (out of 33) two-digit industries with an average export share at least 1% as high-export sectors.[56] Using the cross-reference tables from Amadeus between UKSIC (same as CPA) codes and USSIC codes, I translated these two-digit sectors into the three-digit USSIC codes. The 72 matching industries (out of 141) in

[52] Blomström et al. (2000) discuss that MNCs may help local firms enter the export markets by, for example, creating the transport infrastructure, disseminating information about foreign markets, or providing inputs unavailable in the local markets and thus facilitating the links between local firms and foreign buyers.

[53] Three-digit USSICs often contain four-digit industries linked in the production process. For example, USSIC = 371 includes 3711 (motor vehicles and passenger car bodies manufacturing) as well as 3714 (motor vehicle parts and accessories manufacturing). However, there are no four-digit input-output tables available to explore detailed links.

[54] For evidence on FDI impact on domestic entry rates, see Ayyagari and Kosová (2010).

[55] Unfortunately, the Statistical Office does not report exports at USSIC codes. The data for 1994–1995 are unavailable, since there were numerous changes in the trade statistics and industry classifications due to EU enlargement that the Statistical Office did not incorporate into the data calculations before 1996.

[56] Among these, two sectors had an export share larger than 10%, and five sectors had a share between 5%–10%.

TABLE 10.—LOW-EXPORT INDUSTRIES

USSIC	Industry Description	USSIC	Industry Description
152	general building and residential building contractors	523	paint, glass, and wallpaper stores
161	highway and street construction	531	department stores
162	heavy construction	541	grocery stores
171	plumbing, heating, and air-conditioning	554	gasoline service stations
*172	painting and paper hanging	571	home furniture and furnishing stores
173	electrical work	581	eating and drinking places
174	masonry, stonework, title setting, and plastering	591	drug and proprietary stores
*175	carpentry and floor work	593	used merchandise stores
179	miscellaneous special trade contractors	594	miscellaneous shopping goods stores
361	electric transmission and distribution equipment	596	no store retailers
395	pens, pencils, and other artists' materials	614	personal credit institutions
414	bus charter service	615	business credit institutions
421	trucking and courier services, except air	621	security brokers, dealers, and flotation companies
422	public warehousing and storage	*628	services allied with the exchange of securities and commodities
472	arrangement of passenger transportation	651	real estate operators and lessons
481	telephone communications	653	real estate agent and managers
491	electric services	671	holding offices
493	combination electric, gas, and other utilities services	*672	investment offices
494	water supply	679	miscellaneous investing
495	sanitary services	701	hotels and motels
501	motor vehicles and motor vehicle parts	721	laundry, cleaning, garment services
502	furniture and home furnishing wholesale dealing	729	miscellaneous personal services
503	lumber and other construction materials	731	advertising
504	professional, commercial equipment	734	services to dwellings
505	metals and minerals, except petroleum wholesale dealing	735	miscellaneous equipment rental and leasing
506	electrical goods wholesale dealing	737	computer programming, data processing, other PC services
507	hardware, plumbing, and heating equipment	738	miscellaneous business service
508	machinery equipment and supplies wholesale dealing	751	automotive rental and leasing
509	miscellaneous durable goods wholesale dealing	*792	theatrical producers, bands orchestras, and entertainers
512	drugs, drug properties	794	commercial sports
513	apparel, piece goods, and notions wholesale dealing	799	miscellaneous amusement and creation services
514	groceries and related products wholesale dealing	871	engineering, architectural and surveying services
515	farm product raw materials	873	research, development and testing services
516	chemical and allied products	874	management and public relations services
519	miscellaneous non-durable goods		

*Denotes industries without foreign presence.

my sample represent the high-export industries. The other 69 industries in my sample represent low-export industries (see tables 9 and 10). Also, since my export data are available only until 2000, I exclude the year 2001 from the analysis.

Table 8 shows that while foreign growth rate (larger by 1 standard deviation) raises domestic firm survival in all industries, it significantly raises growth rates by 1.8% only among low-export firms. Since high-export firms have established customers abroad, the local links with MNCs are not so crucial for their growth as for the other domestic firms. So I propose that the positive foreign growth effect that I find represents domestic demand creation (via customer and supplier links among domestic and foreign firms within three-digit industries), not export market spillovers. Similarly, the static crowding out affects all firms, but its impact on survival is weaker (57%) in high-export than in low-export (83%) industries. This again can be justified by the fact that high-export firms have customers abroad, so higher competition due to foreign entry represents a smaller threat.

IX. Conclusion

This paper analyzes the impact of foreign presence on the growth and survival of domestic firms, using 1994–2001 firm-level panel data for the Czech Republic. I separate the two opposing effects of foreign presence—a negative crowding out and positive technology spillovers—and analyze whether the crowding-out effect is dynamic, that is, domestic firms cut production over time as foreign firms grow in the domestic industry, or a static effect, realized on foreign entry. Theoretically I rely on a model that combines a dominant

TABLE 11.—ENTRY AND EXIT OF DOMESTIC AND FOREIGN FIRMS IN THE ANALYSES

	Domestic Firms		Foreign Firms	
Year	Entry	Exit	Entry	Exit
Before 1990	265	NA	12	NA
1990	195	NA	27	NA
1991	1,050	NA	221	NA
1992	1,308	NA	256	NA
1993	779	NA	206	NA
1994	805	81	157	20
1995	541	0	118	0
1996	471	0	74	0
1997	382	1	46	0
1998	275	78	30	8
1999	169	77	22	5
2000	51	36	3	4
2001	0	0	0	2
Year unknown	0	0	37	0
Total firms	6,291	273	1207	39

Reported numbers include firms with with nonmissing sales.

firm-competitive fringe framework and a model on firm and industry dynamics by Jovanovic (1982) and Sun (2002). If crowding out is a dynamic effect, the foreign growth rate should have a negative impact on both the growth and survival of domestic firms. If it is a static effect only foreign entry should have a negative effect on domestic firm growth and survival.

I estimate random and fixed effects, GEE, and tobit models to analyze domestic firm growth rates and Cox, log-normal, and probit models to analyze firm survival. All estimations control for endogeneity due to firm-level unobserved heterogeneity. My results show evidence of both technology spillovers and a crowding-out effect. However, crowding out appears to be a short-term or static phenomenon: initial foreign entry increases the exit rates of domestic firms. Subsequently, however, the foreign sales growth increases both the growth rate and the survival of domestic firms. Dividing industries between low- and high-export oriented suggests that this positive foreign growth effect represents domestic demand creation rather than export spillovers. My results indicate a shakeout of domestic firms due to foreign entry, but afterward, domestic firms benefit from foreign presence. This is consistent with the conclusion by Aitken and Harrison (1999) that a negative competitive effect should be temporary, and positive FDI spillovers should dominate in the long run. In my data, the estimates suggest that positive externalities due to demand creation and technology spillovers offset the initial crowding-out effect caused by foreign entry into the industry within two years.

These results are robust across different specifications. Additional analyses also reject the possibility that benefits from FDI are captured by the joint ventures or that my findings are picking up general entry or a growth effect common to foreign and domestic firms. Including controls for the entry and growth of other domestic firms and dividing industries into those with high versus low FDI stock confirm my findings and provide convincing evidence that the impact of foreign firms is indeed different from that of domestic firms. Although there are long-run benefits from foreign competition, there are no such benefits from other domestic firms. Further analyses also show that domestic firms in the technologically advanced industries are the ones that benefit from technology spillovers. This supports arguments that domestic firms must be technologically advanced in order to benefit from technology spillovers.

From a policy perspective, my paper shows that FDI generates positive benefits for domestic firms, so countries should remove, not install, restrictions against FDI. The results also provide justification for transitional countries' granting investment incentives to MNCs.

A related issue, beyond the scope of this paper, however, is whether the FDI impact varies with the country of origin. Using a smaller sample, where I could identify at least the region of the ultimate owner, I find that the strongest technology spillovers generate the MNCs from Anglo-Saxon countries (United States, Canada and United Kingdom), while the MNCs from western Europe drive the demand creation effect.[57] Due to the lack of exact data on the origin of MNCs, these results are suggestive, but they indicate that FDI origin may affect the type and magnitude of FDI spillovers. Thus, governments should be careful when and what type of FDI incentives to offer. I leave the detailed analyses of these issues for future work.

[57] See Kosová (2004) for more details.

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APPENDIX

Determination of Firm Ultimate Ownership

Amadeus assigns an ultimate owner (UO) if a firm has at least one shareholder with a share equal to or greater than 24.9%. Otherwise, UO is missing or unknown. Out of 10,335 firms in my initial sample, 2,352 had the country of UO reported, so the classification Czech versus foreign is straightforward. An additional 1,705 firms had only the name of UO, but its country was missing. I wrote a program that searches for the country initials, legal forms, and so on in the name of UO that would imply that UO is not Czech. In addition, I classify a firm as foreign when UO is missing, because a firm has only minority shareholders, but the average of firm foreign direct ownerships (across all firm shareholders and years) is 50% or more. If the average is less than 50%, I classify the firm as domestic. If a firm has an UO but it is unknown, I classify it as foreign if the average of firm foreign direct ownership is 60% or more (I use a 60% threshold to avoid the possibility that there might be an unreported 50% shareholder). Since these averages are calculated across all the years I observe a firm in my data, if the Czech firm was privatized at the end of my sample, it remains classified as domestic, but the increase in its foreign ownership will be reflected in the variable *FORdirect*.