The role of foreign direct investment in the host-country firm selection process: firm-level evidence from Slovenian manufacturing

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THE ROLE OF FOREIGN DIRECT INVESTMENT IN THE HOST-COUNTRY FIRM SELECTION PROCESS: FIRM-LEVEL EVIDENCE FROM SLOVENIAN MANUFACTURING

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Abstract

This paper examines the role of inward foreign direct investment (FDI) in firm selection processes in the Slovenian manufacturing sector in the 1994-2003 period. It adopts the firm dynamics framework that allows testing of selection effects directly by assessing the impact of foreign firms' activity on the probability of exiting of local firms (crowding out). The results show that intra-industry productivity spillover effects offset only a minor part of the competition pressure which results from foreign firm entry, hence incumbent firms experience a drop in their survival probability upon a foreign firm's entry within a particular industry. This result is driven by foreign firm entry of the greenfield type, as entry through the acquisition of existing firms has no significant effect. The strength of the crowding-out effect decreases with the incumbent firm's export propensity. There is no significant evidence that inward FDI would stimulate the selection process through backward linkages in the upstream supplying industries, whereas foreign firms' activity reduces the exit probability of downstream local customers (through forward linkages).

***JEL classification**:* F23, L11, L25, C23, C25, C41

***Key words**:* foreign direct investment, firm selection process, crowding out, productivity spillovers, Slovenia, survival analysis

THE ROLE OF FOREIGN DIRECT INVESTMENT IN HOST-COUNTRY FIRM SELECTION PROCESS: FIRM-LEVEL EVIDENCE FROM SLOVENIAN MANUFACTURING

1. Introduction

The paper aims to provide a deeper understanding of the role of incoming foreign direct investment (FDI) in the firm selection process in the Slovenian manufacturing sector. Several recent empirical studies provide evidence that within-industry reallocations from less to more productive firms and the exit/entry process contribute significantly to average productivity growth and constitute an important mode of industrial restructuring (see Olley and Pakes 1996; Roberts and Tybout 1996; Pavcnik 2002; Tybout 2003). At the same time, it is widely recognised that investment liberalisation is one of the most important triggers of the industrial restructuring process driven by intra- and inter-industry firm selection processes.

As indicated in the theoretical literature (reviewed in, for example, Caves 1996; Blomström and Kokko 1997, 1998), there are two main opposing effects through which inward FDI can affect a domestic firm's survival and performance: competition effects and productivity spillover effects. On the one hand, by increasing competition in the host country, a foreign firm's entry and presence may lead to the crowding out of local firms within the particular industry. As emphasised by Görg and Strobl (2003), the increased production of foreign rivals will generally lead to a reduction of the output price which will shrink the price-cost margin and increase the probability of the exit of domestic firms. The competition effect may also operate in the factor markets, whereby foreign firms may crowd out domestic rivals by increasing factor prices in the economy. Moreover, a selection effect might also operate through vertical linkages, leading to a decrease in demand for intermediate products. The demand for domestically produced intermediates might decrease either because foreign firms use inputs more efficiently or they rely more on imported intermediates (see Rivera-Batiz and Rivera-Batiz 1991). In addition, some local suppliers might not be able to achieve the higher product standards or delivery conditions demanded by foreign firms.

On the other hand, foreign firms' activity in the host country may confer positive productivity spillovers on domestic firms.[1] An increase in productivity through spillovers will, ceteris paribus, reduce a domestic firm's average production costs which in turn expands its price-cost margin. Thus, in the case of positive productivity spillovers we can expect a greater probability of survival. Productivity spillovers may occur within the same industry (intra-industry spillovers) as a result, for instance, of multinational enterprises' (MNEs) training of local employees or demonstration effects, or in vertically – upstream and downstream – related industries through customer-supplier links between MNEs and domestic firms (inter-industry spillovers), or as a result of agglomeration (see Blomström and Kokko 1997, 1998).

[1] These externalities may appear since foreign firms may not be able to fully internalise their technological advantages and therefore their presence would lead to various types of productivity spillovers to domestic firms.

While there is a substantial body of empirical literature on spillover effects, evidence of the importance and mechanisms of competition effects is relatively rare. Therefore, I have chosen an industry and firm dynamics framework to focus on the mechanisms of competition effects and in particular on their impact on the crowding out of local firms (increased probability of exiting). More specifically, I estimate a firm exit model employing probit and log-log model specification on firm-level data for the Slovenian manufacturing sector in the 1994-2003 period.

Despite the relatively numerous empirical studies on a firm's survival and growth, empirical evidence on the impacts of inward FDI or even of foreign competition generally on the growth and survival of local firms is very limited. One exception is a study by Görg and Strobl (2003). Using plant-level data for the Irish manufacturing sector in the 1973-1996 period and employing a Cox proportional hazard model, they find that the presence of multinationals has a positive effect on the survival of Irish plants but this effect is only significant for plants that operate in high-tech sectors. Regarding foreign-owned plants, they provide evidence that foreign plants have higher hazards of exiting than indigenous plants and that the presence of multinationals has a negative effect on the survival of other foreign-owned plants in low-tech sectors. In contrast, De Backer and Sleuwaegen (2003) find evidence that inward FDI increases domestic exits for Belgian manufacturing data. The crowding-out effect is stronger in the case of FDI than in the case of imports. Using 1994-2001 firm-level panel data for the Czech Republic, Kosová (2006) provides evidence that foreign expansion, measured by the foreign sales growth rate, has a positive effect on both the growth and survival of domestic firms, but that the exit rates of domestic firms around the time of a foreign entry are significantly higher.

My aim is to provide further evidence on the mechanisms and channels through which inward FDI affects host-country firm dynamics for the Slovenian manufacturing sector in the 1994-2003 period. The main contribution of this paper to the existent empirical studies lies in testing several new theoretical predictions of recent models of heterogeneous firm dynamics. Among others, the following hypotheses are tested: (i) Entry of foreign firms increases the probability of incumbent firms' exit. (ii) Crowding out is most pronounced for firms that are orientated towards domestic market. (iii) Foreign firms' activity affects the survival probability of incumbent firms also through backward and forward linkages (customer-supplier links) between MNEs and domestic firms and through regional spillover effects. One of the advantages of this study is that, unlike in most studies on FDI which restrict the sample to larger firms, it uses a data set that covers the whole population of manufacturing firms registered in Slovenia. This is particularly important for studying characteristics of competition effects of foreign firm entry since a restriction of the sample to larger firms would most likely cause biased estimates as mortality rates tend to be higher for smaller firms than for larger firms.

The rest of the paper is organised as follows. In Section 2, the data and main descriptive statistics with respect to domestic- and foreign-owned firms are presented. Section 3 specifies an exit (survival) model to be applied to panel data for Slovenian manufacturing firms and defines the variables. Section 4 discusses the main econometric problems dealt with in the empirical analysis. Section 5 presents the results and implications of the empirical estimations. Finally, Section 6 concludes with a summary of the main findings of the empirical analysis.

2. The data

The firm's exit model is estimated based on annual panel data on firms operating in the Slovenian manufacturing sector (NACE 15-37) in the 1994-2003 period.[2] The data set covers the whole population of manufacturing firms registered in Slovenia, which amounts to 9,711 firms operating between 1994 and 2003. Firms with a zero number of employees and a negative value of equity were dropped from the sample which gives 7,652 firms in the final sample.

The year of exit and entry is defined according to the effective definition of market operations (i.e. the last (first) year of a firm's effective operation defined by positive sales and employment). Foreign-owned firms are defined as firms in which foreign owners have at least a 10% equity share. For the purpose of distinguishing between different types of FDI, foreign acquisitions are identified when a firm recorded a switch from being classified as a domestic firm in the previous year to being classified as a foreign firm in the year of acquisition. In contrast, the entry of a foreign-owned firm which was not previously registered as a domestic firm is classified as greenfield investment. The main descriptive statistics and indicators of the importance of foreign firms in the Slovenian manufacturing sector are presented in Tables 1 and 2.

Table 1: Average size, labour and total factor productivity, real average annual wage and export propensity of domestic and foreign firms in the Slovenian manufacturing sector, 1994-2003

	Employment		Labour productivity 1000 SIT (1994 prices)		TFP dom. firm in 1994=100		Annual wage 1000 SIT (1994 prices)		Capital intensity 1000 SIT (1994 prices)		Export propensity	
	Dom	For	Dom	For	Dom	For	Dom	For	Dom	For	Dom	For
1994	62	114	1,963	2,879	100	121	724	1,275	4,139	6,459	0.16	0.47
1995	55	113	2,032	2,453	101	131	799	1,105	4,255	4,170	0.15	0.45
1996	49	103	2,232	3,038	103	132	884	1,254	4,517	5,792	0.15	0.48
1997	44	93	2,417	2,924	101	143	985	1,324	5,748	6,133	0.16	0.47
1998	41	108	2,448	3,362	100	150	1,045	1,440	4,864	7,398	0.16	0.50
1999	40	111	2,711	3,934	102	163	1,139	1,529	5,141	7,745	0.16	0.50
2000	36	150	2,716	4,129	101	170	1,194	1,676	5,324	9,330	0.16	0.54
2001	39	141	3,070	4,422	102	164	1,281	1,742	5,627	8,293	0.16	0.59
2002	38	139	3,406	4,107	102	148	1,377	1,752	8,214	8,089	0.16	0.55
2003	37	137	3,542	4,635	102	155	1,477	1,886	8,159	10,940	0.16	0.58

Note: Summary statistics exclude firms with 0 employees and which reported non-positive equity.

There is a notable and persistent difference between domestic and foreign firms with respect to all characteristics shown in Table 1. As expected, throughout the whole period foreign firms have a higher average size, higher labour and total factor productivity (TFP) and higher capital intensity compared to domestic firms with the only exception of capital intensity in 2002. Foreign firms also pay higher average wages and are more export-oriented than their domestic rivals, selling around half of their output abroad. A slight convergence between domestic and

[2] Financial data were obtained from the database of firms' financial statements collected by the Agency of the Republic of Slovenia for Public Legal Records and Related Services. The data on firms' formation, legal and organisational forms and termination of operation were obtained from the Business Register of Slovenia. Other data were provided by the Statistical Office of Republic of Slovenia.

foreign firms can be seen in terms of average labour productivity, while domestic firms have been unable to decrease the gap in TFP.

Table 2: The relative importance of foreign firms in the Slovenian manufacturing sector according to selected indicators, 1994-2003

	No of firms			Employment	Fixed assets	Value added
	Domestic	Foreign	For. firm share	For. firm share	For. firm share	For. firm share
1994	3,304	171	4.9	8.4	11.7	12.4
1995	3,910	186	4.5	8.6	11.3	12.3
1996	4,175	243	5.5	10.1	14.6	13.4
1997	4,377	246	5.3	10.7	16.1	14.5
1998	4,437	256	5.5	13.1	19.8	17.7
1999	4,573	247	5.1	13.0	19.1	18.7
2000	4,607	300	6.1	21.4	33.5	32.4
2001	4,693	284	5.7	17.6	22.1	23.2
2002	4,782	347	6.8	20.5	26.0	27.8
2003	4,912	297	5.7	18.2	22.5	21.5

Note: summary statistics exclude firms with 0 employees.

As can be seen in Table 2, the importance of foreign-owned firms increased during the period considered according to all measures. At the end of our period, foreign firms accounted for approximately 18% of manufacturing employment and above 20% of both fixed assets and value added.

3. Empirical model specification and a description of the variables

Both the theoretical and empirical literature often study firm exits and growth together as an outcome of a single economic process of industrial evolution. Most recent studies adopt the framework of firm and industry dynamics models which focus on the selection process among heterogeneous firms within a particular industry that operates through the entry and exit process and emphasise the importance of firms' learning processes for the selection and evolution process within the industry. These models are thus also known as 'learning models' which presume that the entrant typically does not know its own cost structure (efficiency), but discovers it through the processes of passive learning (Jovanović 1982) or active learning (Ericson and Pakes 1995) from actual market experience subsequent to entry.

Recently, models of industry dynamics with heterogeneous firms have been integrated into general equilibrium trade models by Bernard et al. (2003) and Melitz (2003). The models focus on the effects of increased foreign competition through the lowering of trade barriers on evolution processes within industries. While they are similar in their main prediction that trade liberalisation forces the least efficient firms to contract or exit while promoting the growth and success of more efficient ones, they differ with respect to channels and motivations. The models of firm and industry dynamics that also account for foreign competition are almost exclusively based on trade and do not consider the FDI entry mode.

I chose a general dynamic model of heterogeneous firm behaviour that mostly follows the model of Olley and Pakes (1996) model and its empirical application in Bernard and Jensen (2002). This framework is general enough to allow the testing of various predictions of FDI's impacts on domestic firms' survival in the Slovenian manufacturing sector.

The firm is assumed to maximise the expected discounted value of its future net cash flows. A single-period net cash flow is equal to the current profit π_t minus the cost of the current investment c(i_t), where i_t is the level of investments. Factors that affect current profits are classified in four groups: (i) firm characteristics, i.e. a set of the firm's own state variables ($\boldsymbol{\lambda_t}$); (ii) a vector of state variables $\boldsymbol{\gamma_t}$ that summarises the market structure of the domestic industry including the firm's own prior investment history ($\boldsymbol{\gamma_t}$), (iii) factor prices ($\boldsymbol{\tau_t}$), which are assumed to be common across firms and to evolve according to an exogenous first-order Markov process; and (iv) other exogenous factors ($\boldsymbol{\theta_t}$) that reflect conditions outside the domestic industry ($\pi_t(\boldsymbol{\lambda_t}, \boldsymbol{\theta_t}, \boldsymbol{\tau_t}, \boldsymbol{\gamma_t})$). According to the Olley and Pakes model, the firm's own state variables $\boldsymbol{\lambda_t}$ include the age of the firm a_t, the firm's capital stock k_t, and an index of the firm's efficiency ω_t ($\boldsymbol{\lambda_t} = (a_t, k_t, \omega_t)$). [3]

At the beginning of every period, an incumbent firm has two decisions to make. Firstly, it decides whether to exit or continue to operate. If it exits, it receives a liquidation value of φ. And secondly, provided a firm decides to continue, it chooses variable factors (labour) and a level of investments (i_t).[4]

Following Olley and Pakes (1996) and Bernard and Jensen (2002), the general Bellman value function for the dynamic programme of the firm that maximises the expected discounted value of its future net cash flows can then be written as:

$$V_t(\boldsymbol{\lambda_t}, \boldsymbol{\theta_t}, \boldsymbol{\tau_t}, \boldsymbol{\gamma_t}) = \max \{\varphi, \sup \pi_t(\boldsymbol{\lambda_t}, \boldsymbol{\theta_t}, \boldsymbol{\tau_t}, \boldsymbol{\gamma_t}) - c(i_t) + \beta E[V_{t+1}(\boldsymbol{\lambda_{t+1}}, \boldsymbol{\theta_{t+1}}, \boldsymbol{\tau_{t+1}}, \boldsymbol{\gamma_{t+1}})|J_t]\}, \quad (1)$$

where $\pi_t(\cdot)$ is the restricted current profit function, β is the firm's discount factor, and J_t represents the information available at time *t*. Only if the ongoing value of the firm is greater than the liquidation value does the firm choose a non-negative value of investment. If the indicator function χ_t is defined to be 1 if the firm exits, then the exit rule is specified as:

$$\chi_t = \begin{cases} 1 \ if \ \ d_t < \underline{d}_t(\boldsymbol{\lambda_t}, \boldsymbol{\theta_t}, \boldsymbol{\tau_t}, \boldsymbol{\gamma_t}), \\ 0 \ otherwise, \end{cases} \quad (2)$$

[3] The index of productivity, ω, is known to the firm and evolves over time according to an exogenous Markov process. The distribution of ω_t conditional on all information known at *t* is determined by the family of distribution functions $F_\omega = \{F(\cdot|\omega), \omega \in \Omega\}$.

[4] The capital stock at the beginning of the next period is thus determined by $k_{t+1}=(1-\delta)k_t + i_t$.

Two different parametric specifications of exit decision function (2) are used: probit and complementary log-log model. Firstly, a probit model specification of exit decision function (2) is given by:

$$\Pr(dexit_{it} = 1 | \mathbf{X_{it}}) = \Phi(\mathbf{X}_{it}\boldsymbol{\beta}), \tag{3}$$

where $dexit_{it}$ is the dependent binomial variable, which takes the value of 1 in the year of a firm's exit and 0 for all previous years and $\mathbf{X_{it}}=(\boldsymbol{\lambda_t}, \boldsymbol{\theta_t}, \boldsymbol{\tau_t}, \boldsymbol{\gamma_t})$. The factors $\boldsymbol{\tau_t}$ and $\boldsymbol{\theta_t}$ are both captured by the inclusion of annual dummies.

Secondly, complementary log-log model (*cloglog*) which is a discrete time version of the proportional hazard model is chosen from survival framework to capture the particular nature of the data set which is collected on a yearly basis. As argued by Jenkins (2004) the complementary log-log model is the most commonly used discrete-time model for dealing with intrinsically continuous but grouped data. The underlying assumption of the proportional hazard model is that the hazard rate depends only on time at risk, so-called baseline hazard $\theta_C(t)$ and on explanatory variables affecting the hazard independently of time $exp(\boldsymbol{\beta}'\mathbf{X})$. The hazard rate function is defined as the probability of failure in interval j and j+1 divided by the probability of surviving at least until j. Following Prentice and Gloeckler (1978) and Jenkins (2004) the discrete-time hazard function takes the following form when complementary log-log distribution is assumed:

$$h(j, \mathbf{X}) = 1 - \exp[-\exp(\boldsymbol{\beta}'\mathbf{X} + \gamma_j)], \tag{4}$$

where h(j,**X**) indicates the interval hazard for the period between beginning and the end of the j^{th} interval (year) and γ_j is interval baseline hazard defined as log of the difference between the integrated baseline hazard $\theta_C(t)$ evaluated at the end of the interval (a_{j-1};-a_j) and the beginning of the interval , $\gamma_j = \log \int_{a_{j-1}}^{a_j} \theta_0(t)dt$.

Various factors proposed by different theoretical models and empirical studies are included in probit and *cloglog* specifications. A higher-order logarithmic expansion in principal firm-specific variables was tested until there is no evidence of further nonlinearity, yielding the following regression equation of the firm exit model (3):

$$\begin{aligned}\Pr(dexit_{it}=1) = {} & \beta_0 + \beta_1 MNEentry_{jt} + \beta_2 entry_{jt} + \beta_3 ReghFDI_{jrt} + \beta_4 BackFDIlag_{jt} + \beta_5 ForFDIlag_{jt} + \beta_6 HHI_{jt} + \beta_7 plants_{ij} + \\ & + \beta_8 fdi_{ijt} + \beta_9 ExProp_{ijt} + \beta_{10} ExProp2_{ijt} + \beta_{11} \ln Empllag_{ijt} + \beta_{12} \ln Empl2lag_{ijt} + \beta_{13} \ln TFPlag_{ijt} + \beta_{14} \ln Kintlag_{ijt} + \\ & + \sum \beta_{15,a} dage_a + \sum \beta_{16,t} dyear_t + \sum \beta_{17,j} dindustry_j + \sum \beta_{18,l} downertype_l + \eta_i + \varepsilon_{ijt}\end{aligned} \tag{5}$$

where subscripts i, j and t refer to firms, industries and years, respectively. Ln in variable names denotes the natural logarithm of a particular variable, while 2 (sq) denotes that the variable enters the estimation in a squared form. All values of the financial variables are deflated using producer prices indices at the 2-digit NACE classification.

Among the principal firm characteristics that affect a firm's exit decision the theories postulate a firm's size, age and productivity. The size of a firm ($empl_{ijt}$) is measured by the number of employees. A firm's age enters the model with a set of age dummies.[5] I also test the robustness of the results by including an age variable in a logarithmic form and the results are robust. Productivity is measured as total factor productivity (TFP_{ijt}) based on production function estimates (see the next section). Firm dynamics models predict that smaller and younger firms are less likely to survive but they grow faster than old and large firms. The productivity of the firm is expected to negatively affect the likelihood of an exit.

Further, I include capital intensity $Kint_{ijt}$, measured by real fixed assets per worker. The capital intensity of a firm is expected to positively affect its ability to survive and grow. According to the Olley and Pakes model, the stock of physical capital affects the distribution of future plant productivity[6]. In this case, capital intensity may act as a proxy for other unobserved sources of efficiency leading to the higher likelihood of an exit and lower growth for low-capital-intensity plants. However, employment, TFP and capital intensity may not be entirely exogenous because if the firm starts downsizing before closing, these variables may change, and this change can be a good predictor for the exit decision. Therefore, I use lagged values of these variables in model specifications.

As I use a firm as a unit of observation I must control for the number of firm i's subsidiaries ($plants_{ij}$) as the theory and empirical evidence suggests that hazard and growth rates differ between a single- and multi-plant firm. For testing the impact of the exporting export propensity defined as a share of exports in the firm's total sales ($ExProp_{ijt}$) is included. It is expected that firm's export orientation positively affects its probability of survival.

Among the industry characteristics I include the Herfindahl-Hirschman index HHI_{jt} to measure market concentration. HHI_{jt} is defined as the sum of the squares of the market shares of all firms within a particular industry at the 5-digit NACE level. The expected effect of market concentration it is not so clear-cut. On the one hand, the price level is more likely to be elevated above the long-run average cost at the minimum efficient scale (MES) level of output in concentrated industries which may facilitate the survival of suboptimal scale firms which is what typical entrant firms are. On the other hand, firms in highly concentrated markets may be subjected to fierce aggressive behaviour by rivals which may reduce their chances of survival. The time-invariant market characteristics are captured in the set of industry dummies.

The principal explanatory variables in the paper refer to the entry and presence of foreign-owned firms to test for their intra- and inter-industry effects on indigenous firms' survival. Intra-industry crowding-out effect of foreign firm entry is tested with the entry rate variables $MNEentry_{jt}$, $GREENentry_{jt}$, $ACQUISentry_{jt}$, and $entry_{jt}$ at the 3-

[5] Firm's true age counted from its formation year according to the Business Register is corrected in case the firm has been established before the start of transition (before 1991) since pre-transitional experiences cannot be equalized with post-transition ones with regard to a firm's learning process. In this case age is counted from the year 1991 onwards.

[6] There is a relationship between a producer's underlying efficiency and the incentive to invest in capital. Essentially, efficient firms generate higher levels of investment and larger capital stocks.

digit level of the NACE classification. $MNEentry_{jt}$ denotes the foreign firm entry rate defined as the number of foreign entrants (greenfield and acquisitions) divided by the total number of firms operating in the industry *j*, $GREENentry_{jt}$ and $ACQUISentry_{jt}$ define entry rates considering only greenfield or acquisition entrants, respectively, and $entry_{jt}$ as an entry rate considering all entrants including domestic and foreign ones. All three measures exclude the firm for which the observation is taken. $MNEentry_{jt}$, $GREENentry_{jt}$ and $ACQUISentry_{jt}$ test the within industry crowding-out effect which takes place upon foreign firms' entry, while $entry_{jt}$ serves as a controlling variable to control for the impact of a new firm entry in general. As it is quite likely that MNEs are attracted to industries that offer favourable conditions which also stimulates domestic firm entry levels, estimates that do not control for this possibility may lead to an overestimation of the crowding-out effect of foreign firms' entry. An alternative specification of horizontal FDI variable based on stock definition that measures the concentration of foreign firms in particular industry (the foreign firms' share in total industry employment)[7] was also tested. The results were similar but less significant. Hence, I report only the results based on above described flow definition of foreign entry.

To test the hypothesis that the crowding-out effect is more pronounced for firms that are orientated towards the domestic market due to stronger competition effects from foreign firms' entry interaction term between entry rate variables and $ExProp_{ijt}$ ($MNEentry \times ExProp_{ijt}$, $GREENentry \times ExProp_{ijt}$, $ACQUISentry \times ExProp_{ijt}$) is included. Hence, a negative sign of this interaction term is expected.

$ReghFDI_{jrt}$ measures regional intra-industry foreign firm concentration in terms of employment shares and tests whether any intra-industry effects are reinforced when domestically owned firms are located close to foreign firms. More specifically, it is defined as:

$$ReghFDI_{jrt} = \frac{\sum_{i=1}^{m} empl_{ijrt} \cdot fdi_{ijt}}{\sum_{i=1}^{m} empl_{ijrt}}, \qquad (6)$$

where *m* denotes the number of firms within industry *i* and region *r* (at the NUTS 3 level). The dummy variable fdi_{ijt} denotes foreign ownership. It takes a value of 1 for 'foreign firms' considering a 10% ownership share threshold.

The inter-industry effects are tested through two additional explanatory variables $BackFDI_{jt}$ and $ForFDI_{jt}$ measuring the concentration of FDI in backwardly and forwardly linked industries with industry *j*. $BackFDI_{jt}$ measures the extent of potential contacts between local suppliers and foreign firms (vertical connections between local suppliers and foreign affiliates – customers) and thus tests the presence of 'backward' inter-industry spillovers:

[7] Such specification based on the employment share of foreign firms is used in several studies testing the presence of horizontal spillover effects (among others in Barrios et al. 2005; Keller and Yeaple 2003; Görg and Strobl 2003).

$$BackFDI_{jt} = \sum_{k;k\neq j} \alpha_{jk} \cdot hFDI_{kt} \,, \tag{7}$$

where technical coefficient α_{jk} denotes the share of product *j* originating from domestic production that is used by industry *k* in its intermediate consumption (excluding final use and imports of intermediate products) and the variable $hFDI_{kt}$ represents the foreign firms' share in total industry *k* employment. This variable accounts for the impact of foreign affiliates on their upstream local suppliers, that is for the impact of the concentration of foreign firms in industries to which industry *j* supplies its output.

The extent of potential contacts between local customers and foreign firms-suppliers (through forward linkages) is measured by $ForFDI_{jt}$:

$$ForFDI_{jt} = \sum_{k;k\neq j} \delta_{jk} \cdot hFDI_{kt} \,, \tag{8}$$

where the technical coefficient δ_{jk} denotes the share of input *k* in the total intermediate consumption of industry *j*.[8] This variable accounts for the impact of foreign affiliates on their downstream local customers (the impact of the concentration of foreign firms in industries that provide inputs for industry *j*). A negative and statistically significant coefficient in the exit model would suggest there are positive inter-industry externalities connected to the concentration of foreign-owned firms in vertically linked industries. As expected, the impact of vertical FDI concentration operates with lags (one year lag) while the impact of $MNEentry_{jt}$, variable is most significant upon the foreign firm entry when the competitive pressure is most pronounced.[9]

To control for the industry- and time-specific effects throughout our 1994-2003 sample period I include annual dummies $dyear_t$ and industry dummies at the 3-digit level of NACE $dindustry_j$**.** Additionally, dummies for ownership type $downertype_l$ discriminating among different types of ownership are included.

Several other variables were also tested but, due to insignificant coefficients or multicollinearity in all empirical specifications, were not included in final empirical models. Among others, I tested for the effect of average yearly real wage per employee, ratio of long-term debt to total assets, a minimum efficient scale defined as the log of median employment size in industry *j* and industry growth with respect to the previous year defined as the growth of total employment within particular industry *j*.

[8] Technical coefficients α_{jk} and δ_{jk} are obtained from the input-output table, more specifically from 'Use table for the domestic output at basic prices'. As the input-output table for the Slovenian economy is not available for all years in our 1994-2003 sample, the year 2000's I-O table was chosen as a base for the technical (input) coefficient calculation. $BackFDI_{jt}$ and $ForFDI_{jt}$ are constructed at the 2-digit level of NACE which is the most detailed level of the I-O table available.

[9] The impact of vertical FDI is robust to inclusion of controlling variables that measure the general concentration of economic activity in interrelated industries defined as backwardly and forwardly linked industries' share of total manufacturing employment weighted by technical coefficients α and δ.

To motivate the multi-variable estimations, unconditional relationships between the FDI variables and the probability of firm exit from a single variable heteroscedastic probit exit model are reported in Table 3 along with the means of each FDI variable for two types of firms, exiting firms and survivors. On the one hand, there is a strong and significant negative relationship between a local firm's exit and the concentration of foreign firms' activity in vertically linked industries (backward and forward). Similarly, the unconditional relationship is negative for the local intra-industry concentration of foreign firm activity within the same region. Particularly large is the marginal effect on the probability to exit through forward linkages with local customers. On the other hand, the marginal probability of exit is significantly increasing in the foreign firm entry rate. The estimated direction of the FDI influence on the probability to exit is in accordance with our expectations: the entry/presence of foreign firms decreases survival probability of incumbent firms within the industry (competition effect prevails upon horizontal productivity spillover effects), while it positively affects firm's survival in vertically linked industries and within the same region.

Table 3: Means and single variable heteroscedastic probit exit model estimations

	Survivors Mean	Exiting firms Mean	Coef.	Marginal effects dP/dX
MNEentry	0.0102	0.0098	1.02* (1.78)	0.094*
GREENentry	0.0030	0.0031	1.65 (1.51)	0.154
ACQUISentry	0.0073	0.0068	0.75 (1.08)	0.070
ReghFDI	0.0202	0.0160	-0.43* (-1.78)	-0.040*
BackFDIlag	0.0630	0.0564	-0.74*** (-3.22)	-0.068***
ForFDIlag	0.0551	0.0491	-2.59*** (-4.75)	-0.236***

Notes: - t-statistics are in parentheses, Huber--White sandwich estimator of variance, ***, **, * denotes significance at the level of 1%, 5% and 10%, respectively. Time dummies included in all specifications. Marginal effect at means after heteroscedastic probit estimation.

4. Econometric issues

4.1 Heteroscedasticity

There are several potential econometric problems of estimating probit exit models with heteroscedasticity (e.g. Hall 1987; Evans 1987). Most models of heterogeneous firm dynamics predict that firm size and age affect the conditional variance of the firm's growth and exit decision. Indeed, most studies actually confirmed that the variability of firm growth decreases with firm size suggesting that variance is not constant across firms. When based on Wald's test for heteroscedasticity the null hypothesis of homoscedastic variance (i.e. H_0: $\ln(\sigma_i^2)=0$) can be rejected I apply a heteroscedastic probit model that generalises the probit model by generalising the cumulative distribution function (CDF) of a standard normal random variable $\Phi()$ with a mean of 0 and variance of 1 to a normal CDF with a variance no longer fixed at 1 but allowed to vary as a function of the independent variables. Following Harvey (1976), the general formulation of the heteroscedastic model is $\Pr(y_i=1)=\Phi(\mathbf{x_i b}/\exp(\mathbf{z_i}\gamma))$, where $\mathrm{Var}[\varepsilon_i]=\sigma_i^2=[\exp(\mathbf{z_i}\gamma)]^2$.

4.2 Unobserved heterogeneity-endogeneity problem

To control for the possibility that unobserved firm-specific effects are correlated with regressors and to obtain consistent maximum likelihood estimates in probit models, I parameterise unobserved heterogeneity (unobserved firm-specific effects - η_i) in the manner suggested by Mundlak (1978), Chamberlain (1984), Wooldridge (2002):

$$\eta_i = \alpha_0 + \alpha_1 \overline{\mathbf{X_i}} + u_i \qquad (9)$$

where unobserved heterogeneity η_i is a linear function of a vector of the firm-level means of all time-varying independent variables over the sample period ($\overline{\mathbf{X}}_\mathbf{i}$) and u_i is assumed to be distributed N(0, σ_u^2) and independent of **X** variables and the idiosyncratic error term ε_{it} (Kosová (2006) uses the same approach). In addition, annual industry-level means of all firm-time-varying independent variables ***X*** are included to account for the industry-specific shocks that are not captured by the industry characteristics explicitly included in the empirical model specifications.

4.3 Endogeneity

Another potential econometric concern which may cause biased estimates when testing for the direct impact of foreign ownership on a firm's exit decision is the possibility that the foreign ownership dummy variable (fdi_{ijt}) might not be entirely exogenous. It is usually argued that foreign investors tend to acquire shares in the most successful and larger firms and therefore experience a lower probability of exiting or higher growth ceteris paribus (see Djankov and Hoekman 2000; Evenett and Voicu 2001; Damijan et al. 2003). More specifically, fdi_{ijt} may be endogenous if the decision for FDI (in the form of foreign acquisitions) is correlated with unobservables that affect a firm's exit decision.

To deal with this problem I instrument for fdi_{ijt} and employ instrumental variables models. I use the two-stage method proposed by Newey (1987)[10] for limited dependent variable models with endogenous explanatory variables to estimate the exit model. The instruments employed are size, size squared, age, age squared, the ratio of net profits to sales, export propensity, TFP and average wage. I use lagged values of these instruments for domestic firms, values of the instruments in the year before an acquisition takes place for firms that have been acquired by foreign investors and the first-year values for greenfield FDI. To avoid autocorrelation the first-year observations for greenfield investments are dropped.

4.4 Total factor productivity estimates

There are additional potential econometric concerns related to the estimation of a firm's TFP. Typically, TFP is estimated as the residual in the production function estimates based on firm-level panel data. As simultaneity bias may result from the endogeneity of production inputs, caused by a correlation between unobservable productivity shocks and input levels causing the regressors and the error term to be correlated which makes OLS

[10] I perform instrumental variable probit estimates using the STATA module developed by Gelbach (1999, [http://fmwww.bc.edu/repec/bocode/p/probitiv.ado]).

estimates inconsistent. A bias thus occurs when at least part of the TFP is observed by the firm early enough to allow the firm to change its factor input decision. Several methods of controlling for a simultaneity bias are proposed in the literature. Olley and Pakes (1996) developed an estimator that uses investment as a proxy for these unobservable productivity shocks. One of the drawbacks of the Olley and Pakes approach is that there must be a strictly monotonous relationship between the proxy (investment) and output for obtaining consistent estimates. This means that observations with a zero investment have to be dropped from the sample. Therefore, to avoid truncating observations with a zero investment I follow Levinsohn and Petrin's (2003) approach and employ their two-step estimator which uses intermediate inputs as proxies. Another advantage of this estimator is that intermediates may respond more smoothly to productivity shocks and may respond more fully to the entire productivity term than investment (investment is usually associated with substantial adjustment costs).

5. Results

The results of different specifications of a firm's exit model (5) including pooled probit, random-effects probit and maximum-likelihood complementary log-log survival are presented in Table 4. For all estimated specifications of the exit model Wald's test of a full versus a constant only model indicates that the full model is significant at negligible risk. In the first five specifications the pooled probit model estimations of a firm's exit (5) with standard error adjusted for firm clusters which specifies that observations are independent only across clusters (firms) but not necessarily within clusters (firms) are reported. Based on Wald's test for heteroscedasticity in the form of $\sigma_i^2 = [\exp(\gamma \cdot \ln Empllag_i)]^2$ I cannot reject the null hypothesis of homoscedastic variance (i.e. H_0: $\ln(\sigma_i^2)=0$).

Regarding the key variables, the results (Table 4) confirm the expected positive impact of a foreign firm's entry via FDI on the probability of incumbent firms exiting within particular industry as the estimated coefficient on the variable $MNEentry_{jt}$ is positive and significant. The evidence of the crowding-out effect (increased probability of exiting) upon foreign firms' entry is robust to the inclusion of the controlling variable for the general entry rate. Expressing the marginal effects at sample mean[11] I find that if the foreign firm entry rate increases by one structural point, the exit probability increases on average by 3.6% all else being equal (specification 1, Table 4). As expected, when I control for TFP (specification 2, Table 4) which takes up productivity spillover effects, the regression coefficient of $MNEentry_{jt}$ variable becomes higher and more significant. But this change is relatively modest, which helps to highlight the insignificant coefficient of the horizontal productivity spillovers variable found in a previous study on the Slovenian manufacturing sector by Damijan et al. (2003). The results suggest that productivity spillover effects offset only a minor part of competition pressure upon foreign firm entry; hence incumbent firms face increased probability of exiting due to foreign firms' entry in a particular industry.

[11] Marginal effects refer to the marginal probability change at the mean of independent variables or the change in probability for a discrete change in a dummy variable from 0 to 1.

Table 4: Exit model estimates for Slovenian manufacturing firms

	Pooled probit					RE probit	cloglog
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MNEentry	1.51* (1.79) [.089]	1.71** (1.92) [.096]	2.97*** (3.03) [.167]				
MNEentry× ExProp			-8.12*** (-2.64) [-.456]				
GREENentry				3.48** (2.12) [.196]	5.52*** (3.00) [.310]	4.51*** (2.63)	6.99** (2.07) [1089.1]
GREENentry ×ExProp					-11.75** (-2.41) [-.659]		
ACQUISentry				0.76 (0.72) [.043]	1.70 (1.45) [.095]	0.48 (0.38)	1.67 (0.74) [5.33]
ACQUISentry ×ExProp					-6.67* (-1.71) [-.374]		
entry	0.42 (1.23) [.025]	0.38 (1.07) [.021]	0.37 (1.04) [.021]	0.32 (0.90) [.018]	0.31 (0.87) [.017]	0.30 (0.72)	0.57 (0.76) [1.77]
ReghFDI	-0.55* (-1.70) [-.032]	-0.82** (-2.31) [-.046]	-0.82** (-2.32) [-.046]	-0.83** (-2.40) [-.047]	-0.84** (-2.44) [-.047]	-0.84** (-1.96)	-1.85** (-2.12) [0.16]
BackFDIlag	-0.84 (-0.81) [-.049]	-0.48 (-0.46) [-.027]	-0.46 (-0.43) [-.026]	-0.46 (-0.44) [-.026]	-0.42 (-0.40) [-.024]	-0.75 (-0.51)	-0.79 (-0.36) [0.46]
ForFDIlag	-2.71** (-2.01) [-.159]	-2.86** (-2.08) [-.162]	-2.91** (-2.11) [-.163]	-2.81** (-2.04) [-.158]	-2.87** (-2.08) [-.161]	-3.50** (-2.18)	-5.58* (-1.81) [.004]
HHI	0.15 (0.95) [.009]	0.13 (0.84) [.008]	0.12 (0.77) [.007]	0.14 (0.87) [.008]	0.12 (0.78) [.007]	0.21 (1.08)	0.39 (1.14) [1.47]
plants	-0.12*** (-5.17) [-.007]	-0.12*** (-5.14) [-.007]	-0.12*** (-5.15) [-.007]	-0.12*** (-5.13) [-.007]	-0.12*** (-5.15) [-.007]	-0.13*** (-4.32)	-0.29*** (-4.96) [0.75]
fdi	0.11* (1.71) [.007]	0.15** (2.21) [.010]	0.15** (2.29) [.010]	0.15** (2.19) [.009]	0.15** (2.28) [.010]	0.18** (2.12)	0.33** (2.23) [1.39]
ExProp	-1.15*** (-5.03) [-.068]	-1.05*** (-4.53) [-.059]	-0.97*** (-4.13) [-.054]	-1.05*** (-4.54) [-.059]	-0.97*** (-4.12) [-.054]	-2.46*** (-5.72)	-2.37*** (-4.50) [0.09]
ExProp2	1.30*** (5.26) [.077]	1.20*** (4.78) [.068]	1.20*** (4.78) [.067]	1.20*** (4.79) [.068]	1.20*** (4.77) [.067]	2.30*** (4.83)	2.68*** (4.75) [14.51]
ln*Empllag*	-0.17*** (-6.66) [-.010]	-0.13*** (-4.96) [-.008]	-0.14*** (-5.00) [-.008]	-0.14*** (-4.97) [-.008]	-0.14*** (-5.03) [-.008]	-0.10* (-1.77)	-0.29*** (-4.81) [0.75]
ln*Empl2lag*	0.01* (1.85) [.001]	0.01 (1.39) [.001]	0.01 (1.47) [.001]	0.01 (1.39) [.001]	0.01 (1.50) [.001]	0.01 (0.42)	0.02 (1.36) [1.02]
ln*TFPlag*		-0.18*** (-6.43) [-.010]	-0.18*** (-6.38) [-.010]	-0.18*** (-6.45) [-.010]	-0.18*** (-6.41) [-.010]	0.05 (0.93)	-0.39*** (-7.02) [0.68]
ln*Kintlag*	-0.07*** (-7.46) [-.004]	-0.07*** (-6.61) [-.004]	-0.07*** (-6.61) [-.004]	-0.07*** (-6.62) [-.004]	-0.07*** (-6.62) [-.004]	0.04* (1.59)	-0.15*** (-6.99) [0.86]
Cons	2.20*** (7.24)	2.77*** (8.72)	2.76*** (8.69)	2.78*** (8.76)	2.78*** (8.74)	4.36*** (4.37)	2.55*** (6.79)
Wald's test for heteroscedasticity. H_0: lnsigma2=0							
lnsigma2 ln*empllag*	0.022 (0.72)	-0.012 (-0.35)	-0.019 (-0.54)	-0.013 (-0.36)	-.022 (-0.62)		
chi2(1) (Prob>chi2)	0.52 (0.47)	0.12 (0.73)	0.29 (0.59)	0.13 (0.72)	0.38 (0.54)		
Likelihood-ratio test of rho=0: chi2(1) (Prob>chi2)						6.80*** (0.005)	
pseudo R2	0.085	0.089	0.090	0.089	0.090		
Log (pseudo-) likelihood	-4,625.5	-4,422.8	-4,418.5	-4,421.7	-4,416.8	-4,349.5	-4,456.0
N	31,522	31,108	31,108	31,108	31,108	31,108	31,108
Obs. P	0.038	0.036	0.036	0.036	0.036		
Pred P. at $\overline{\mathbf{X}}$	0.025	0.024	0.024	0.024	0.024		

Notes: - t-statistics are in parentheses, while marginal effects *dP/dX* for pooled probit models (1-5) and exponentiated coefficients (exp(**b**)) for *cloglog* model (7) are reported in square brackets. For dummy variables marginal effect *dP/dX* is for a discrete change from 0 to 1. Std. Err. adjusted for firm clusters. Huber--White sandwich estimator of variance. ***, **, * denotes significance at the level of 1%, 5% and 10%, respectively. Industry, time, and ownership dummies are included in all specifications, while age dummies only in probit specifications (1-6). Means of independent variables according to (9) included in RE probit specification (6). In *cloglog* (7) log(time) functional form of baseline hazard function is assumed.

To explore this further, the expectation that a foreign firm's entry does not affect the probability of exiting equally for firms with different export orientation is tested by the inclusion of the interaction term $MNEentry \times ExProp_{ijt}$ (specification 3, Table 4). It turns out that this interaction term has a negative and highly significant impact, while $MNEentry_{jt}$ becomes even more positive and significant which indicates that the strength of the crowding-out effect decreases with the firm's export propensity. The results thus suggest that within those industries facing a significant foreign firm entry a firm's export propensity offsets some of or even entirely the increased probability of exiting and that the probability of survival increases with export propensity more rapidly in those industries with a higher foreign firm activity (in terms of entry rate). Inferring from marginal effects, one structural point increase in foreign firm entry rate on average increases the exit probability of non-exporters by 7%. This result lends support to the prediction that the probability of exiting after a foreign firm entry increases the most among the non-exporting firms in the host economy. It appears that for firms which are mostly orientated towards the domestic market, the competition effect prevails over positive externalities, while for firms that sell an important part of their output abroad there is more scope for a net positive effect from foreign firm entry.

However, as pointed out by Ai and Norton (2003) the interaction effect in probit models cannot be evaluated simply by looking at the sign, magnitude and statistical significance of the coefficient on the interaction term, as the magnitude of the interaction effect depends on all covariates in the model. Instead it requires computing the cross derivative. Using Ai and Norton's (2003) programme I find that the interaction effect of $MNEentry \times ExProp_{ijt}$ is indeed negative for a substantial majority of observations and mostly significant. However, there is a group of observations belonging to relatively low predicted exit probabilities with positive but insignificant interaction effects. The statistical significance of the interaction effect is stronger when the interaction effect is negative.

Distinguishing between greenfield entry and foreign firm entry through acquisition (specification 4&5, Table 4), I find that although the impact of both two types of FDI on exit probability is positive, only the coefficient of the greenfield entry is confirmed as significant. The crowding-out effect of greenfield entry is considerably stronger compared to joint foreign firm entry rate (*MNEentry* variable). Expressing the marginal effects at sample mean, a firm's exit probability increases on average by 8.2% when greenfield entry rate increases by one structural point compared to 3.6% increase in case of *MNEentry* variable. This result is in line with general conviction of greater crowding out being associated with greenfield entry. Inclusion of the interaction terms with export propensity confirms that the impact of greenfield entry on incumbent firm's survival also depends on its export orientation (specification 5, Table 4) while the impact of acquisition entry remains insignificant. Similarly as in case of joint foreign firm entry rate, interaction term $GREENentry \times ExProp_{ijt}$ has a negative and highly significant impact, while $GREENentry_{jt}$ becomes even more positive and significant which indicates that the strength of the crowding-out effect associated with greenfield entry decreases with the firm's export propensity. However, in all model specifications the concentration of foreign firm activity within the industry and in the same region has a positive impact on firms' survival probability suggesting that geographical proximity plays an important role in the ability of local firms to benefit from foreign firms´ presence. This is in line with theoretical expectations that

several potential sources of spillovers, such as the mobility of workers and demonstration effects tend to be local in nature due to easier and cheaper communication in the case of a local presence.

Regarding vertical FDI concentration I find a significantly negative effect of foreign firms' presence on the probability of local firms exiting through forward linkages with one-period lag, suggesting that the presence of foreign affiliates does reduce the exit probability of their downstream local customers. According to the literature, local firms may benefit from their upstream foreign firm suppliers through several potential channels such as through the increased availability of inputs, through their qualitative improvement and/or price reduction etc. The beneficial effect on the price decline of intermediates is also emphasised as an important channel of increased foreign competition (through imports) in Bernard et al. (2003). However, more detailed data would be needed to test for these different channels.

However, there is no evidence that the presence of foreign firms would significantly affect the probability of shutting down their upstream local suppliers (through backward linkages). This result, at least at first sight, contradicts recent findings of positive productivity externalities connected to the extent of foreign firm presence through backward linkages for several transition countries.[12] However, the studies mentioned above estimate vertical (backward) spillovers conditioned on the survival of domestic firms in the upstream industry and only consider larger firms with more than 10 employees which are less likely to exit the market. Taking into account those findings on the positive effects of MNEs' presence in backwardly linked industries on the productivity of surviving firms and their insignificant impact on the probability of surviving, it appears that only successful surviving firms are able to take advantage of the MNEs' presence in downstream industries through backward linkages.

The impacts of other standard variables in exit and growth models are also in line with the theoretical predictions. Size and TFP both have a negative effect on the probability of exiting and are all highly significant. The second-order term of size is significantly positive, confirming the nonlinear relation between firm size and the probability of exiting, and is in accordance with several other studies that also found the presence of nonlinear size effect. All 11 age dummies with the first year of firm's operation being reference year are negative and highly significant at negligible risk which indicates that probability to shutdown is highest in the first year of firm's life (infant mortality). The exit probability decreases over survival time but not in fully monotone manner.

Among other firm characteristics that affect the prospects of survival, capital intensity and export propensity are found to significantly reduce the probability of exiting which indicates the importance of investments and market sales diversification for the firm's survival. Export orientation also exhibits a nonlinear relation with the probability to exit as indicated by a significant second-order term $ExProp2_{ijt}$. This result thus contradicts Konings and Xavier (2002) who found a negative effect of exporting status on firm survival for Slovenian manufacturing firms but for a different period.

[12] For instance, Damijan et al. (2003) for Czech Republic, Poland and Slovenia, and Smarzynska (2004) for Lithuania.

The number of a firm's subsidiaries decreases the probability of exiting, which corresponds to the prediction that multi-plant firms have a lower probability of death compared to single-plant firms, with everything else being equal. Regarding the effect of industry-specific factors, in all estimated versions of the exit model market concentration positively affects the probability of exiting although the coefficient is insignificant.

5.1. Accounting for heterogeneity

To account for heterogeneity the model specification (6) in Table 4 includes means of independent variables to control for unobserved 'correlated' heterogeneity according to equation (9) and employs a random-effects probit model to also explicitly account for that part of heterogeneity that is uncorrelated with firm-level means (u_i). The likelihood ratio test which compares the pooled (probit) estimator with the panel estimator with an asymptotic distribution of a 50:50 mixture of chi-square with no degrees of freedom (i.e. the point mass at zero) and a chi-square with 1 degree of freedom rejects the homogeneity (the null of no heterogeneity) at negligible risk. This suggests that the proportion of the total variance contributed by the panel-level variance component (ρ) is important. However, regarding the estimated coefficients for FDI variables, the random-effects probit results support previous estimates both with respect to the significance and relative magnitude of the estimated coefficients with the minor exception that the coefficient on *GREENentry* and *ForFDIlag* becomes even greater in magnitude. Not surprisingly, the main difference appears to be with respect to the significance of firm's characteristics as their impact is partly overtaken by firm-specific effects. More specifically, in random-effects probit estimates the impact of firm's size, TFP and capital intensity becomes mostly insignificant.

5.2 Accounting for duration dependence

Specification (7) in Table 4 reports results of complementary log-log (*cloglog*) survival model estimates. Different functional forms for the baseline hazard function were tested: log(time), cubic polynomial and fully non-parametric specification with duration-interval-specific dummy variables. All these specifications gave very similar results for all estimated coefficients hence only estimates based on log(time) specification are reported in Table 4. The coefficient on log(time) is negative indicating that the baseline hazard decreases with elapsed survival time.

Survival analysis (specification 7, Table 4) also supports probit results regarding the impact of FDI variables and other industry and firm characteristics on firm's probability of exiting with respect to the direction and significance of their impact. The minor exceptions are that the second-order term of size becomes insignificant and that a significance of $ForFDI_{jt}$ is a bit weaker in the complementary log-log estimations. However, the magnitudes of estimated coefficients cannot be directly compared. Therefore also exponentiated coefficients which can be interpreted as hazard ratios (since the *cloglog* model is the discrete time proportional hazards model) are reported for specification 7 in Table 4. The impact of foreign firm entry on firms' survival seems even bigger in magnitude compared to probit estimates. More specifically, one structural point increase in

foreign firm entry rate[13] is associated with approximately a 32% higher hazard rate.[14] The impact of greenfield entry is expectedly even more pronounced. From specification (7) in Table 4, it can be seen that an increase of one tenth of structural point in greenfield entry rate[15] is associated with more than 100% higher hazard rate. Furthermore, an increase in regional intra-industry foreign firm concentration and in concentration of FDI in forwardly linked industries by 10 structural points helps to reduce the exit hazard to 91.6 percent and to 90 percent in proportional hazard terms, respectively.

As probit analysis suggests that there is unobserved heterogeneity in the model I want to test the robustness with random effects *cloglog*. However, the problem is that there are left-truncated data in the data set (the data are observed only from 1994 onward) and the models with unobserved heterogeneity do not properly account for left-truncated data. Therefore, I perform random effects *cloglog* on a sub-sample of firms that where established after 1994 in which all firms with delayed entry are omitted to test the robustness of *cloglog* estimations. According to the likelihood–ratio test the hypothesis of rho=0[16] cannot be rejected; therefore it can be concluded that the unobserved heterogeneity ("frailty") is unimportant in this sub-sample. Therefore, only results of *cloglog* estimation on the whole population data are reported.

5.3 Correcting for endogeneity

In all estimated versions of the exit model reported in Table 4, the coefficient of the fdi_{ijt} dummy variable is positive and significant suggesting that foreign firms find it easier to exit compared to domestically owned competitors after controlling for other determinants of the exit decision. A survival analysis suggests that at each survival time, the hazard rate for foreign owned firms is 40% higher compared to domestic firms. These results support the findings of Görg and Strobl (2003) and Bernard and Jensen (2002) who confirm that foreign plants have higher hazards of exiting than indigenous plants. However, as already pointed out in the previous section, foreign ownership might not be entirely exogenous particularly where foreign investors tend to acquire shares in the most successful, larger domestic firms. Due to an expected downward bias in the estimated coefficient of foreign ownership dummy an even more pronounced difference between domestic and foreign firms with respect to exit probability is expected.

[13] According to Table 3 one structural point increase in *MNEentry* variable represents roughly a 100% increase compared to its mean value.

[14] The results of *cloglog* empirical specification with joint foreign firm entry variable (*MNEentry*) included are not reported in Table 4. The results can be obtained from the author.

[15] According to Table 3 one tenth of structural point increase in *GREENentry* variable represents roughly a 33% increase compared to its mean value.

[16] »Rho« is the ratio of the heterogeneity variance to one plus the heterogeneity variance. Chibar2(01) statistics is 0.11 with prob >= chibar2 = 0.372.

To deal with the problem of endogeneity, I instrument for the foreign ownership variable and estimate the instrumental variables probit by employing the two-stage method proposed by Newey (1987).[17] The IV probit model doesn't confirm the intuition of the downward bias in the estimated coefficient of foreign ownership dummy in the previous estimates. The Wald's test fails to reject the null hypothesis of exogeneity of the foreign ownership variable. When exploring further, I find that the influence of the foreign ownership variable is not uniform for the two different types of foreign investment. Only foreign ownership in the form of greenfield investment is associated with a greater probability of exiting compared to other firms, while there is no evidence of a significant impact for an acquisition type of foreign ownership. Regarding the estimated coefficients for the other variables, the IV probit results support previous estimates both with respect to the significance and magnitude of the estimated coefficients.

It can be concluded that estimates from the basic pooled probit model (Table 4) about the impact of foreign firms' entry and presence on the probability of exiting of incumbent firms are robust after controlling for unobserved heterogeneity, duration dependence and the potential endogeneity of the foreign ownership variable.

However, it has to be stressed that the IV probit's results crucially depend on the appropriateness (exogeneity) and quality of instruments used in the first step of the estimator. Besides, there is another issue that needs to be taken into account, namely the possibility that various factors affect the probability of exiting of domestic and foreign firms differently. Since the IV approach assumes that coefficients on the *X*'s (independent variables) are restricted to be the same for foreign and domestic firms I also estimate Heckman's maximum-likelihood probit selection correction model (endogenous switching regime model). I split the sample into foreign and domestic firms and then estimate the exit model for each sub-sample correcting for the fact that the sub-samples are non-random samples of all firms (Table 5).

The estimates for the sub-sample of domestic firms (Table 5, specification 1), corrected for selection bias which is according to Wald's test significant at 2% risk, largely support previous estimates based on the aggregate sample with respect to the significance and magnitude of the estimated coefficients. The minor exception is that the coefficient on regional intra-industry concentration of foreign firms' activity is slightly less significant. However, when not corrected for the selection bias, the impact of concentration of foreign firms in upstream industries *(ForFDIlag)* becomes insignificant.

On the contrary, the independence of the exit and selection equation cannot be rejected for the foreign firm sub-sample according to the Wald's test (Table 5, specification 3). This can be also seen from the comparison with the ordinary probit estimates on the sub-sample of foreign firms without controlling for the selection (Table 5, specification 4). The results for the foreign firm sub-sample (specification 3-4, Table 5) confirm that several factors considered in the model affect the probability of foreign firms exiting differently than in the case of

[17] I test robustness of the results by estimating both, an IV model in which I instrument for foreign ownership without distinguishing between different types of foreign investment, and an IV model in which I instrument for foreign ownership only in case of acquisition-type foreign investments. The IV model results can be obtained from the author upon request.

domestic firms. It appears that size and TFP have an insignificant impact on the probability of foreign firms exiting which is probably due to the greater multicollinearity of these variables with capital intensity compared to the sub-sample of domestic firms, while the impact of other firm characteristics is similar as for domestic firms. The impact of the number of subsidiaries on exit probability is considerably larger for foreign firms. Regarding the effects of the entry and presence of other foreign firms, there is no evidence for a significant impact neither within the same industry and/or region nor through backwardly and forwardly linked industries.

Table 5: Heckman's selection correction exit model for foreign and domestic firms

	Domestic firms	**Domestic firms**	**Foreign firms**	**Foreign firms**
	Heckman's selection 1	**Without selection 2**	**Heckman's selection 3**	**Without selection 4**
MNEentry	1.80** (2.11)	1.73** (2.05)	-6.31 (-1.40)	-5.95 (-1.29)
entry	0.41 (1.20)	0.29 (0.88)	0.28 (0.20)	0.16 (0.11)
ReghFDI	-0.66* (-1.82)	-0.62* (-1.73)	-1.85 (-1.59)	-1.84 (-1.58)
BackFDIlag	-0.57 (-0.56)	-0.64 (-0.62)	5.83 (1.17)	5.18 (1.05)
ForFDIlag	-2.93** (-2.12)	-2.16 (-1.56)	-3.86 (-0.57)	-3.84 (-0.57)
HHI	0.06 (0.39)	0.11 (0.72)	-0.51 (-0.64)	-0.53 (-0.66)
plants	-0.12*** (-5.48)	-0.14*** (-5.96)	-0.99*** (-2.52)	-0.98*** (-2.51)
ExProp	-1.09*** (-4.51)	-1.06*** (-4.47)	-1.50* (-1.71)	-1.50* (-1.73)
*ExProp*2	1.16*** (4.35)	1.10*** (4.18)	1.71** (1.99)	1.73** (2.03)
ln*Empllag*	-0.15*** (-5.59)	-0.15*** (-5.76)	-0.20 (-1.46)	-0.19 (-1.43)
ln*Empl2lag*	0.03*** (5.14)	0.03*** (6.03)	-0.02 (-0.62)	-0.02 (-0.64)
ln*TFPlag*	-0.20*** (-6.72)	-0.20*** (-6.76)	-0.07 (-0.77)	-0.07 (-0.81)
ln*Kintlag*	-0.07*** (-6.61)	-0.07*** (-6.32)	-0.06* (-1.66)	-0.06* (-1.73)
Cons	-0.32* (-1.80)	-0.07 (-0.41)	-0.50 (-0.77)	-0.50 (-0.78)
1. STAGE SELECTION	**domestic**		**fdi**	
domesticlag/fdilag	4.01*** (47.66)		3.99*** (48.50)	
ln*Empl0*	-0.09*** (-5.69)		0.08*** (5.30)	
ln*Age*0	0.59*** (6.20)		-0.63*** (-6.64)	
ln*Age*20	-0.12*** (-3.66)		0.13*** (4.02)	
*Profitsales*0	-0.01*** (-3.40)		0.01*** (3.01)	
*Exprop*0	-0.70*** (-9.05)		0.69*** (8.91)	
ln*TFP*0	0.35*** (7.28)		-0.30*** (-5.50)	
ln*Wage*0	-0.11*** (-14.07)		0.10*** (13.72)	
cons	-3.06*** (-13.33)		-1.10*** (-4.56)	
Wald's test of independent equations (H_0: rho=0)				
Athrho	0.245** (2.25)		-0.114 (-1.13)	
rho	0.240		-0.114	
chi2(1) (Prob>chi2)	5.08** (0.02)		1.27 (0.26)	
Log pseudo-likelihood	-5,792.7	-4,429.6	-1,708.0	-204.1
N (uncensored)	31,101 (29,216)	29,293	31,113 (1,862)	1,828

Notes: - t-statistics are in parentheses. Std. Err. are adjusted for firm clusters. Huber--White sandwich estimator of variance. ***, **, * denotes significance at the level of 1%, 5% and 10%, respectively. Industry, age and time dummies are included in all specifications. 0 in the variables' symbols in the first-stage selection equation refers to lagged values of these variables for domestic firms, values in the year before an acquisition takes place for firms that have been acquired by foreign investors and the first-year values for greenfield FDI.

The selection equation in the first stage of Heckman's probit selection correction model (Table 5, specification 3) indicates that MNEs tend to acquire shares in domestic firms that are larger, younger, have a higher export propensity and a higher ratio of profits to sales, and are more skill intensive (pay higher average wages), while the incidence of being acquired by a foreign investor is negatively related to TFP. Thus, our hypothesis that foreign owners invest in more efficient local firms is not entirely confirmed. This also helps to explain why IV probit doesn't confirm the downward bias in the coefficient on the foreign ownership dummy variable. These conclusions are partially in line with previous studies on the determinants of FDI selection for a sample of Slovenian manufacturing firms. Damijan et al. (2003) found for a sample of firms with more than 10 employees that the probability of a foreign investment decision is positively related to the skill intensity of a firm, while capital intensity, labour productivity and size have an insignificant effect.

6. Conclusions

In the paper I test several theoretical predictions on inward FDI's impacts on a local firm's exit decision. I estimate different empirical specifications of the exit probit model and a survival complementary log-log model using annual panel data on Slovenian manufacturing firms for the 1994-2003 period.

The theoretical expectations regarding the impact of inward FDI on firm selection processes in a host country prove to be mostly significant for the Slovenian manufacturing sector in the period considered. Incumbent firms experience a drop in their survival probability upon a foreign firm's entry if entry is of the greenfield type, while entry of the acquisition type has no significant effect on survival. The results also show that intra-industry productivity spillover effects offset only a minor part of the competition pressure which result from foreign firm entry within the industry, but the strength of the crowding-out effect decreases with the firm's export propensity. For firms which sell an important part of their output abroad there is more scope for the net positive effect from foreign firm entry.

Regarding vertical FDI concentration, a significantly negative effect of a foreign firm's presence on the probability of local firms exiting through forward linkages is found, indicating that the presence of foreign affiliates does reduces the exit probability of downstream local customers. In contrast, there is no significant evidence that inward FDI would affect the selection process also through backward linkages in the upstream supplying industries. Further, net positive externalities from foreign firms' activity are found also to be associated with the intra-industry concentration of foreign firms within the same region suggesting that geographical proximity plays an important role in the ability of local firms to benefit from foreign firms' presence.

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