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by

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Foreign Ownership and Firm Survival: First evidence for enterprises in Germany*

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Abstract:

This paper documents the relationship between foreign ownership and firm survival for enterprises in Germany using unique tailor-made new representative data that merge information from surveys performed by the Statistical Offices, from administrative data collected by the Tax Authorities and from a commercial data provider. It contributes to the literature by providing the first evidence on the role of foreign ownership for firm survival in Germany, one of the most important destination countries for foreign direct investments. Our micro-econometric analysis reveals a ceteris paribus higher risk of exit for foreign owned firms in West Germany but not in East Germany.

JEL classification: F23, L60

Keywords: Foreign ownership, firm survival, Germany

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1. Motivation

Germany is one of the leading destination countries for foreign direct investments (FDI) world-wide. According to the World Investment Report 2011 (published by the United Nations Conference on Trade and Development) only the US, Hong Kong, the UK and France had a larger FDI inward stock than Germany in 2010 (see UNCTAD 2011, Annex table I.2).[1] While the share of foreign owned firms (FOF)[2] in all firms in Germany is tiny – according to the Federal Statistical Office only 1.1 percent of all firms were FOF in 2008 - these firms employed 12 percent of all employees, and they contributed 26.7 percent to the total turnover and 20.2 percent to total value added (Nahm 2011). FOF are an important part of today's German economy.

Given this high importance of FOF it might come as a surprise that only little is known about the relative performance of these firms compared to firms controlled by German owners. Micro-econometric research on performance differentials between FOF in Germany and genuine German firms started only recently. The reason is that high-quality representative data on the foreign ownership status of enterprises in Germany became available for researchers early in 2011 only, covering the reporting years from 2007 onwards. In a series of papers Weche Gelübcke (2011a, 2011b, 2011c) uses these data (described in more detail in section 2 below) for 2007 and 2008 to document descriptive facts on FOF and to investigate performance differentials between FOF and German firms. He finds, among others, that on average FOF are larger and more productive, pay higher wages, are more often (and

[1] As regards the FDI outward stock Germany was number four (after the US, the UK and France) world-wide in 2010 according to the same source.

[2] A firm is regarded as a FOF when more than fifty percent of the voting rights of the owners or more than fifty percent of the shares are controlled (directly or indirectly) by a firm or a person/institution located outside Germany; see Nahm (2011) for details.

to a higher degree) involved in exports and invest more in research and development R&D). FOF tend to outperform domestic German firms in various dimensions.

One dimension of firm performance that has not been investigated for Germany is the role of foreign ownership for firm survival, a key dimension of firm performance for all stakeholders in a firm. Baldwin and Yan (2011) argue that from a theoretical point of view the relationship that should be expected between foreign ownership and firm exit is not clear. On the one hand, FOF may have access to superior technologies belonging to their foreign owners that might increase their efficiency and lower the risk of exit. The greater propensity to invest in R&D found in FOF in Germany might lead to more innovations, improve the competitiveness in Germany and on foreign markets and might therefore increase the chance to survive. On the other hand, Baldwin and Yan (2011) point out that FOF are less rooted in the host country economy and that they can shift their activities to another country when the local economy deteriorates. This should increase the probability of shutdown compared to nationally owned firms.

A number of recent micro-econometric studies use firm level data for FOF and domestically controlled firms to investigate the (ceteris paribus) relationship between foreign ownership and firm survival. Table 1 presents a synopsis of 22 mainly country specific studies that use data from 15 developed and developing countries, two of which use data on affiliates worldwide. The big picture emerging from the findings from these studies can be summarized as follows. Results are highly country-dependent. Foreign affiliates were found to be more likely to exit as compared to their domestic counterparts in Ireland (Görg and Strobl (2003a), (2003b) and O'Farrell and Crouchley (1983)), Belgium (Van Beveren (2007)), Spain (Pérez, Sanchis Llopis, and Sanchis Llopis (2004)), and Indonesia (Bernard and Sjöholm (2003)) but less likely to

exit in Canada (Baldwin and Yan (2011)), Italy (Colombo and Delmastro (2000)), Taiwan (Chen and Wu (1996)), and the US (Li and Guisinger (1991)). No significant differences in closure rates due to foreign ownership could be revealed for Japan (Kimura and Kiyota (2007)), Turkey (Taymaz and Özler (2007)) and the UK (Fabbri, Haskel, and Slaughter (2003)). Not surprisingly, the consideration of other factors determining firm survival, such as size and productivity, influences the results essentially (see e.g. Bernard and Sjöholm for Indonesia).

Looking at foreign acquisitions in the UK, Girma and Görg (2004) find foreign ownership negatively related to firm survival but Bandick and Görg (2010) find the opposite result for Sweden, if the acquired plant was an exporter. Taking changes over time into account, Kronborg and Thomsen (2009) find a declining survival premium for foreign companies in Denmark during the period 1895 to 2005 which disappeared in the last decade. Also Georgopoulos and Lalountas (undated) find no differences in the long-run for Greece. Zaheer and Mosakowski (1997) observe a decreasing liability of foreignness for foreign-owned currency trading rooms around the world. Godart, Görg, and Hanley (2011) and as Alfaro and Chen (2011) investigate the response of foreign affiliates during the global financial crisis, which started around 2008, for Ireland and worldwide. While exit probabilities of domestic and foreign firms in Ireland were the same during the crisis, foreign subsidiaries had better chances to survive in a global perspective.

[Table 1 near here]

This paper contributes to the literature by providing the first evidence on the link between foreign ownership status and firm survival in Germany. It uses a unique

tailor-made new representative data set that merges information from surveys performed by the Statistical Offices, from administrative data collected by the Tax Authorities and from a commercial data provider. To anticipate the most important result, our micro-econometric analysis reveals a ceteris paribus higher risk of exit for foreign owned firms in West Germany but not in East Germany.

The rest of the paper is organized as follows. Section 2 describes the new data set. Section 3 presents descriptive results. Section 4 reports probit estimates for survival premia of foreign owned firms over domestically controlled firms by looking at one cohort of exits that were active in 2007 but no longer in 2008. Section 5 explicitly takes the rare events nature of market exits into account and estimates the survival premia using rare events logit.[3] Section 6 concludes.

2. Data

This study uses a tailor-made enterprise level data set that contains information from surveys performed by the Statistical Offices, from data collected by the Tax Authorities and from a commercial data provider.

The first source of data is the monthly report and the annual report for establishments in mining, quarrying and manufacturing industries described in Konold (2007). These surveys together cover all establishments from mining, quarrying and manufacturing industries that employ at least twenty persons in the local production unit or in the company that owns the unit as a whole. Participation of

[3] Due to the data used in this study (described in section 2) and the definition of exits and survivors (discussed in section 3) applied here the study covers only exits from one year, namely 2007. Therefore, it is not possible to apply methods from survival analysis (see Godart, Görg and Hanley 2011 for the use of a discrete time proportional hazard model in the analysis of exits of foreign owned and domestically owned firms).

firms in the survey is mandated in official statistics law. Participation in this survey is used to identify surviving and exiting firms (discussed in detail in section 3). This survey is also the source for information on the location of the firm in West Germany or East Germany, the industry affiliation, information on whether a firm exports or not, labour productivity (measured as sales per employee) and the number of employees (used to measure firm size). Furthermore, given that the data start with the year 1995 this survey is used to distinguish between old firms (that were already covered by the survey in 1995) and new firms (that entered the survey in 1996 or later). Note that in this data set, export refers to the amount of sales to a customer in a foreign country plus sales to a German export trading company; indirect exports (for example, tires produced in a plant in Germany that are delivered to a German manufacturer of cars who exports some of his products) are not covered by this definition. For this project the information collected at the establishment level has been aggregated at the enterprise level to match the unit of observation from the other sources of data used here.

The second source of data is the German Turnover Tax Statistics Panel (described in detail in Vogel and Dittrich 2008). This data set is based on the yearly turnover tax; all enterprises with a turnover that exceeds a rather low threshold (17,500€ since 2003) are covered in the data. This data set is the source of information whether a firm imports or not. Note, however, that imports are not directly recorded therein completely. Imports from EU member states are reported under the item of 'intra-Community acquisitions'. The amount of imports from states beyond the EU is not included in the turnover tax statistics. In this case an import turnover tax is charged by the customs authorities. Nonetheless, this import turnover tax is

deductible as input tax and therefore reported in the dataset. From this information we know whether the enterprise imports from non-EU states or not.

The third source of data is the survey of products (*Produktionsstatistik*). This survey is used to distinguish between firms that produce only one product and multi-product firms.

The data from these three sources were linked by using the enterprise register system (*Unternehmensregistersystem*) that includes, among others, information on the unique enterprise identifier used in surveys conducted by the Statistical Offices and the unique turnover tax identifier used by the Tax Authorities.

Information on the foreign ownership status of a firm is based on data from the commercial database MARKUS, a joint product of the commercial data providers Bureau van Dijk and Creditreform. This database reports whether an enterprise is an affiliate, group head, or independent entity whether the group head of an affiliate is located abroad. Starting with the reporting year 2007 this information was linked to the German enterprise register system (*URS - Unternehmensregistersystem*) by the German Statistical Office (see Weche Gelübcke (2011a) for details). A firm is regarded as a FOF if it is an affiliate with a group head located in a foreign country and if more than fifty percent of the voting rights of the owners or more than fifty percent of the shares are controlled (directly or indirectly) by a firm or a person/institution located outside Germany. In order to prevent comparing “apples with oranges”, domestic independent firms, which do not benefit from any network effects, were excluded from the analysis. Hence, the control group is made of firms that are affiliates with a group head located in Germany.

3. Descriptive results

A firm is identified as an exit in year *t* if it has reported to either the monthly report or the annual report for establishments in mining, quarrying, and manufacturing industries in year *t* but not in year *t+1* – i.e. if it was active in a part of year *t* but no longer than December 31 of year *t*. A surviving firm reported to the monthly report or the annual report in year t and year t+1. Our data base includes information up to the reporting year 2008. Given that information on foreign ownership status is available for 2007 and 2008 only the empirical analysis is limited to firms that either exited in 2007 or survived until 2008.

It should be noted that the definition of firm exit used here is not without problems. First of all, if a firm relocates outside Germany or changes its activities from mining, quarrying, and manufacturing to services or agriculture, it no longer reports to the monthly report or the annual report for establishments in mining, quarrying, and manufacturing industries and, therefore, is considered as an exit. To the best of our knowledge and according to information from employees in official statistics that are in charge of preparing the data used here this is only rarely the case. Second, firms that shrink below the threshold of twenty employees in the local production unit or in the company that owns the unit are no longer obliged to report to the survey (but often do so at least for some years anyway) – and if they did not report in 2008 they are considered as exits here but are in fact survivors. Note that neither a change of the legal form of the firm nor a change in the ownership (due to a merger or an acquisition) nor a relocation of the firm inside Germany leads to an erroneous classification of a firm as an exit, because the identification number of the firm used in official statistics will not change. Unfortunately, it is not possible to investigate further the data for firms identified as exits according to the definition used

here due to the strict confidentiality of the firm level data. A certain degree of fuzziness, therefore, remains, and this should be kept in mind when putting the results from the empirical investigation into perspective.

The numbers of exits from the cohort 2007 and the percent share of exits in all firms (exits plus survivors) in this year are reported in table 2 for West Germany and East Germany.[4] This share of exits is small – 2.77 percent in West Germany and 3.47 percent in East Germany[5] and it is (nearly) identical for foreign owned firms and domestically owned firms.

[Table 2 near here]

However, it should be kept in mind that foreign ownership is related to firm characteristics that are linked to firm exit and survival and that should be controlled for when investigating the links between foreign ownership status and survival.[6] While this issue is tackled in the following two sections of the paper, the rest of this section will give some information on the share of exits in firms by international trade activities, size class, firm age, number of products and productivity.[7]

[4] The West German and the East German economy still differ largely even many years after the unification in 1990. Therefore, all empirical investigations are carried out separately for both parts of Germany here.

[5] When putting these numbers into perspective it should be kept in mind that only firms with at least 20 persons working in it are covered by the data used in this study and that the rate of exit can be expected to be much higher among smaller firms (although we are not able to report comparable figures due to the lack of data).

[6] The rest of this section closely follows the discussion in Wagner (2011) where the links between international trade activities and firm survival are investigated.

[7] Unfortunately, other firm characteristics that might be important for both firm survival and foreign ownership like innovation activities (see Esteve-Pérez et al. 2008) and financial variables (see Görg and Spaliara 2010) cannot be included here due to lack of information in the data.

Exports and imports: Wagner (2011) points out that exporting can be considered as a form of risk diversification through spread of sales over different markets with different business cycle conditions or in a different phase of the product cycle (see Hirsch and Lev 1971). Therefore, exports might provide a chance to substitute sales at home by sales abroad when a negative demand shock hits the home market and would force a firm to close down otherwise. Furthermore, Baldwin and Yan (2011, p. 135) argue that non-exporters are in general less efficient than exporters (younger, smaller and less productive) and that, as a result, one expects that non-exporters are more likely to fail than exporters.

As regards imports, imported intermediate inputs or capital goods might be cheaper and / or technically more advanced than inputs bought on the national market. Gibson and Graciano (2011) argue that the benefit of using imported inputs lies in a combination of the relative price and the technology embodied in the inputs. Imports, therefore, lead to an increase in price competitiveness and non-price competitiveness of importers compared to firms that do not import. Furthermore, there is empirical evidence for a positive link of imports and productivity (discussed in Vogel and Wagner 2010), documented by a significant productivity differential between firms that import and firms that do not trade internationally. Therefore, the probability to survive can be expected to be higher for importers than for non-importers, ceteris paribus.

Firms that both export and import can be expected to benefit from the positive effects of both forms of international trade on firm survival. Furthermore, two-way traders tend to be more productive than firms that either only import, or only export, or do not trade at all (see Vogel and Wagner 2010). Therefore, we expect the

probability of firm exit to be smaller for two-way traders than for firms that only export or only import.

The descriptive evidence reported in Table 2 is in line with these expectations. The rate of exit is much lower among firms that are engaged in international trade activities, and it is smallest among the group of firms that both export and import.

Firm size: David Audretsch (1995, p. 149) mentions as a stylized fact from many empirical studies on exits that the likelihood of firm exit apparently declines with firm size (usually measured by the number of employees in a firm). This is theoretically linked to the hypothesis of "liability of smallness" from organizational ecology. A small size can be interpreted as a proxy variable for a number of unobserved firm characteristics, including disadvantages of scale, higher restrictions on the capital market leading to a higher risk of insolvency and illiquidity, disadvantages of small firms in the competition for highly qualified employees, and lower talent of management (Strotmann 2007). Results reported in table 2 show a pattern of the rate of exit over firm size class (measured by the number of employees) that is broadly in line with this hypothesis for West Germany but not for East Germany.[8]

Firm age: David Audretsch (1995, p. 149) mentions as another stylized fact from many empirical studies on exits that the likelihood of firm exit apparently declines with firm age, too. This positive link between firm age and probability of

[8] Note, however, that among larger firms both the number of survivors and the number of exits is very small in East Germany, and that, therefore, one or two exits more or less tend to make a large difference in the percentage share reported. In our data set we have three exits and 99 survivors in the largest size class. The share of firms from the four size classes in West Germany and East Germany in each cohort is reported in Appendix I. Note that large firms are much more often found in West Germany than in East Germany.

survival is labelled “liability of newness” and it is related to the fact that older firms are “better” because they spent a longer time in the market during which they learned how to solve the range of problems facing them in day-to-day business. Table 2 indicates that, in line with this hypothesis, the rate of exit is smaller in older firms (founded before 1996) than in younger firms that started in 1996 or later.[9]

Product diversification: On a theoretical level, the existence of multi-product enterprises has been explained by pointing to the reduction of risk and uncertainty that can be reached by diversification across product markets (Jovanovic and Gilbert, 1993, pp. 199f.; Lipczynski and Wilson, 2001, pp. 324f.). Demand shocks or new competitors may have a negative impact on sales and profits in a product market in an unpredictable manner. A single-product firm, therefore, is highly vulnerable to adverse shocks that hit their market. A multi-product firm can substantially reduce this vulnerability, at least if the risks on the various product markets are randomly distributed or negatively correlated. Consequently, we would expect that, other things equal, higher levels of product diversification are positively related to a higher probability of survival. To the best of my knowledge, however, this hypothesis has not been tested empirically for Germany before.[10]

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[9] Not surprisingly, the share of old firms is much larger in West Germany than in East Germany; see Appendix I.

[10] Using data from the U.S. Bernard and Jensen (2007) report that the probability of failure is lower for multiproduct plants than for single-product plants after controlling for other plant characteristics including size, age and exporter status. Braakmann and Wagner (2011a) use German firm level longitudinal data to investigate the relationship between product diversification and the stability of sales and employment. They find that contrary to portfolio theoretic considerations more diversified firms exhibit a higher variability of sales and employment. However, the effects are negligibly small from an economic point of view. Furthermore, Braakmann and Wagner (2011b) find that an increase in the degree of product diversification has a negative impact on profitability when observed and unobserved firm characteristics are controlled for. This helps to understand the fact that about 40

As is shown in table 2 the rate of exits is higher among single-product firms than among firms that produce two or more products in both parts of Germany. This descriptive evidence is in line with the theory sketched above.

Productivity: In theoretical models for the dynamics of industries with heterogeneous firms, including Jovanovic (1982), Hopenhayn (1992), and Ericson and Pakes (1995), productivity differentials play a central role for entry, growth, and exit of firms. In equilibrium growing and shrinking, exiting and entering firms that have different productivities are found in an industry. These models lead to hypotheses that can be tested empirically. Hopenhayn (1992) considers a long-run equilibrium in an industry with many price-taking firms producing a homogeneous good. Output is a function of inputs and a random variable that models a firm specific productivity shock. These shocks are independent between firms, and are the reason for the heterogeneity of firms. There are sunk costs to be paid at entry, and entrants do not know their specific shock in advance. Incumbents can choose between exiting or staying in the market. When firms realized their productivity shock they decide about the profit maximizing volume of production. The model assumes that a higher shock in t+1 has a higher probability the higher the shock is in t. In equilibrium firms will exit if for given prices of output and inputs the productivity shock is smaller than a critical value, and production is no longer profitable.

Farinas und Ruano (2005, p. 507f.) argue that this model leads to the following testable hypothesis: Firms that exit in year t were in t-1 less productive than firms that continue to produce in t. They test this hypothesis using panel data for Spanish firms.

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percent of all firms are single-product firms according to a detailed classification of products (see Appendix I for the cohorts of firms investigated here), and that multi-product enterprises with a large number of goods are a rare species.

The hypothesis is supported by the data. Wagner (2009) replicates the study by Farinas and Ruano with panel data for West and East German firms from manufacturing industries. For the cohorts of exit from 1997 to 2002 the results are in line with the results for Spain.

As is shown in table 2 the rate of exit is much higher among firms from the lower third of the productivity distribution than among the more productive firms.[11] While this is in line with the theory sketched above it should be noted that exits can be found among the most productive firms, too.

4. Trader survival premia: Results from Probit estimates

The second step in the empirical investigation of the links between foreign ownership and firm survival consists in the estimation of survival premia for FOF that are defined as the difference of the probability to exit between domestically owned firms and foreign owned firms. To document these premia two empirical models were estimated by Probit for firms that left the market in 2007 and from the respective control group of surviving firms. The first model includes a dummy variable taking the value 1 for exits and the value 0 for survivors as the endogenous variable; a dummy variable for FOF plus a full set of 2digit-level industry dummy variables and a constant are included as exogenous variables. The second model augments the first model by adding a number of control variables: dummy variables for three types of internationally trading firms (i.e., only exporters, only importers, two way traders), using firms that do not trade internationally as the reference group, three firm size classes (using firms from the smallest size class as the reference category), for old

[11] As is reported in Appendix II the average productivity is considerably lower among exits than among surviving firms in East Germany, too, while this is not case in West Germany.

firms and for multi-product firms plus labour productivity (measured as sales per employee).[12]

Results are reported in table 3 for West Germany and East Germany.[13] The estimated coefficients from a Probit model cannot easily be used for statements about the size of the ceteris paribus effect of a change of the value of an exogenous variable (e. g. being a foreign owned firm or not) on the value of the endogenous variable (the probability of exit), because the size of this effect depends on both the value of the exogenous variable under consideration and on the values of all other variables in the model (see Long and Freese (2001), p. 87ff.). To put it differently, the estimated size of the change in the probability of exit due to a change in the value of one exogenous variable depends on where we start. In the table, therefore, the estimated marginal effects are reported. For a continuous variable the marginal effect is the estimated change in the probability of exit due to a one unit change in the value of that variable when the values of all variables in the model are at the mean of the sample used for the estimation of the model. For a dummy variable the marginal effect is the change in the probability of exit when this dummy variable takes on the value 1 instead of the value 0 (and when the values of all other exogenous variables in the model are fixed at the sample mean).

[Table 3 near here]

[12] Note that these empirical models are not to be considered as models that explain the exit decision of the firms. The data at hand are not rich enough for that kind of empirical investigation. The empirical models are only used to indicate the ceteris paribus difference in the exit probability of foreign owned firms and domestic firms, following a standard approach used in empirical studies from the micro-econometrics of international firm activities (see the studies summarized in table 1).

[13] Descriptive statistics for variables included in the empirical models are reported in Appendix II.

From the results of the Probit estimates for model 2 we have strong evidence that in West Germany foreign owned firms have a ceteris paribus higher risk of exit than affiliates of a company that is located in Germany. The estimated regression coefficient of the foreign ownership variable is positive and highly statistically significant. The marginal effect indicates that ceteris paribus the risk of exit is 1.18 percentage points larger for foreign owned firms – a large difference from an economic point of view given that the overall rate of exits is 2.77 percent (see Table 2).

A comparison of the results from model 1 and model 2 indicate that it is important to control for other variables related to the risk of exit in an investigation of the link between foreign ownership and firm exit. Estimation results for the control variables included in model two are in line with the descriptive evidence discussed above.

The picture is different for East Germany. While the estimated marginal effect of the foreign ownership status on firm exit from model 2 is the same in both parts of Germany, it is not statistically significant at any conventional level in East Germany, and the same holds for some of the control variables. Whether this is due to the fact that the absolute number of exits is much smaller in East Germany and, therefore, any empirical link between the exit status and a firm characteristic cannot be estimated precisely enough or whether such an effect is non-existent has to remain an open question.

5. Trader survival premia: Results from Rare Events Logit estimates

Firm exit from the market is a rare event – in 2007 only 2.77 percent of all firms in West Germany and 3.47 percent of all firms in East Germany that are included in our

sample left the market (see Table 2). In the application of the standard Probit model to estimate the marginal effects of trade activities and other firm characteristics on the probability of exit in section 4 this rare events nature of exits is ignored. King and Zeng (2001a, 2001b) developed a version of the Logit model to compute unbiased estimates in a situation like this. This method – that is called Rare Events Logistic Regression or ReLogit – estimates the same logit model as the standard logit procedure, but it uses an estimator that gives lower mean square error in the presence of rare events data for coefficients, probabilities, and other quantities of interest.

As the next step in the empirical investigation of the links between foreign ownership and firm survival ReLogit is used to estimate the models 1 and 2 (described in section 4).[14] Results are reported in table 4 for West Germany and East Germany.

[Table 4 near here]

The big picture from the rare events logit estimates is exactly the same as the one based on the probit estimates reported in section 4 above. While the coefficients from the ReLogit estimations reported in Table 4 and the marginal effects based on probit estimates reported in Table 3 cannot be compared directly, a comparison of the ReLogit coefficients with the estimated coefficients from a standard logit model does not reveal any differences. For West Germany the coefficient of the foreign ownership dummy variable from the standard logit estimate is 0.0419 (with a p-value

[14] All estimations were done using the Stata ado-file `relogit.ado` available from Gary King's website (see http://gking.harvard.edu/software/).

of 0.722) for model 1 and 0.4982 (with a p-value of 0.000) for model 2 – these estimates are virtually identical to the ReLogit estimates reported in Table 4. A comparison between the ReLogit estimates and the standard logit estimates for the control variables and for the empirical models for East Germany show an identical pattern. Taking care of the rare events nature of exits, therefore, does not make a difference here.

6. Concluding remarks

This paper provides the first evidence on the role of foreign ownership in shaping firm survival in Germany. Our micro-econometric analysis reveals (with and without explicitly taking the rare events nature of firm exit into account) a ceteris paribus higher risk of exit for foreign owned firms in West Germany (but not in East Germany). Evidence for West Germany is in line with findings for Ireland, Belgium. Spain and Indonesia, while studies for Canada, Italy, Taiwan and the US show evidence for a lower rate of exits for foreign owned firms and no differences are found for Japan, Turkey and the UK (see Table 1). Note, however, that the studies mentioned are not strictly comparable due to differences in the samples and definition of the variables used, in the specification of the empirical models and in the econometric methods applied.

Given that Germany is one of the most important destination countries for foreign direct investments world-wide and that FOF play an important role for the economy as a whole the empirical evidence presented in this paper is interesting on its own. As a promising area for future research we suggest to produce a set of results that are based on strictly comparable data, empirical models and econometric methods that reveal stylized facts about similarities and differences across countries.

Results from such an exercise could be a more sound basis for any evidence-based recommendations for policy makers regarding measures related to foreign direct investment.

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Table 1: Micro-econometric studies on foreign ownership and firm survival

Country Author(s) (Year of publication)	*Period covered*	*Topics investigated*	*Methods used*	*Important findings*
Belgium Van Beveren (2007)	1996-2001	Impact of multinational ownership on exit decisions	Cox proportional hazard model	Foreign MNEs are more likely to shut down compared to national firms in manufacturing and services. Domestic multinationals exhibit higher exit rates in manufacturing.
Canada Baldwin and Yan (2011)	1979-1996	Effects of changes in tariffs and real exchange rates on plant death	Probit estimates for exit	Foreign-owned plants have much lower failure rates than domestic plants but their survival rates are more sensitive to changes in tariffs and exchange rates.
Denmark Kronborg and Thomsen (2009)	1895-2005	Long-term survival patterns of foreign- and domestically owned companies	Cox hazard model	Survival premium in favor of foreign-owned companies which declines over time and disappears in the last decade.
Greece Georgopoulos and Lalountas (undated)	1960-2001	Impact of changing environmental factors on plant survival	Cox hazard model	Foreign ownership premium which decreases over time. No differences between domestic and foreign plants in the long run.
Indonesia Bernard and Sjöholm (2003)	1975-1989	Association of foreign ownership with plant survival in a developing economy	Semiparametric estimation of hazard function	Foreign-owned plants are more likely to survive. Once controlled for size and productivity they are more likely to close.
Ireland	2006-2009	Exit probabilities of foreign and	Hazard function	Increasing likelihood of exit in manufacturing and

Godart, Görg, and Hanley (2011)		domestic firms during crisis	estimates	services for all firms but no difference for foreign-owned. Only EU firms were 40 percent less likely to exit before the crisis.
Ireland Görg and Strobl (2003a)	1973-1996	Exit probabilities of foreign and domestic plants	Cox proportional hazard model	Foreign multinationals have lower survival rates, ceteris paribus.
Ireland Görg and Strobl (2003b)	1973-1996	Effect of the presence of multinationals on survival of indigenous and foreign plants	Cox proportional hazard model	Foreign plants have a higher chance of exiting than indigenous plants, once controlled for other determinants.
Ireland O'Farrell and Crouchley (1983)	1973-1981	Analysis of industrial closures at plant level	Logit estimates	Foreign MNEs have a higher closure probability than indigenous single and multiplant units. Closure probabilities of different overseas groups do not differ.
Italy Colombo and Delmastro (2000)	1989-1997	Relation between size, ownership status and plant's closure	Probit estimates	likelihood of survival would seem to be larger for foreign owned units than for establishments of Italian groups
Japan Kimura and Kiyota (2007)	1994-1998	Exit probabilities of foreign and domestic plants	Probit estimates	No difference in the probability of exit between foreign-owned and domestically-owned firms.
Portugal Mata and Portugal (2004)	1983-1989	Comparison of the entry and post-entry process by foreign and domestic firms	Hazard rate estimates	Domestic entrants are much more likely to exit, both greenfield and acquisition.
Portugal	1983-1989	Survival of domestic and	Hazard model	Chances of survival not different after controlling for

Mata and Portugal (2002)		foreign entrants	estimates	other determinants.
Spain Pérez, Sanchis Llopis, and Sanchis Llopis (2004)	1990-1999	Factors determining Spanish manufacturing firms' survival	Cox proportional hazard model estimates	Firms with foreign capital participation have a higher risk of exit.
Sweden Bandick and Görg (2010)	1993-2002	Survival effect of foreign acquisitions	IV, propensity score matching, and hazard rates	Foreign acquisitions increase the lifetime of plants only if they were exporters.
Taiwan Chen and Wu (1996)	1975-1990	Relationship between divestment and subsidiary characteristics	Hazard rate estimates with Weibull and log-logistic distribution	Foreign ownership contributes to survival.
Turkey Taymaz and Özler (2007)	1983-2001	Differences in survival patterns of foreign and domestic plants	Cox proportional hazard model estimates	Foreign plants are more likely to survive but differences disappear if industry and plant characteristics are controlled for.
United Kingdom Girma and Görg (2004)	1980-1993	Effect of foreign takeover on plant survival in electronics and food industries	Standard hazard model estimates	Foreign takeover reduces the lifetime of the acquired plant.
United Kingdom Fabbri, Haskel, and Slaughter (2003)	1973-1992	Labor demand differences by firm type and nationality	Cox proportional hazard model	Foreign and domestic multinationals are both more likely to shut down as compared to purely domestic plants, ceteris paribus.
USA Li and Guisinger	1978-1988	Business failures of foreign-owned and domestically	Comparison of failure rates with non-	Foreign-controlled firms fail less often.

(1991)		owned firms	parametric tests	
Global Alfaro and Chen (2011)	2005-2008	Response of multinational subsidiaries to the crisis relative to local establishments	Matching and probit estimates	Foreign subsidiaries fared better than local counterparts but only in crisis years. Furthermore, establishments sharing stronger vertical production and financial linkages with parents exhibit greater resilience.
Global Zaheer and Mosakowski (1997)	1974-1993	Impact of foreignness on survival of currency trading rooms	Event history analysis	Liability of foreignness that declines over time

Table 2: Exit cohort 2007: Descriptive statistics for West and East Germany

	West Germany	East Germany
Number of exits	435	111
Share of exits (percentage)		
- in all firms	2.77	3.47
- in foreign owned firms	2.72	3.35
- in domestically controlled firms	2.78	3.49
- in firms that do not trade	5.23	5.84
- in firms that only export	2.76	2.97
- in firms that only import	3.78	3.83
- in firms that export and import	1.81	2.15
- in firms with less than 50 employees	5.68	6.56
- in firms with 50 to 249 employees	1.32	1.48
- in firms with 250 to 499 employees	1.03	1.55
- in firms with 500 and more employees	0.95	2.94
- in firms that started before 1996	2.25	2.23
- in firms that started in 1996 or later	3.48	4.27
- in firms with only one product	3.51	4.26
- in firms with two or more products	2.24	2.82
- in firms from the lower third of the distribution of labor productivity	3.86	4.62
- in firms from the middle third of the distribution of labor productivity	1.79	2.80
- in firms from the upper third of the distribution of labor productivity	2.65	2.99

Note: For a definition of exits and survivors see text.

Table 3: Probit estimates of determinants of firm exits, Germany 2007

		West Germany		East Germany	
		Model 1	Model 2	Model 1	Model 2
Foreign owned firms	ß	0.0012	0.0118	-0.0003	0.0118
	P	0.688	0.000	0.978	0.206
Firms that only export	ß		-0.0077		-0.0065
	p		0.000		0.325
Firms that only import	ß		-0.0045		-0.0061
	p		0.149		0.318
Firms that export and import	ß		-0.0151		-0.0147
	p		0.000		0.048
Firms with 50 to 249 employees	ß		-0.0306		-0.0369
	p		0.000		0.000
Firms with 250 to 499 employees	ß		-0.0197		-0.0190
	p		0.000		0.005
Firms with 500 and more employees	ß		-0.0198		-0.0112
	p		0.000		0.160
Firms that started before 1996	ß		-0.0057		-0.0127
	p		0.003		0.004
Firms with two or more products	ß		-0.0040		-0.0080
	p		0.065		0.122
Labour productivity	ß		3.97e-06		-0.000013
(sales per employee; 1000 Euro)	p		0.173		0.003
Number of firms		15,686	15,686	3,103	3,103

Note: The entries in the table are the marginal effects (ß) und the p-values (p). The reference categories for the dummy variables are: domestically owned firms; firms that do not trade; firms with less than 50 employees; firms that started in 1996 or later; firms with only one product. All models include a constant plus a full set of 2digit-level industry dummy variables. Standard errors are adjusted for clusters at 2digit-level industries.

Table 4: Rare events logit estimates of determinants of firm exits, Germany 2007

		West Germany		East Germany	
		Model 1	Model 2	Model 1	Model 2
Foreign owned firms	ß	0.0463	0.4980	0.0410	0.4782
	P	0.693	0.000	0.888	0.146
Firms that only export	ß		-0.3710		-0.3142
	p		0.000		0.323
Firms that only import	ß		-0.2024		-0.3092
	p		0.185		0.287
Firms that export and import	ß		-0.7334		-0.7035
	p		0.000		0.048
Firms with 50 to 249 employees	ß		-1.4366		-1.4668
	p		0.000		0.000
Firms with 250 to 499 employees	ß		-1.6929		-1.3196
	p		0.000		0.008
Firms with 500 and more employees	ß		-1.8055		-0.4316
	p		0.000		0.333
Firms that started before 1996	ß		-0.2562		-0.5279
	p		0.006		0.008
Firms with two or more products	ß		-0.1798		-0.3207
	p		0.082		0.145
Labour productivity	ß		0.0002		-0.0004
(sales per employee; 1000 Euro)	p		0.067		0.057
Number of firms		15,686	15,686	3,103	3,103

Note: The entries in the table are the estimated coefficients (ß) und the p-values (p). The reference categories for the dummy variables are: domestically owned firms; firms that do not trade; firms with less than 50 employees; firms that started in 1996 or later; firms with only one product. All models include a constant plus a full set of 2digit-level industry dummy variables. Standard errors are adjusted for clusters at 2digit-level industries.

Appendix I: Shares of firms from various groups in all firms (percentage)

Part of Germany	West	East
Foreign owned firms	18.68	18.64
Domestically owned firms		
Firms that do not trade	14.23	23.52
Firms that only export	33.63	26.26
Firms that only import	7.58	13.87
Firms that export and import	44.56	36.35
Firms with less than 50 employees	34.41	38.07
Firms with 50 to 249 employees	49.04	52.72
Firms with 250 to 499 employees	9.23	6.03
Firms with 500 and more employees	7.33	3.19
Firms that started before 1996	57.72	39.26
Firms that started in 1996 or later	42.28	60.74
Firms with only one product	41.46	44.72
Firms with two or more products	58.54	55.28

Appendix II: Descriptive statistics for variables included in the empirical models

		West Germany		East Germany	
		Exits	Survivors	Exits	Survivors
Foreign owned firms		18.39	18.69	18.02	18.67
Firms that only export		33.56	33.63	22.52	26.40
Firms that only import		10.34	7.51	15.32	13.81
Firms that export and import		29.20	45.00	22.52	36.85
Firms with 50 to 249 employees		23.45	49.77	22.52	53.80
Firms with 250 to 499 employees		3.45	9.39	2.70	6.15
Firms with 500 and more employees		2.53	7.47	2.70	3.20
Firms that started before 1996		46.90	58.03	25.23	39.76
Firms with two or more products		47.36	58.86	45.05	55.65
Labour productivity	mean	209.76	210.78	161.63	201.77
(sales per employee; 1000 Euro)	std. dev.	268.32	260.94	209.72	315.59

Note: For a definition of exits and survivors see text. All variables with the exception of labor productivity are dummy variables coded as 1 if the firm belongs to the category and 0 else; the numbers in the table indicate the percentage share of firms from a category in all exits and all survivors, respectively, in the year.

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