

Does Foreign Ownership Matter for the Innovative Activities of Enterprises?

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Abstract:

This paper tests if foreign ownership influences the innovative behaviour and performance of enterprises. The analysis uses data from the Community Innovation Survey (CIS 3) for Austria. We employ a kernel-based matching approach as a non-parametric test. After controlling for size, sectoral affiliation, export intensity and other variables that influence innovative behaviour we found that the impact of foreign ownership on innovation input and outcome is not significant in most variables. Membership in a multinational enterprise group, however, significantly helps to overcome different obstacles in the innovation process, such as the lack of financial resources, the lack of technological and market information or organisational problems. The nationality of the parent enterprise does not matter for innovative behaviour and performance except in the case of Anglo-Saxon-owned enterprises.

JEL Codes: O310; O340; F 230

Keywords: innovation; research and development; foreign-owned enterprises; foreign direct investment; kernel-based matching; Austria

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Abstract:

This paper tests if foreign ownership influences the innovative behaviour and performance of enterprises. The analysis uses data from the Community Innovation Survey (CIS 3) for Austria. We employ a kernel-based matching approach as a non-parametric test. After controlling for size, sectoral affiliation, export intensity and other variables that influence innovative behaviour we found that the impact of foreign ownership on innovation input and outcome is not significant in most variables. Membership in a multinational enterprise group, however, significantly helps to overcome different obstacles in the innovation process, such as the lack of financial resources, the lack of technological and market information or organisational problems. The nationality of the parent enterprise does not matter for innovative behaviour and performance except in the case of Anglo-Saxon-owned enterprises.

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1 Introduction

An important characteristic of the ongoing integration of the world economy is the intensified division of labour between countries and regions in the generation of scientific and technological knowledge. This ‘internationalisation’ of science and technology is not a new phenomenon. The process, however, has gained momentum in recent years. Researchers observe a higher number of trans-border technological alliances, a rising share of scientific publications involving authors from different countries, an increasing international mobility of researchers, or higher transborder financial flows related to science and technology (Veugelers et al. 2005).

A considerable part of this acceleration can be attributed to the activities of multinational enterprises (MNEs). MNEs increasingly locate research, development (R&D) and innovation activities outside of their home country. In 2003, subsidiaries of MNEs accounted for more than 25% of total manufacturing R&D expenditure in a number of countries including Portugal, Germany, Canada, Italy, Spain, Sweden and the UK. Their share even exceeds 50 % in Ireland and Belgium (OECD 2006b, table 29).

The growing share of foreign-owned subsidiaries on innovative activities in many countries has raised considerable attention from economic policy in recent years. Politicians, on the one hand, are aware that attracting subsidiaries of MNEs can substantially increase a country’s technological capabilities and overall R&D spending in a short time. On the other hand, fears of too much dependence on foreign direct investment and R&D performed by foreign-owned subsidiaries have come up. One reason for these fears is the observation that MNEs concentrate strategic R&D activities in their home countries and pursue less radical innovations and more adaptations of existing technology at locations abroad (UNCTAD 2005, p. 122; OECD 2006b, chapter 4).

This paper wants to examine whether these fears are justified or not. Differences between foreign-owned and domestically owned enterprises in wages, staff skills, growth rates or productivity are well-documented in the literature (Lipseý 2002; Barba Navaretti 2004; Bellak 2004). Empirical evidence with respect to innovation and the creation of new technologies, however, has been

inconclusive so far (Bellak 2004, p. 500), with the exception of some very recent results (Sadowski and Sadowski-Rasters 2006; Frenz and Ietto-Gillies 2007).

We analyze the innovative behaviour of foreign-owned enterprises for the case of Austria, a country which has benefited considerably from inflows of MNE R&D funds in recent years. Austria receives more than 20% of its R&D financing from sources from abroad, one of the highest levels in the OECD (OECD 2005, p. 19). About forty percent of all patent inventions made in Austria have a least one foreign-domiciled co-owner (OECD 2006a, p. 33).

We first discuss possible reasons why differences in innovative behaviour between the foreign-owned and domestically owned enterprises (section 2) and derive hypotheses in section 3. Section 4 presents our econometric approach. We employ a kernel-based matching approach which creates a counterfactual control group of domestically owned enterprises with similar values in a number of control variables to the foreign-owned enterprises in our sample. The empirical analysis of section 5 and 6 employs data from the European Community Innovation Survey (CIS) for Austria. Section 7 draws conclusions from the results.

2 Conceptual Background

The objective of this work is to explore whether domestically owned and foreign-owned enterprises in Austria differ in their innovative behaviour. These differences may be, on the one hand, related to differences between the two groups in enterprise characteristics such as size, sectoral affiliation, export intensity, or human capital endowments which in turn are associated with a different innovative behaviour.

Foreign-owned enterprises, on the other hand, may also differ in innovative efforts and output because they pursue different innovation strategies than domestically owned enterprises. The literature discusses two basic strategies of how multinational enterprises organize cross-border innovation activities (see Narula and Zanfei 2005 for a survey):

The first strategy has been labelled as “asset-exploiting” (Dunning and Narula 1995), “home-base exploiting” (Kuemmerle 1999), “competence-exploiting” (Cantwell and Mudambi 2005), or “market-seeking” (von Zedtwitz and Gassmann 2002). Asset-exploiting strategies are associated with a view of multinational enterprises as a means to exploit firm-specific assets in foreign markets (Dunning 1973; Markusen 1995; Barba Navaretti and Venables 2004): MNEs exist because they possess firm-specific intangible assets such as superior technological knowledge, well-known products and brands, design or management capabilities. They exploit these assets by international production. Innovative activities of the subsidiaries support the exploitation by adapting technologies, products and processes to local needs, consumer tastes, regulation etc. Engineering and design activities are therefore located in proximity to the customers and production facilities abroad to support overseas production and sales activities. The intensity and degree of novelty of these overseas innovative activities, however, will remain below the home country where the assets of the MNE are mostly developed.

Asset-exploiting strategies have a number of advantages for MNEs: a concentration of long-term, strategic innovative activities in the home country allows an intensified specialisation and division of labour in innovation and the utilisation of scale economies, avoids additional cost of transmitting knowledge, helps avoid involuntary spillovers (von Zedtwitz and Gassmann 2002; Sanna-Randaccio and Veugelers 2003; Gersbach and Schmutzler 2006). Moreover, these strategies also result from the high degree of interrelatedness between the technological competences of multinational enterprises and the institutional setting and actors of their home innovation systems (Patel and Pavitt 1999; Narula 2003).

The asset-exploiting perspective has been challenged in recent years by the observation that multinational enterprises increasingly develop new products and processes outside of their home countries, instead of just exploiting firm-specific assets abroad. Such a strategy has been described as “asset-seeking” (Dunning and Narula 1995), “home-base augmenting” (Kuemmerle 1999), “competence-creating” (Cantwell and Mudambi 2005) or “technology-driven” (von Zedtwitz and Gassmann 2002).

Asset-seeking strategies are driven by technological supply-side factors, such as the availability of skilled researchers, the need to monitor the technological activities of competitors, clients, universities and other research organisations, or the wish to assimilate local knowledge in the host countries (Birkinshaw et al. 1998; Almeida 1999; Frost 2001; Castellani and Zanfei 2002; Almeida and Phene 2004). It is difficult to maintain such learning processes over distance due to the “sticky” and often tacit nature of knowledge (Jaffe et al. 1993; Von Hippel 1994; Cowan et al. 2000; Breschi and Lissoni 2001). Therefore, knowledge absorption has to take place where such knowledge is localized. Asset-seeking strategies also reflect the changing nature of innovative processes that forces firms to widen and adapt their search strategies to account for the rising importance of external actors and sources (Chesbrough 2003; Laursen and Salter 2006).

3 Research Hypotheses

Empirical research has shown that asset-exploiting internationalisation strategies are more frequently than asset-seeking behaviour (Patel and Vega 1999; le Bas and Sierra 2002; von Zedtwitz and Gassmann 2002). If asset-exploiting strategies also prevail in the case of foreign-owned enterprises in Austria, the role of these subsidiaries basically boils down to a support of production and marketing by adapting technologies and products to the conditions of the host market. Foreign-owned subsidiaries that pursue such a strategy may therefore exhibit a lower level of permanent R&D activity and a lower level of innovative input than domestically owned enterprises because firm-specific assets are mainly created by the parent enterprise. The fact that innovations are based on existing technologies does not necessarily affect innovativeness and innovative output as such; however, we can expect that asset-exploiting behaviour results in a lower share of products new to the market compared to domestically owned enterprises because the main tasks of foreign-owned subsidiaries are redesign, product customization and adjustments.

Hypothesis 1: Assuming asset-exploiting strategies, we expect that foreign-owned enterprises exhibit a lower level of innovative input compared to domestically owned enterprises because firm-specific assets are mainly created by the parent enterprise.

Performance differences due to different strategies will also manifest in innovative output:

Hypothesis 2: Assuming asset-exploiting strategies, we expect that foreign-owned enterprises exhibit a lower level of novelty in innovative output, for example fewer products new to the market compared to domestically owned enterprises. This is because the main tasks of MNE subsidiaries are redesign, product customization and adjustments of existing products and not radical innovation. Innovative output of products new to the firm, however should be unaffected by ownership.

Factors that hamper innovation, such as a lack of financial resources or a lack of technological expertise, should be less relevant for foreign-owned subsidiaries which can draw on the financial resources and managerial expertise of their enterprise group. Moreover, members of a MNE group may also learn from the experiences made by the MNE in other geographical markets and use concepts and technologies that have proven to be successful in other countries. This should give foreign-owned enterprises an advantage over domestically owned non-group enterprises. Their advantage, however, should diminish if we compare foreign-owned enterprises to domestically owned group enterprises, because advantages of group membership are also shared by enterprises affiliated to domestically-owned multinationals (Frenz and Ietto-Gillies 2007).

Hypothesis 3: Foreign-owned enterprises face fewer obstacles in the innovation process than domestically owned non-group enterprises due to access to diverse sets of superior resources in the multinational enterprise group. This advantage, however, should diminish if we compare foreign-owned enterprises to domestically owned group enterprises.

Differences between foreign-owned and domestically owned enterprises may also vary with respect to the home country of the foreign-owned enterprise. Empirical evidence shows that a common language and geographical proximity is significantly affecting the generation of cross-border patents (Guellec and van Pottelsberghe de la Potterie 2001). One explanation for this phenomenon is cultural similarity between countries. Cultural proximity helps to overcome social and cognitive access barriers known as the 'liability of foreignness' (Zaheer 1995; Sofka 2006) and makes co-operation and access to knowledge in the host country easier. Geographical and cultural proximity between

parent enterprise and subsidiary may also help to transfer successful business practices from the MNE home country to host country, minimize monitoring cost and overcome agency problems. Another explanation are different corporate governance regimes (Buckley 2000; Hall and Soskice 2001).

We investigate the effects of cultural proximity by distinguishing between enterprises from countries which have a common border with Austria and share the same language (Germany/Liechtenstein/Switzerland - GLS), the rest of Europe and Anglo-Saxon countries.

Hypothesis 4: Differences between German/Liechtenstein/Swiss-owned and domestically owned enterprises may be smaller than between enterprises from Anglo-Saxon countries or other European states and domestically owned enterprises.

4 Econometric Approach

The basic idea of the econometric analysis is to estimate the differences Δ between the innovation behaviour (Y^F) of foreign-owned enterprises and the innovation behaviour (Y^A) of domestically owned firms:

$$E(\Delta) = E(Y^F) - E(Y^A) \quad (1)$$

Differences Δ between foreign-owned and domestically owned enterprises can only be attributed to foreign ownership if the two groups are similar in factors that influence innovative behaviour, such as size, export orientation, skill intensity, or sectoral affiliation¹. Descriptive statistics not reported here, however, show that foreign-owned enterprises in Austria are on average larger, more export oriented, and employ more skilled personnel.

¹ An extensive survey on the determinants of innovative activity is given by Cohen (1995). Kleinknecht and Mohnen present a number of studies that examine determinants of innovative activity with CIS data, Falk and Leo (2004) identify determinants of innovative activity for Austrian enterprises.

In order to isolate the effect of foreign ownership on innovative behaviour from other influences our analysis has to control for these differences in enterprise characteristics. This will be done by means of a matching procedure. Matching creates a counterfactual control group of domestically owned enterprises which are similar to the foreign-owned enterprises in terms of a number of control variables.

We then calculate the difference $E(\Delta)$ to examine the impact of foreign ownership. Once foreign-owned and domestically owned enterprises share the same exogenous enterprise characteristics differences in innovative behaviour are attributable to ownership only:

$$E(\Delta) = E(Y^F | X=x) - E(Y^D | X=x) \quad (2)$$

The advantage of this approach over regression analysis is that it allows an intuitive interpretation of the results addressing the question “what innovation behaviour could be expected from a foreign-owned enterprise if it were domestically owned?” Moreover, our approach allows to present differences between domestically owned and foreign-owned enterprises for a number of variables, as well as between domestically owned enterprises and enterprises from different home countries in this very intuitive form.

The econometric matching methodology is based on the techniques to estimate treatment effects (Blundell and Costa Dias 2000). However, we do not interpret foreign ownership as a ‘treatment’ in a narrow sense. Rather, in the vein of Czarnitzki (2005) we regard the matching approach as a non-parametric technique to estimate the effects of differences between two groups on their performance. We use the matching approach to correct for structural differences between the two groups by generating a sample of domestically owned enterprises which is similar to a sample of foreign-owned enterprises in a number of enterprise characteristics influential for innovation.

The similarity between foreign-owned and domestically owned enterprises is measured in terms of the exogenous enterprise characteristics X . With an increasing number of exogenous characteristics – the dimensions of X -space – it gets increasingly difficult to find exact – or even similar – matches between foreign-owned and domestically owned enterprises. Rosenbaum and Rubin (1983) suggest

that it is sufficient to match on the propensity of receiving a treatment - being foreign-owned in our context. This procedure generates a balanced sample of foreign-owned and domestically owned enterprises. Rosenbaum and Rubin, however, assumed that the propensity is known. Heckman et al. (1998a) show that the propensity score can be estimated. We estimate the propensity of foreign ownership based on a Heckman (1979) selection model, where the selection equation captures the fact that only enterprises which are part of an enterprise group can be foreign-owned.

As a matching algorithm we apply a kernel-based matching² which constructs for each foreign-owned enterprise a matching domestically owned enterprise through a convex combination of all domestically owned enterprises j . The difference in innovative behaviour between a foreign-owned enterprise i and its behaviour in the case it were domestically owned is

$$Y_i^F - \sum_j \lambda_{ij} Y_j^A \quad \text{where} \quad \sum_j \lambda_{ij} = 1 \quad (3)$$

The weights λ_{ij} increase with the similarity of the foreign-owned enterprise i and the domestically owned enterprise j according to

$$\lambda_{ij} = \frac{K(d_{ij})/h}{\sum_k K(d_{ik})/h} \quad (4)$$

where k indexes all domestically owned enterprises.

The kernel attaches a higher weight to enterprise j the closer it is to enterprise i . In (4) d_{ij} gives the distance between enterprise i , characterised by x_i , and enterprise j , characterised by x_j . The distance in

2 Matching estimators have been applied and discussed, amongst others, by Heckman et al. (1998a; 1998b). Recent contributions in the field of innovation studies include Almus and Czarnitzki (2003), Czarnitzki and Fier (2002; 2003) and Czarnitzki, Ebersberger and Fier (2007).

the multi-dimensional space of enterprise characteristics is measured by the Mahalanobis metric. As the kernel function $K(\cdot)$ we employ a Gaussian kernel and a bandwidth suggested by a modified Silverman's rule of thumb (Silverman 1986; Bergemann et al. 2001).

As matching criteria we use both the propensity of an enterprise to be part of a group and its propensity to be foreign-owned.³ The selection of these two matching criteria ensures that foreign-owned and domestically owned enterprises are equally likely to be a member of an enterprise group as well as being foreign-owned. This accounts for the fact that advantages of foreign-owned enterprises may arise from both factors. Additionally, we use the enterprise size as matching criteria.

In the final step of our analysis we calculate $E(\Delta)$ for each dependent variable and test for equality by means of a t-test.

In short, our quantitative strategy proceeds as follows:

1. We estimate the propensity of an enterprise to be part of a group and their propensity to be foreign-owned depending on its exogenous characteristics.
2. For each foreign-owned enterprise we:
 - a. construct a matching enterprise from all domestically owned enterprises in the sample based on equations (2), (3) and (4) above.
 - b. put the foreign-owned and the matched domestically owned enterprise into the analysis data set
 - c. eliminate the selected foreign-owned enterprise from the set of foreign-owned enterprises.
 - d. stop the process when the set of foreign-owned enterprises is empty.

3. The analysis data set now contains the data on the foreign-owned enterprises and the matched domestically owned enterprises.

4. We test for differences between the group of foreign-owned and the group of matched domestically owned enterprises.

5 Data

5.1 Community Innovation Survey

The analysis draws on data from the third wave of the Community Innovation Survey (CIS 3) for Austria. CIS 3 is a survey based on a questionnaire administered by Eurostat and national statistical offices and aims at assessing various aspects of the innovative behaviour and performance of enterprises (Statistik Austria 2002; EUROSTAT 2004). The data set covers the period 1998-2000.

The CIS questionnaire identifies foreign ownership by asking whether the enterprise is part of a group, and if so, by asking about the home country of the enterprise group. Our sample consists of 618 enterprises that belong to an enterprise group and 676 that do not. 396 of the group members are Austrian-owned, another 121 are owned by a German, Liechtenstein or Swiss (GLS) parent enterprise, 54 are Anglo-Saxon owned⁴, and another 47 enterprises originate from other parts of Europe⁵.

5.2 Variables in the analysis

The choice between innovation activity indicators is a 'non-trivial' one, as Kleinknecht et al. (2002) have pointed out. Innovative behaviour can hardly be represented by one indicator alone. Therefore,

³ For the analysis of case 1 we only use the propensity score for the foreign ownership.

⁴ Includes CA, IE, UK, US, ZA.

⁵ Includes BE, FI, FR, IT, LU, NL, NO, PT, SE, SI; 10 enterprises from countries outside of Europe have been dropped

we analyse a broad spectrum of left-hand variables ranging from innovation input to innovation output and indicators of innovation hampering factors (Table 1).

5.2.1 Innovative activity and innovative input

The dummy variable *INNOV* indicates innovative activity of the enterprise regardless of its success. It includes both, product and process innovations. The commitment towards research and development is captured by the dummy variable *RDENG* indicating permanent R&D activities. Another input indicator is the number of employees with tertiary education as a fraction of total employment (*EMPHI*). The financial means devoted to innovation activities are measured by total innovation expenditure as a fraction of sales (*INNOVEXP*). Additionally, we include a measure for the intensity of research and development efforts (*RDYRS*), which indicates the man-years per employee spent on R&D.

5.2.2 Innovative output

The first indicator of innovative output is the dummy variable *INMAR* which marks enterprises that have launched a product innovation which is new to the market. *TURNMAR* denotes the share of sales generated by products new to the market. The questionnaire does not tell the market (national, European, world) where the novelty was introduced. However, we know from another question of the survey that most enterprises regard the European or the world market as their main target markets, which indicates that market novelties refer to a market larger than Austria.

Besides market novelties, we also check the effects of foreign ownership on the share of sales generated by products new or significantly modified to the enterprise (*TURNIN*) and on innovation productivity measured by innovative returns per employee (*INNOPROD*). We compute innovation productivity as suggested by Janz et al. (2003) and Lööf and Heshmati (2003).

5.2.3 Hampering factors

Enterprises have to overcome different obstacles when introducing new products or processes. The variable *HAMPECO* summarizes the enterprise's assessment of *economic* factors hampering the innovation process. These factors include too high economic risks, too high innovation cost, and a lack of financial resources. The variable *HAMPINT* refers to the assessment of *internal* hampering factors, which comprehends organisational problems related to innovation, a lack of skilled personnel, a lack of technological information and/or a lack of market information.

6 Empirical Results

The empirical analysis proceeds in two steps. In a first step (6.1), we analyse the characteristics of foreign-owned enterprises and enterprises belonging to an enterprise group by Heckman probit regression (Table 2 reports the exogenous variables, Table 3 the regression results). This regression delivers the propensity scores employed in a second step (6.2) to estimate the counterfactual from the domestic-owned enterprises and test the hypotheses stated above.

6.1 Determinants of Foreign Ownership and Group Membership

Table 3 reports the results of the Heckman regression model, where column 1 contains the results of the regression determining foreign ownership (FOROWN) and column 2 shows the results of the selection equation (group membership GP). The right-hand variables of the two regressions include several enterprise-specific as well as sector-specific exogenous variables (see also Table 2): *ORCH*⁶ is an indicator for organizational change within the enterprise. *EMPL* and *EMPL2* represent enterprise size and its square measured by the number of employees. *INVEST* is the investment expenditure per employee. Inter-industry differences in innovative behaviour are accounted for by the OECD

⁶ Organizational change is only used in the group membership equation of the Heckman probit.

classification of industries according to their technology intensity (OECD 2003, p. 155ff). We differentiate between high- and medium-high-technology (*SEHT*), medium-low technology (*SEMLT*), low technology (*SELT*), knowledge-intensive services (*SEKIS*) and other services (*SEOS*). Finally, we account for appropriability conditions (*APPRCOND*), innovation dynamics (*SPEED*) and the international competitiveness of the sector, proxied by its average export share (*SECEXSHR*) related to 2-digit NACE sectors. All three variables are sectoral variables at the level of NACE-2 industries.

The regression results show that enterprises belonging to a group differ from non-group members in (almost) all the exogenous variables (Table 3, column 2). Even after controlling for group membership, foreign-owned enterprises are still larger than domestically owned enterprises and operate more frequently in knowledge intensive services, other service sectors and in export-oriented sectors. Before matching the exogenous enterprise characteristics distinguish individually and jointly between foreign-owned enterprises and domestically owned ones. After the matching they do so neither jointly nor individually. The regression results to illustrate the quality of the matching are available from the authors upon request.

6.2 *Test for differences between foreign-owned and domestically owned enterprises*

The following analysis bases on the analysis data set containing the foreign-owned enterprises and their matched Austrian owned counterfactuals. Table 4 shows the differences between foreign-owned and domestically owned enterprises after matching. Instead of reporting $E(\Delta)$ we report $E(Y^F)$ and $E(Y^A)$ and test for differences by means of a t-test.

We investigate five cases: all foreign-owned vs. all domestically owned enterprises (case I), all foreign-owned vs. domestically owned enterprises belonging to a group of enterprises which we will refer to as group enterprises (case II), European-owned enterprises vs. domestically owned group enterprises (case III), German, Liechtenstein and Swiss (GLS)-owned enterprises vs. domestically owned group enterprises (case IV), and Anglo-Saxon owned enterprises vs. domestically owned group enterprises (case V).

6.2.1 Innovativeness

We did not make assumptions about differences in innovativeness between the two groups because different innovation strategies rather have an impact on input and output intensity than on innovativeness. Results on innovativeness are nevertheless reported because the analysis of innovative input and output only includes innovative enterprises.

There is no significant effect of foreign ownership on the propensity to innovate if the counterfactual situation is constructed from all domestically owned enterprises (Table 4, case I). Once we include only domestically owned group enterprises, however, the neutral effect turns into a quite substantial negative one for foreign-owned enterprises of around 10 percentage points (Table 4, case II-V). The effect of Anglo-Saxon ownership (case V) on innovativeness is larger than the effect of GLS ownership (case IV).

6.2.2 Innovative Input

The further analysis only considers innovative enterprises and is therefore not distorted by the negative effect of foreign ownership on the propensity to innovate.

Hypothesis 1 assumes asset-exploiting behaviour of foreign-owned enterprises and predicts a lower input intensity of foreign-owned enterprises compared to their domestically owned counterparts. The empirical results do not support this assumption. Once foreign-owned enterprises decide to engage in innovation activities, ownership does not affect any of the four variables that portray innovative input. It neither affects the intensity of innovative activity measured by the level of innovation expenditure (*INNOVEXP*), nor R&D expenditure (*RDYRS*), the commitment to permanent R&D activity (*RDENG*), or the share of employees with tertiary education (*EMPHI*). There is neither an indication that foreign-owned enterprises innovate more intensively, nor do we find a lower innovative intensity of foreign-owned enterprises which would point to an asset-exploiting strategy. In contrast, foreign-owned enterprises in Austria, once they engage in innovative activity, exhibit the same levels of various inputs like domestically-owned enterprises. Foreign-owned enterprises in Austria therefore actively increase the stock of knowledge of the MNE group by their own R&D and innovation

activities. Only Anglo-Saxon enterprises show a significant lower R&D input per employee. We can therefore reject hypothesis 1.

6.2.3 *Innovative Output*

Hypothesis 2 states that foreign-owned enterprises exhibit a lower degree of novelty in their innovative output compared to domestically owned enterprises. Our results show a different result. The probability to generate market novelties (*INMAR*) is unaffected by foreign ownership. There is, however, a difference in the economic significance of these novelties (*TURNMAR*). Domestically owned group enterprises can gain higher sales from market novelties than foreign-owned enterprises. This difference, however, is only significant at the 10% error level for all enterprises. Again, Anglo-Saxon enterprises perform considerably worse than domestically owned group enterprises. Differences in turnover generated by new products to the enterprise (*TURNIN*) and per employee (*INNOPROD*) are not significant in any of our five comparisons. We can therefore reject hypothesis 2 for all comparisons with the exception of Anglo-Saxon enterprises.

6.2.4 *Hampering Factors in the Innovation Process*

Advantages for foreign-owned enterprises in the innovation process are most visible in the analysis of hampering factors. CIS asked the enterprises for a subjective judgment if different obstacles have hampered their innovation processes. Our results show that foreign-owned enterprises report less frequently report severe economic (*HAMPECO*) and internal hampering factors (*HAMPINT*) in all five comparisons. The differences are significant in all cases, with no differences between domestically owned group and non-group members. Severe economic hampering factors, for example have been reported by 54.7% of all domestically owned group enterprises, but only by 41.1% of all foreign-owned enterprises.

These results impressively show the advantages foreign-owned subsidiaries can derive from the membership in a multinational enterprise group. If we compare this result with previous findings on innovative inputs and outputs, it becomes clear that different average *perceptions* of hampering

factors between foreign-owned and domestically owned enterprises have not caused a different behaviour of the two groups.

6.2.5 Effects from Corporate Nationality

The results give no support for the claim that foreign-owned enterprises from Austria's neighbouring countries Germany, Liechtenstein or Switzerland would be more similar to domestically owned enterprises in innovative behaviour than foreign-owned enterprises from other countries. A slight effect of corporate nationality can only be seen in case five, where we compare Anglo-Saxon and domestically owned enterprises. A significant disadvantage of Anglo-Saxon enterprises in two variables, however, does not allow accept the assumption that foreign-owned enterprises from Austria's neighbouring countries would systematically perform better than enterprises from other countries. We therefore reject hypothesis 4.

To sum up, our analysis has shown no indication that foreign-owned enterprises perform worse than their domestically owned counterparts. Based on the empirical evidence we have to reject hypothesis 1, 2, and 4. Foreign-owned enterprises neither show a lower innovative input, nor a lower innovative output than domestically owned enterprises. They face, however, significantly fewer obstacles in the innovation process.

7 Concluding Remarks

This paper analyzed differences in innovative behaviour between foreign-owned and domestically owned enterprises. After controlling for other variables that influence innovative behaviour we found that the impact of foreign ownership on innovation is neutral. Once foreign-owned enterprises decide to innovate, the impact of foreign ownership on input and outcome variables is mostly not statistically significant. Membership in a multinational enterprise group significantly helps to overcome different obstacles in the innovation process, such as the lack of financial resources, the lack of technological and market information or organisational problems. This advantage, however, does not transfer into a higher innovative input or output.

Differences between foreign-owned and domestically owned enterprises in Austria can therefore rather be explained by enterprise characteristics such as size, sectoral affiliation, export intensity etc. than by the ownership status. We have to reject the hypothesis that foreign-owned enterprises spend less in R&D and innovation and pursue less radical innovation projects due to an asset-exploiting strategy. Austrian subsidiaries of multinational enterprises actively create new knowledge, instead of just exploiting existing knowledge at the Austrian market, and play an active role in enhancing the stock of knowledge and technologies available in their enterprise group.

Corporate nationality matters in one case; differences between domestically owned and Anglo-Saxon-owned enterprises are in some cases larger than between domestically owned enterprises and any other sub-group in the analysis. The hypothesis that cultural proximity leads to improved innovative performance, however, is not generally supported by the data. Our results indicate that the innovative behaviour of foreign-owned enterprises is largely shaped by the incentives and constraints of the host country and only to a minor degree by corporate nationality.

Results similar to our findings have also been discovered for the small open economies of the Nordic countries (Ebersberger and Lööf 2005). We therefore conclude that our results are not an exception, but part of a common story across countries. The Product Life Cycle Model and subsequent theories found in the international business literature therefore may, as suggested by Cantwell (1995), be better suited to explain the behaviour of MNE originating from the US than from European economies with a high degree of internationalisation and long-lasting relationships to neighbouring countries and other European countries alike.

With respect to policy, our results neither justify fears that foreign ownership could lead to an erosion of innovative activity in the host country, nor do they deliver arguments for specific incentives to attract foreign-owned enterprises based on an assumed superior performance. Innovation policy should instead try to foster innovative capabilities of both, foreign-owned and domestically owned enterprises. This includes all governmental measures intended to support the creation (funding, basic

research and education at universities, public infrastructure), as well as the adoption of technology (information services, technology transfer, standards, promotion of technology diffusion).

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Table 1: Endogenous variables

Category	Variable	Description
Innovative behaviour	INNOV	Decision to carry out any innovation project (dummy)
	EMPHI	Share of employees with tertiary education as a percentage of total employment
Innovative input	RDENG	Permanent R&D activities (dummy)
	RDYRS	Man-years per employee spent on R&D
	INNOVEXP	Innovation expenditure of the enterprise as a fraction of the sales
Innovative output	INMAR	Product innovation that is new to the market (dummy)
	TURNMAR	Share of sales generated by product innovation new to the market
	TURNIN	Share of sales generated by new and significantly modified products
	INNOPROD	Innovative returns per employee
Hampering factors	HAMPECO	Economic factors hampering the innovation process
	HAMPINT	Internal hampering factors

Table 2: Exogenous variables

Variable	Description
ORCH	Enterprise has undertaken organisation innovation between 1998 and 2000, dummy
EMPL	Number of employees
EMPL2	Number of employees, squared
INVEST	Investment expenditure per employee, 1,000 Euro
SEHT	High-technology or medium-high technology sector according to OECD (2003), dummy
SEMLT	Medium-low technology sector according to OECD (2003), dummy
SEKIS	Knowledge-intensive service sector, dummy
SEOS	Other service sector, dummy
APPRCOND	Appropriability conditions in the sector as suggested by Cassiman and Veugelers (2002) at NACE 2 level
SECEXSHR	International orientation of the sector measured by average export intensity at NACE 2 level
SPEED	Technological dynamics in the sector (share of new to the market innovators relative to all innovators) at NACE 2 level
Note: all variables relate to the year 2000, unless otherwise stated	

Table 3: Determinants of foreign ownership and group membership, Heckman probit regression

	(1)			(2)		
Dependent	FOROWN			GP		
Variable	Coef.	Std.Err.	Sig.	Coef.	Std.Err.	Sig.
ORCH	-	-		0.252	0.075	***
EMPL	0.381	0.227	*	2.178	0.239	***
EMPL2	-0.063	0.046		-0.280	0.042	***
INVEST	-0.131	0.229		0.122	0.173	
SEHT	0.400	0.349		1.042	0.399	***
SEMLT	-0.083	0.221		0.450	0.157	***
SEKIS	0.957	0.272	***	2.046	0.187	***
SEOS	1.018	0.194	***	0.604	0.135	***
APPRCOND	0.242	0.236		0.586	0.195	***
SECEXSHR	1.845	0.276	***	1.138	0.200	***
SPEED	0.333	0.328		-0.763	0.260	***
CONST	-2.833	0.449	***	-1.975	0.332	***
Wald	81.74	***		LR	5.82	**

Note: * (**, ***) indicates significance at the 5%, (1%, 0.1%) level. The likelihood ratio test rejects the correlation coefficient ρ to be zero at the 1% level. Regressing GP is the selection equation.

Column (1) shows the results of the selection equation, column (2) the results of the function equation.

Table 4: Effect of foreign ownership on the innovation activities of enterprises

	Case I			Case II			Case III			Case IV			Case V			
	Foreign (Mean)	AT all (Mean)	Sig.	Foreign (Mean)	AT (Mean)	Sig.	Euro-pean ⁺ (Mean)	AT (Mean)	Sig.	GLS ⁺⁺ (Mean)	AT (Mean)	Sig.	Angl.-Sax. (Mean)	AT (Mean)	Sig.	
Innovative Behaviour	INNOV	0.479	0.459	0.500	0.596	***	0.479	0.588	***	0.500	0.596	*	0.472	0.596	*	
Innovative input	EMPHI	26.981	32.655	27.743	24.107		26.104	22.555		28.298	24.481		33	29.328		
	RDENG	0.212	0.173	0.198	0.180		0.234	0.187		0.281	0.186		0.083	0.159		
	RDYRS	0.042	0.060	0.043	0.064		0.046	0.06		0.056	0.058		0.031	0.075	**	
	INNOVEXP	0.047	0.068	0.046	0.053		0.048	0.049		0.056	0.047		0.04	0.063		
Innovative output	INMAR	0.462	0.428	0.446	0.475		0.455	0.475		0.474	0.489		0.417	0.475		
	TURNMAR	7.096	8.287	6.941	9.875	*	8.052	9.850		8.509	10.246		3.375	9.84	***	
	TURNIN	22.24	23.041	22.287	25.673		22.247	25.177		22.789	25.653		22.417	27.151		
	INNOPROD	62.993	46.596	63.686	70.283		66.295	68.209		62.371	69.853		55.316	77.203		
Hampering factors	HAMPECO	0.411	0.539	***	0.411	0.547	***	0.424	0.546	***	0.431	0.552	***	0.37	0.545	**
	HAMPINT	0.304	0.378	***	0.304	0.371	***	0.312	0.369	**	0.311	0.374	*	0.278	0.378	**
	⁺ European-owned enterprises including German, Swiss and Liechtenstein owned enterprises, excluding the Anglo-Saxon owned enterprises. ⁺⁺ German, Swiss and Liechtenstein owned enterprises															

