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Research Policy xxx (2006) xxx–xxx

research policy

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On the innovativeness of foreign affiliates: Evidence from companies in The Netherlands

Bert M. Sadowski *, Gaby Sadowski-Rasters

Economics of Innovation and Technological Change, University of Technology Eindhoven, PO Box 513, 5600 MB Eindhoven, The Netherlands

Received 23 July 2004; received in revised form 12 December 2005; accepted 26 January 2006

Abstract

In examining the distinctive contributions of foreign subsidiaries and domestic firms to innovative performance in Dutch manufacturing, the paper shows that foreign ownership is an important factor in explaining inter-firm differences affecting innovativeness. It characterizes innovativeness by distinguishing between products that are new to the firm ('imitative' innovations), and those products that are new to the market ('real' innovations). It uses firm-level data for 4780 firms which took part in the Community Innovation Survey (CIS-2) for 1996 in The Netherlands. It concludes that foreign subsidiaries are more innovative, they are more likely to introduce 'imitative' as well as 'real' innovations compared to domestic firms. In comparison with the population of innovative companies, however, there is greater heterogeneity among foreign subsidiaries, i.e. they are not more likely to introduce 'real' innovations if they cannot utilize knowledge transfer from an associated company.

JEL classification: O32; O38

Keywords: Innovativeness; Foreign affiliates; Multinational enterprises

1. Introduction

Over the last decade, international research and development (R&D) activities of foreign affiliates have become an integral part of the innovation system in host countries and influenced the management of advanced technologies within multinational enterprises (MNE). The contribution of foreign affiliates to innovativeness in host countries differs according to the extent to which R&D facilities of MNE have a predominantly home-base exploiting or home-base augmenting component. As a large part of international R&D activities of MNE has traditionally been associated with adapting and modifying their technological assets in response to mainly demand conditions ('home-base exploiting R&D'), MNE are increasingly locating a growing proportion of their technological activities outside the country of origin to augment their existing R&D activities ('home-base augmenting R&D'). In order to develop innovations, foreign affiliates utilize linkages with the parent company as well as exploit own R&D capabilities at the affiliate level. The management of R&D activities within the affiliate can be aimed at exploiting existing ('imitative') innovations provided by the parent company, but can include also the development of 'real' innovations, i.e. products that have been new to the firm.

* Corresponding author. Tel.: +31 40 2472640; fax: +31 40 2474646.
E-mail address: b.m.sadowski@tm.tue.nl (B.M. Sadowski).

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doi:10.1016/j.respol.2006.01.003

RESPOL-1880; No. of Pages 16

In recent years, an extensive literature has emerged demonstrating the importance of inter-firm differences for innovativeness in manufacturing industries, with only a few studies linking these differences to foreign ownership (Belderbos et al., 2004; De Backer and Sleuwaegen, 2003). In the management and applied economics literature on innovation, the size of R&D activities has been characterized as an important variable in explaining inter-firm differences in innovativeness (Kleinknecht et al., 2002). Recently, the ownership of these activities has been considered as important in studying innovativeness (Klomp and van Leeuwen, 2001). Within the literature on the internationalization of R&D, foreign ownership advantages are considered as being responsible for performance differences between foreign affiliates and domestic firms. The early literature in the area has related the explanation of performance advantages to increases in cost efficiency in the innovation process. Drawing on earlier versions of the product life cycle, studies in this tradition considered the centralized location of R&D as a necessity to achieve economies of scale in the R&D function and to diffuse technology through transfer to a foreign affiliate. R&D in foreign affiliates has been related to facilitate the effective implementation of less profitable stages of the product cycle. But as recent evidence has shown the international flow of technology has not only been one-directional, i.e. running from creation (in one location), through transfer to a firm or affiliate (in another location), to diffusion to a wider variety of firms in the host country. In contrast, it has been demonstrated that MNE locate a growing proportion of their R&D capabilities outside the country of origin. In order to innovate, foreign affiliates might even tap into local fields of expertise and utilize the expertise gained to develop innovations that are entirely new to the firm (Cantwell, 1995; Cantwell and Janne, 1999; Pearce and Papanastassiou, 1999). As the literature on the internationalization of R&D has characterized the link between innovativeness and foreign ownership, it has been less clear about the extent to which foreign affiliates have contributed to the exploitation of existing innovation compared to the creation of 'real' innovation. Therefore, a synthesis of the research streams on the internationalization of R&D and the economics of innovation can provide new insights into the link between foreign ownership and different types of innovativeness.

In this context, the paper is aimed at characterizing the extent to which foreign ownership affects the propensity of companies to engage in innovation. It employs firm-level data from the Community Innovation Survey (CIS-2) in The Netherlands consisting of a data set of 4780 firms in 1996. The degree of newness of an innovation[1] is measured on the micro-level based on managerial perceptions of new product introductions. The responses allowed to introduce a distinction between 'real' innovations that are 'new to the market' and 'imitative' innovations that are 'new to the firm'. As this distinction is well established in the literature,[2] it allows to examine innovativeness of companies by using a direct measure of innovativeness (van Beers and Sadowski, 2003; Kleinknecht et al., 2002).

In the following, the paper surveys the literature on the relationship between foreign ownership and innovativeness before discussing the nature of the data, the empirical models as derived from the literature and the estimation results. Summary and conclusions are presented in the final section of the paper.

2. Literature review and earlier studies

This section briefly reviews the literature on the internationalization of R&D, on R&D intensity of foreign affiliates and on innovative output of foreign affiliates. A first stream of relevant literature refers to a growing number of studies on the internationalization of R&D (Kuemmerle, 1997; von Zedtwitz and Gassmann, 2002). In order to characterize the motives for FDI (foreign direct investment) in R&D, two primary types of international R&D activity have been identified: home-base exploiting and home-base augmenting R&D (Dunning and Narula, 1995; Kuemmerle, 1997). According to the long prevailing view in the literature, foreign corporate R&D activities were primarily motivated by the exploitation of existing firm-specific capabilities in foreign environments, i.e. home-base exploiting R&D activities of MNE. With its roots in the 'internalization theory' (Rugman, 1981), this view assigned to foreign subsidiaries a mere supportive role in adapting technologies created at home to the conditions of the host market. This line of research has been consistent with the product life cycle model as originally proposed by Vernon (1966) arguing that centralization of R&D at headquarters allows MNE to achieve economies of scale in R&D and to diffuse technology through firm-internal transfer

[1] For a survey see Garcia and Calantone (2002).

[2] There has been a theoretical discussion on the degree of "newness" of an innovation in the literature (Danneels and Kleinschmidt, 2001; Garcia and Calantone, 2002; Gatignon et al., 2002) The distinction between 'new to the market' and 'new to the firm' seems well established. However, there is some discussion as to whether these distinctions can be used to classify "'real' vis-à-vis 'imitative'" innovations (Danneels and Kleinschmidt, 2001). We follow with our distinction previous work by Brouwer and Kleinknecht (1999).

to foreign affiliates. Despite some criticism in particular on early versions of Vernon's product life cycle model (Cantwell and Janne, 1999), it has been shown that home-base exploiting R&D activities are still important motives for the internationalization of MNE (Bas and Sierra, 2002; Kuemmerle, 1999a,b). Rather recently, another view has become influential in the literature aimed at explaining how MNE utilize internationalization strategies to create (as opposite to simply exploit) innovations. This view has focused on home-base augmenting FDI in R&D, i.e. those R&D activities aimed at monitoring or acquiring competitive advantages which are complementary to those already possessed by the firm (Dunning and Narula, 1995; Kuemmerle, 1999a,b). Firmly rooted in the 'capability theory of the firm' (Teece et al., 1997), studies in this tradition have shown that foreign affiliates have been able to build up advanced technology capabilities in order to take up responsibility for product development (Pearce and Papanastassiou, 1999; Zander, 1997) or to absorb superior technology provided by companies and institutions in host countries (Driffield and Love, 2003). However, as these capabilities have to be accumulated within MNE, home country advantages still remain important. As Kuemmerle (1999a,b) has shown MNE establish first a network of R&D sites in the home country before venturing abroad. The classification of home-base exploiting and home-base augmenting R&D has not been aimed at labeling R&D facilities of MNE with one of these categories, as any facility might perform both activities and might change its activities over time (Zanfei, 2000). As the literature in this area has been conclusive about the importance of inter-firm transfer of knowledge for innovative activities within foreign affiliates, the link between knowledge transfer and local R&D activities of MNE in producing innovations has just recently been explored.

In order to examine degree and characteristics of the internationalization of R&D of MNE, a second stream of literature has concentrated on the R&D intensity of foreign affiliates (Belderbos, 2003; De Backer and Sleuwaegen, 2003; Zejan, 1990). Studies focusing on the relationship between parent company and foreign affiliate have shown that foreign-located R&D is related to the extent to which technologies provided by the parent company are adapted and utilized within the company. The accumulation of R&D activities of foreign affiliates is depending on existing R&D activities of the parent company. As Papanastassiou and Pierce demonstrated for a sample of 190 MNE operating in the United Kingdom, distinctive competences for foreign affiliates in the area of new product development emerge from their background and experience within the group (Papanastassiou and Pearce, 1997). As foreign affiliates become embedded in internal R&D networks within MNE, their R&D activities increase (Zander, 1999). With respect to location of R&D activities, it has been shown that research activities are more concentrated than development activities. Based on a series of 290 interviews in 24 technology-intensive MNE, von Zedtwitz and Gassmann (2002) found that research activities are more concentrated at headquarters or at particular locations while development activities are more globally dispersed. In focusing on determinants influencing the accumulation of R&D activities within foreign affiliates, it has been proposed that firms that are more internationalized in terms of sales and manufacturing are expected to have larger R&D activities at the foreign affiliate level in order to exploit and adapt their existing product and process technologies abroad. With substantial sales abroad, R&D activities undertaken by foreign affiliates enabled MNE to keep track of local demand and technological trends and to provide technical support for marketing and after sales services (Belderbos, 2001). As this stream of literature has shown that local technological efforts are important for MNE in engaging in innovative activities in host countries, these technological efforts have not always been more effective in developing innovations compared to domestic firms.

A third stream of literature has shown that foreign affiliates positively affect innovativeness in host countries (Klomp and van Leeuwen, 2001). In this literature, it has long been taken for granted that countries with a larger share of foreign affiliates are better off, as foreign affiliates generally expected to perform better than their domestic counterparts. Based on a survey of 56 empirical studies on productivity, wage and skills gaps, Bellak (2004) found that foreign affiliates generally perform better than domestic owned firms, no matter which indicator has been used (with the exception of profitability) (Bellak, 2004). To characterize the effects of foreign affiliates on innovativeness, researchers have utilized patenting indicators (Cantwell and Iammarino, 2000; Criscuolo et al., 2005) with their well-known (dis-) advantages (Kleinknecht et al., 2002). With improved datasets becoming available that allow to undertake cross-country comparison, recent studies have shown that these performance differences between domestic firms and foreign affiliates might not always prevail. Based on a sample of 3932 firms located in France, Italy and Spain, Castellani and Zanfei could confirm performance advantages for foreign affiliates in Italy but found that foreign firms in France are not always more productive than their domestic counterparts. For Spain, they even found negative effects of foreign ownership on productivity (Castellani and Zanfei, 2003a,b). Performance differences between foreign affiliates and domestic firms have recently been linked to different measures of innovativeness as the innovation process and the effects of innovative output on performance have been considered as important variables in explaining performance differences between firms (Belderbos et al., 2004; Klomp and van Leeuwen, 2001). To characterize different types of innovativeness, this literature distinguishes between 'real' innovations and imitations. 'Real' innovations (i.e. products that have not previously been introduced in the market) represent a higher degree of novelty compared to imitations (i.e. products that are already known to the firms in the market) (van Beers and Sadowski, 2003; Kleinknecht et al., 2002; Tidd et al., 2001). Recently a number of studies have focused on foreign ownership as the main variable (Balcet and Evangelista, 2004; Castellani and Zanfei, 2003a,b; Frenz and Ietto-Gilles, 2004) or as a control variable (Belderbos et al., 2004; Klomp and van Leeuwen, 2001) in explaining these different types of innovativeness. By utilizing the Italian CIS-2 survey, Castellani and Zanfei found for a sample of 1114 Italian firms that MNE have a higher propensity to get involved in R&D and develop product innovations (Castellani and Zanfei, 2003a,b). It has, furthermore, been shown that the investment behaviour of MNE has positive effects not only the utilization of existing innovations but also on the generation of 'real' innovations in foreign affiliates. By using the British CIS survey, Frenz and Ietto-Gilles observed for a sample of 679 firms that multinationality is positively related to novel product innovations (Frenz and Ietto-Gilles, 2004). This stream of literature has convincingly demonstrated that the relationship between foreign affiliates and innovative output has been more complex than initially thought. To account for this complexity, further distinctions between 'imitative' and 'real' innovations have been introduced in order to examine whether (or not) foreign affiliates have been more inclined to produce different types of innovative output.

In the literature, it has, furthermore, been shown that the relationship between MNE and innovativeness is mediated by industry level effects (Patel, 1995). Industry level effects affect R&D decisions of companies, mainly technological opportunity and appropriability conditions (for a survey, see Cohen (1995)). Technological opportunity characterizes variations in cost and potential for technological advance across industries. Appropriability conditions refer to the extent to which a firm can appropriate returns from its R&D expenditures in a particular industry. Technological opportunity and appropriability conditions vary across industries and technologies. Industry characteristics are important in affecting not only the innovativeness of companies but also the decision of MNE to locate R&D activities abroad. In their choice to opt for a particular internationalization strategy, MNE take the strengths and weaknesses of a host country in a particular industry into account. For the Italian CIS-2 data, Balcet and Evangelista have confirmed these conclusions and demonstrated that the investment strategies of MNE are strongly linked to industries in which Italian firms have traditionally been strong such as mechanical engineering (Balcet and Evangelista, 2004).

3. The empirical model, data and descriptive statistics

The objective of the empirical analysis is to determine whether foreign ownership affects the propensity of companies to introduce different types of innovation. The dependent variable in the empirical model is a measure of innovativeness. It is a yes/no answer to the question: did your firm sell products and/or use processes that were technologically new or improved during 1994–1996? As the dependent variable has a binary character, a logit model was formulated that relates the measure of innovativeness, denoted for convenience as INN_i, to a vector of regressors X_i. The underlying regression has been defined as

$$\mathrm{INN}_i = \beta_i + \beta_2\mathrm{OWN\_RD}_i + \beta_3\mathrm{AFF\_TRAN}_i + \beta_4\mathrm{LSIZ}_i + \beta_5\mathrm{EXP}_i + \beta_6\mathrm{MG}_i + \beta_7\mathrm{NEW}_i + \varepsilon_i \quad (1)$$

where β are the estimated coefficients and ε_i is a normally distributed error term (Greene, 2003). We observe

$$\mathrm{INN}_i = \begin{cases} 1, & \text{if } \mathrm{INN}^* > 0 \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

where $\mathrm{INN}_i = 1$ represents the probability that a foreign affiliate is introducing innovations and $\mathrm{INN}_i = 0$ if it does not. In other words, there is a critical threshold of the index called INN^* in a way that if INN_i exceeds INN^* the company will introduce innovations otherwise it will not. The application of a logit model allows to estimate the probability that a company innovates conditional on a number of independent variables. The model characterizes innovativeness in two different ways: first, as the ability of a firm to innovate (as opposed to not innovate) and, second, as the ability of a company to introduce 'real' innovations as opposed to develop imitative innovations.

In order to take local technological efforts into account, the model includes two variables to identify whether (or not) the foreign affiliate has own R&D facilities and the extent to which the foreign associated company has been a source of knowledge transfer. Differences in the impact of local technological efforts of foreign affiliates on innovativeness reflect the variety of motives to internationalize R&D activities of MNE. In order to innovate, foreign affiliates need to achieve a particular fit between existing own resources and capabilities as well as the available knowledge provided by the parent company. Imitations that have already been introduced and tested in the market impose less of a risk and have a greater chance of success for the management of the affiliate compared to the development of 'real' innovations. To produce imitations, existing resources and capabilities within the affiliate and the available knowledge provided by the parent company fit more easily with the requirement of a new product. To introduce 'real' innovations, foreign affiliates have to develop new local resources and capabilities such as R&D expertise, knowledge of customer needs and competitive situations, market research skills, production facilities etc. They can rely to a lesser extent on the knowledge transferred from headquarters and might even transfer knowledge back to the parent company. As a result, the creative scope of the foreign affiliate is widening by enabling it to move beyond the range of established products and develop its own distinctive contribution to the group's capabilities (Papanastassiou and Pearce, 1997).

The model includes dummy variables to characterize differences in innovativeness between independent firms, companies that are part of a domestic grouping and foreign affiliates. In contrast to independent firms, group firms can base their innovative efforts on technology and organizational expertise from headquarters and firms within the group. Foreign affiliates are identified if the location of the headquarters of the company has been abroad. The *X*-factor consists of other firm-level control variables, such as size, export intensity, market growth and newly established firms as well as industry dummies.

3.1. Data and variables

The data used in the present study originate from the Community Innovation Survey (CIS-2) for The Netherlands in 1996. This questionnaire has been aimed at analyzing the determinants of firms' innovation behavior. The survey was undertaken amongst companies in The Netherlands with 10 or more employees. It contains information on ownership, R&D and innovation activities of companies, including innovation expenditure, as well as information on sources of knowledge used in the innovation process. A total of 10 446 companies responded to the survey. Due to missing values for some explanatory variables, the complete sample included 4780 firms.

Utilizing data from the CIS-2 survey to examine effects of foreign ownership on innovativeness has particularly been important as the inflow of FDI in The Netherlands has relatively been high during the period 1994 and 1996. During the early 1990s, FDI in The Netherlands was growing by 6.6% on an annual basis.[3] With only a few restrictions on FDI, multinational companies considered the openness to FDI as a major locational advantage of The Netherlands compared to other European countries. National policies were based on the assumption that openness would stimulate domestic competition and innovativeness of domestic as well as foreign companies.[4] As a result, The Netherlands became a top receiving country of FDI in Europe in 2000.[5] The surge in FDI in The Netherlands in the late 1990s has therefore its origins already in the early 1990s.

The dependent variable (INN) distinguishes between products and/or processes that are *new to the firm* as a proxy for all imitative innovations, and those that are *new to the market* which is a proxy for innovations excluding imitations (so-called 'real' innovations). The use of this indicator has advantages compared to traditional measures of innovativeness such as patents as it directly measures innovativeness. It allows to characterize different types of innovations which contribute directly to the cashflow of companies (Brouwer and Kleinknecht, 1999; Kleinknecht et al., 2002).

In line with previous literature that documented a positive relationship between research intensity and innovativeness, an R&D input measure (denoted as RDINT) has been included in the analysis. The measure of R&D intensity is total innovation expenditures as a percentage of sales. These expenditures include a variety of expenses related to extramural R&D, education and marketing activities, own R&D personnel or the purchase of licenses. Therefore, the variable also controls for the impact of external technology transfer. However, information on R&D (and R&D related activities) has only

[3] Total FDI in The Netherlands went from €8.67 billion in 1990 to €12.7 billion in 1996 (UNCTAD, 2003).

[4] See for example (Ministry of Economic Affairs, 2001. Innovatie en Inkomende Investeringen. Den Hague, MINEZ).

[5] By 2000, the high point of FDI inflow in The Netherlands, total FDI reached Hfl 144 billion (about €65 billion). It slowed from 2001 onwards (UNCTAD, 2003).

been provided by companies that have been involved in innovative activities. Non-innovating companies did not have to provide any information on this issue.

As discussed above, local R&D facilities of foreign affiliates fulfill different functions within the network of an MNE. They absorb external knowledge coming from headquarters or elsewhere to develop 'real' innovations, modify existing products and processes to fit local requirements, support local marketing and production facilities of MNE. In line with the existing literature, a positive relationship between own local technological efforts and innovativeness is expected. In order to characterize these efforts, a dummy variable (OWN_RD) has been specified that indicates whether (or not) the foreign affiliate was undertaking R&D activities using own personnel.

To measure incoming knowledge transfer from an associated company, the CIS-2 survey provides a direct measure of the importance of the external knowledge for the firms' innovation process. In the CIS-2 survey, managers are asked to provide an indication of relevant sources of external knowledge (e.g. buyer, supplier or associated company) for the innovation process in their companies over the past 2 years. The importance of various sources of external knowledge is rated according to contribution to the firm's innovation process. In the model, a variable has been created indicating the extent to which the company has utilized external knowledge from an associated company for its innovation process (denoted as AFF_TRAN). This variable characterizes the importance of knowledge transfer at different levels as 'not relevant', 'hardly relevant', 'relevant' and 'highly relevant' on a scale from zero to three (see Appendix 1). We expected a positive relationship between this variable and innovativeness.

To distinguish between the effects of different types of ownership on innovativeness, a dummy variable for foreign affiliates (FOR) has been created. In the CIS-2 questionnaire, the foreignness of a company is identified as a positive response to the question whether (or not) the location of the headquarters of the company is abroad. Based on the literature review, positive effects of foreign ownership on innovativeness have been expected. Similar to foreign firms, companies that are part of a domestic grouping (denoted as DOMG) can draw on technological and organizational expertise provided by associated companies and/or headquarters. In The Netherlands, the industrial landscape is characterized by the presence of several large MNE such as Philips, Akzo-Nobel, DSM Shell and Unilever, which decisively influence the country's technological infrastructure. These companies are also responsible for a large part of business R&D in The Netherlands (Hoesel and Narula, 1999). We introduced 'DOMG' as a control variable and expected positive effects for this variable with respect to innovativeness.

As the primary focus of the empirical analysis is on the relationship between foreign ownership and innovativeness, controls for some company and industry characteristics have been introduced in order to investigate the robustness of the results. Other independent variables include size (LSIZ), market growth (MG), export intensity (EXP), newly established firm (NEW) and dummy variables for different industries.[6]

The relationship between firm size and innovation has been a classical research topic in the Schumpeterian tradition. Schumpeter posed the original question as to whether there are qualitative differences between the innovative activities of small, entrepreneurial enterprises and those of large modern corporations with own R&D laboratories (Schumpeter, 1942). Within the empirical literature, his claim for a large firm advantage in innovation was interpreted as a proposition that innovativeness increases more than proportionally than firm size (Cohen, 1995). Although the empirical results have been mixed, they seem to suggest that there is a positive relationship between innovativeness of companies and firm size, however this relationship is not necessarily linear (Aghion et al., 2002; Cohen and Levin, 1989; Kamien and Schwartz, 1982). In recent nation-wide surveys on innovation, there has been some evidence that size has been in important variable in explaining innovativeness (Brouwer and Kleinknecht, 1999; Evangelista et al., 1997; Veugelers and Cassiman, 1999). The variable LSIZ is a proxy for the size of the firm. It is expected that a larger firm has more funds available to implement research and development, which will increase, in turn, the probability to undertake innovations.

Modern trade theory has raised the hypothesis that innovativeness (mostly proxied by R&D expenditure or patent counts) is closely linked to export performance. However, the empirical evidence in favor of this hypothesis has been far from clear-cut. This has been due to deficient innovation data as well as indicators on innovativeness used (Brouwer and Kleinknecht, 1993). A number of firm-level studies on innovation and export performance has used R&D intensity as a measure of innovation (e.g. Belderbos, 2003). In utilizing additional innovation variables such as number of produced innovations Wakelin (1998) found differences in the export performance of innovating and non-innovating firms since the former were, on average, more export oriented

[6] For a more detailed description of the variables see Appendix 1.

(Wakelin, 1998). Therefore it has been proposed that export-intensity has been a major factor in explaining the innovativeness of companies because export-intensive firms have been more exposed to international competition, therefore are more inclined to innovate than firms that oriented towards domestic markets. The independent variable (EXP) characterizes the export-intensity of the company. Export-intensive firms are more inclined to perform technological activities due to the need to monitor international technological trends and provide technical support for marketing and after sales services. However, less export intensive firms tend to interpret *new to the market* more generously, than larger and internationally operating firms do. As a result EXP should have a positive sign if the dependent variable represents innovations that are *new to the firm* and a negative sign if innovations are *new to the market*.

For the independent variable for market growth (MG) a positive sign is expected as high and increasing demand stimulates technological activities within a firm. This variable is related to the scope of future demand, i.e. the classical hypothesis raised by Schmookler (1962). Therefore it can be assumed that not only the size and growth of the market matters, but also the willingness to pay for new or improved products.

To take differences in appropriability conditions and technological conditions across industries into account, empirical studies have utilized a variety of industry classification schemes (Peneder, 2003). A widely used taxonomy (Archibugi, 2001) has been introduced by Pavitt (1984) who characterizes industrial sectors according to the main sources and directions of technological accumulation as well as main channels of imitation. Based on particular industry and technology characteristics, he distinguishes between supplier dominated, scale-intensive, information-intensive, science-based and specialized supplier industries (Pavitt, 1984). Several studies have demonstrated that this taxonomy explains rather well the innovativeness of manufacturing firms (Arundel and Kabla, 1998; Brouwer and Kleinknecht, 1999; Evangelista et al., 1997). In the model the variables SUPD, SCB, SPS measure the relationship between certain industry characteristics and innovativeness. The focus is in the following on supplier dominated (SUPD), science-based (SCB) and specialized supplier industries (SBS). In supplier dominated sectors such as textiles and agriculture, suppliers of machinery and other production inputs contribute to most technical change in the industry In science-based sectors, technological accumulation takes mainly place in corporate R&D laboratories which are, in turn, heavily dependent on knowledge, skills and techniques from academic research. Examples of typical science-based sectors are chemicals and electronics. In specialized supplier sectors companies are generally small and provide high performance inputs into complex production systems. Examples of typical specialized supplier sectors are machinery, instruments and software. Technological advances take place incrementally (Pavitt, 1984).[7]

3.2. Descriptive statistics

The distribution of cases by industry and descriptive statistics is presented in Table 1. It also shows the relationship between the industrial sectors (characterized according to the NACE classification) and the Pavitt classification according to specialized supplier, science based, supplier dominated and scale intensive industries. In the sample, there have been 612 companies with foreign headquarters, 1383 firms were part of a domestic grouping. In the petrol and chemical (science-based) industry, foreign ownership has been highest (17.6%) followed by the machines and equipment (specialized supplier) industry (11.4) and other industries characterized as supplier dominated (10.3). Foreign ownership has been lowest in the utilities (scale intensive) industry (0.2%), the textiles (supplier dominated) industry (2.3) and mining (scale intensive) industry (2.6). In general, companies with foreign ownership have mostly been found in science-based industries (petrol and chemicals, rubber and plastics and electronics) (213 firms or 34.8% of all foreign owned firms). In scale intensive (mining, food, metallurgy, metal products, cars and transport and utilities) and supplier dominated industries (textiles, paper, printing & publishing and other), this percentage was 27.0 (or 165 firms) and 26.8 (or 164 companies) respectively. In specialized supplier industry (machines and equipment) the number of foreign firms (70) was the lowest (only 11.4% of all foreign own companies could be found in this industry). The total share of companies with foreign ownership in the sample was 12.8%. For companies that have been part of a domestic grouping this percentage was 28.9, the majority of firms have been domestically owned (58.3%).

There have also been variations in terms of innovativeness across different industries. Table 2 shows the distribution of innovative performance of companies

[7] In firms in scale intensive industries, a fourth category according to Pavitt (1984), the accumulation of technology takes place during the design, building and operation of complex production systems and/or products. In the automobile industry, car manufacturers typically represent this category. This fourth category is used as the reference group in the statistical analysis.

Table 1
Distribution of firms across industries and different forms of ownership

NACE	Sector	Pavitt sector	No. of observation in sample	Share in %	Share of firms in domestic groupings	No. of observations	Share of foreign firms	No. of observations	Share of domestic firms	No. of observations
10–14	Mining	Scale intensive	66	1.4	1.7	24	2.6	16	0.9	26
15, 16	Food	Scale intensive	417	8.7	8.5	117	10.1	62	8.5	238
17–19	Textile	Supplier dominated	243	5.1	5.0	69	2.3	14	5.7	160
21	Paper	Supplier dominated	135	2.8	2.6	36	6.2	38	2.2	61
22	Printing, publishing	Supplier dominated	308	6.4	7.7	106	3.8	23	6.4	179
23, 24	Petrol & Chemicals	Science-based	214	4.5	3.3	45	17.6	108	2.2	61
25	Rubber and plastics	Science-based	177	3.7	3.8	53	7.4	45	2.8	79
27	Metallurgy	Scale intensive	62	1.3	0.9	13	3.3	20	1.0	29
28	Metal products	Scale intensive	396	8.3	8.3	115	6.4	39	8.7	242
29	Machines and equipment	Specialized supplier	390	8.2	7.9	109	11.4	70	7.6	211
30–33	Electronics	Science-based	285	6.0	4.6	63	9.8	60	5.8	162
34, 35	Cars and transport	Scale intensive	222	4.6	4.6	63	4.4	27	4.7	132
20, 26, 36, 37	Other industry	Supplier dominated	450	9.4	9.4	130	10.3	63	9.2	257
40, 41	Utilities	Scale intensive	66	1.4	1.4	20	0.2	1	1.6	45
45	Construction	Supplier dominated	1349	28.2	30.4	420	4.2	26	32.4	903
Total			4780	100.0	28.9	1383	12.8	612	58.3	2785

across industries i.e. firms with no innovations vis-à-vis firms producing 'imitative' and 'real' innovations. The total number of companies with an innovation has been 2454 compared to firms with no innovations, which accounted for 2326 observations. From all innovating firms, 1101 reported that they have introduced 'real' innovations and 1353 that they developed 'imitative' innovations. In the construction (supplier dominated) industry, the share of companies with an innovation has been highest (302 or 12.3% of all innovative companies), followed by the machines and equipment (specialized supplier) industry, where 297 companies reported an innovation (12.1%) and the food (scale intensive) industry where 265 firms introduced innovations (10.8%). Interestingly, companies in the construction industry were also responsible for the highest share of imitative innovations (15.5% of all companies with imitative innovations), whereas firms in the specialized supplier industry reported the highest percentage with respect to developing 'real' innovations (17.0% of all companies with 'real' innovations). The mining and utilities industries (both scale intensive) had the lowest number of companies with innovations (21 in mining and 35 in utilities, or 0.9 and 1.4%, respectively). In scale intensive (mining, food, metallurgy, metal products, cars and transport and utilities) and supplier dominated industries (textiles, paper, printing & publishing and other industries), the percentage of companies with 'real' innovations (326 or 29.6% of all 'real' innovating firms) and the percentage of firms with 'imitative' innovations (602 or 44.5% of all 'imitative' innovating firms) has been the highest, respectively.

Table 3 provides a contingency table displaying the means of the variables used in the model by type of ownership. It provides some preliminary evidence that there are significant differences along several parameters between domestic firms (column 2), companies that belong to a domestic grouping (column 3) and firms with foreign ownership (column 4). Foreign affiliates have higher export intensities and introduce more 'imitative' and 'real' innovations compared to their domestic counterparts. They report substantially greater own technological efforts and greater incoming knowledge transfer from an associated company compared to domestic firms (the F-test in column 5 shows that these differences are significant) and firms belonging to a domestic grouping (see results of the F-test in column 6). The size of foreign affiliates (measured in number of employees) has significantly been larger compared to domestic firms but not compared to companies belong to a domestic grouping. This surely indicates the presence of large domestic multinational companies like Philips or DSM in The

Table 2
Distribution of firms across industries and different forms of innovativeness

NACE	Sector	Pavitt sector	Share of companies with no innovation in %	No. of observation	Share of companies with imitative innovation	No. of observation	Share of companies with real innovation	No. of observation	Share of companies with an innovation (total)	No. of observations
10–14	Mining	Scale intensive	1.9	45	1.1	15	0.5	6	0.9	21
15, 16	Food	Scale intensive	6.5	152	11.1	150	10.4	115	10.8	265
17–19	Textile	Supplier dominated	5.5	127	4.8	65	4.6	51	4.7	116
21	Paper	Supplier dominated	2.2	52	3.7	50	3.0	33	3.4	83
22	Printing, publishing	Supplier dominated	6.4	150	8.7	118	3.6	40	6.4	158
23, 24	Petrol & chemicals	Science-based	1.6	37	6.2	84	8.4	93	7.2	177
25	Rubber and plastics	Science-based	1.9	44	4.6	62	6.4	71	5.4	133
27	Metallurgy	Scale intensive	0.9	21	2.0	27	1.3	14	1.7	41
28	Metal products	Scale intensive	7.4	171	8.8	119	9.6	106	9.2	225
29	Machines and equipment	Specialized supplier	4.0	93	8.1	110	17.0	187	12.1	297
30–33	Electronics	Science-based	3.4	80	7.4	100	9.5	105	8.4	205
34, 35	Cars and transport	Scale intensive	3.8	88	4.4	59	6.8	75	5.5	134
20, 26, 36, 37	Other industry	Supplier dominated	8.1	188	11.8	159	9.4	103	10.7	262
40, 41	Utilities	Scale intensive	1.3	31	1.8	25	0.9	10	1.4	35
45	Construction	Supplier dominated	45.0	1047	15.5	210	8.4	92	12.3	302
Total			100.0	2326	100.0	1353	100.0	1101	100.0	2454

Table 3
Descriptive statistics for different forms of ownership and innovativeness

	Domestic firms = 1	Domestic grouping = 1	Foreign ownership = 1	Mean test 1[a] *F*-value	Mean test 2[b] *F*-value
Own technology effort	0.6763	0.7668	0.8205	37.063***	4.913**
Associated company transfer	0.0000	0.5568	1.2941	1367.792***	239.884***
Innovation expenditure	0.0198	0.0138	0.0228	0.089	4.214*
Firm size	106	194	234	53.691***	0.635
New firms	0.0208	0.0253	0.0212	0.032	0.210
Export intensity	0.1546	0.1951	1.9087	7.752**	3.617*
Market growth	0.2516	0.1799	0.2256	0.088	1.474
No innovators	0.5475	0.4765	0.2304	212.912***	113.514***
Imitative innovations	0.3215	0.3795	0.6168	124.926***	65.244***
Real innovations	0.4266	0.4434	0.5180	11.080**	6.671**
No of observations	2785	1383	612		

[a] The test is the comparison between firms with foreign ownership and domestic firms that are not associated at all.
[b] The test is the comparison between firms with foreign ownership vis-à-vis firms that are part of a domestic grouping.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Netherlands. Interestingly, research intensities of foreign affiliates have been higher compared to firms in domestic groupings.

4. The estimation results

Before the analysis, the level of correlation between variables in the data was checked (see Appendix 2). It appeared that there have been no unexpected multicollinearity problems in the data with respect to the use of a multivariate model. Due to missing observations in some independent variables specified in the empirical model, 4780 observations remained valid. The smaller sample of 3679 firms included only innovating companies. Due to the specifics of the CIS-2 questionnaire, only for this smaller sample of innovating firms information on R&D expenditure and additional innovation related indicators was available. For non-innovating firms, the questionnaire provided no information on these issues as managers were asked to skip questions related to the innovation process if their company did not introduce any innovation. Based on the responses, of both innovating as well as non-innovating firms, we were able to discriminate between non-innovators vis-à-vis 'imitative' innovators and 'real' vis-à-vis 'imitative' innovators.

A logit model was specified in which the dependent variable characterizes whether (or not) the firm introduced an innovation between 1994 and 1996. In order to test for the robustness of the findings, a number of control variables was utilized that have extensively been used in earlier studies. These variables included some (standard) explanatory variables such as firm size (LSIZ), market growth (MG) and export performance (EXP) as well as industry dummies (SUPD, SCB and SPS) capturing the scope for technological opportunities and appropriability conditions in particular industrial sectors.

As can be seen in Tables 4 and 5, the models presented have a high explanatory power of independent variables as indicated by the significance level and the Chi-square in the different regressions. Table 4 shows three regression models (1)–(3) that show the effects of a number of independent variables on three different forms of the dependent variable INN. In characterizing the probability of companies to introduce 'imitative' innovations, the first model takes the group of firms that reported no innovation as a base category. The second and third model are intended to further disentangle differences in innovativeness by examining differences between 'real' vis-à-vis 'imitative' innovations and 'real' innovations vis-à-vis no innovations. From the 4780 observations in the original sample, 3679 observations were used in model (1), 2454 and 3427 in models (2) and (3), respectively. For all three models (1)–(3) the overall fit of the model improved by moving from a restricted to the full model that included the variable for foreign ownership. The Wald test showed that the variable for foreign ownership belongs to the subset of coefficients that contributed to the explanation of the different regression models.[8]

The coefficients in Table 4 are the estimated partial derivatives of probabilities with respect to the vector of characteristics. The coefficient reflects how much the

[8] Due to space restrictions, these regressions are not reported but are available on request.

Table 4
Innovativeness and foreign affiliates: results of logit estimations

	Regression		
	1	2	3
Variables	'Imitative' innovation No innovations	'Real' innovations 'Imitative' innovations	'Real' innovations No Innovations
Constant	−1.809*** (0.157)	−1.892*** (0.187)	−3.668*** (0.192)
LSIZ	0.161*** (0.036)	0.293*** (0.040)	0.436*** (0.041)
EXP	1.062*** (0.143)	−0.005 (0.009)	−0.019*** (0.160)
MG	−0.001 (0.021)	− 0.067 (0.058)	−0.019 (0.042)
SUPD	1.072*** (0.123)	0.733*** (0.118)	1.814*** (0.136)
SCB	0.594*** (0.092)	0.451*** (0.106)	1.081*** (0.107)
SPS	0.847*** (0.160)	1.207*** (0.142)	2.056*** (0.159)
NEW	−0.572* (0.316)	0.451 (0.387)	−0.388 (0.346)
FOR	0.558*** (0.138)	− 0.020 (0.121)	0.449* (0.151)
DOMG	0.192* (0.085)	−0.050 (0.101)	0.141 (0.098)
Observations	3679	2454	3427
χ^2	382.078	149.438	856.869
P	0.000***	0.000***	0.000***
−2LL	4213.924	3104.535	3262.871
Nagelkerke R^2	0.142	0.082	0.322

Note: Standard errors are in parentheses. The estimates are robust maximum-likelihood logit estimates.
* Significant at 10%.
*** Significant at 1%.

Table 5
Innovativeness in foreign affliates: results of logit estimations

	Regression		
	4	5	6
Variables	'Real' innovations Imitative innovations	'Real' innovations Imitative innovations	'Real' innovations Imitative innovations
Constant	−2.045*** (0.194)	−1.978*** (0.195)	−2.2279*** (0.203)
RDINT	0.839* (0.356)	0.790* (0.349)	0.654* (0.315)
LSIZ	0.322*** (0.042)	0.290*** (0.042)	0.203*** (0.044)
EXP	−0.005 (0.010)	−0.005 (0.010)	−0.006 (0.013)
MG	−0.068 (0.058)	−0.066 (0.058)	−0.074 (0.058)
SUPD	0.746*** (0.119)	0.728*** (0.120)	0.445*** (0.124)
SCB	0.471*** (0.107)	0.464*** (0.108)	0.284** (0.112)
SPS	1.227** (0.143)	1.244** (0.143)	0.916*** (0.148)
NEW	0.387 (0.391)	0.351 (0.392)	0.278 (0.400)
FOR	−0.066 (0.122)	−0.308** (0.136)	−0.319* (0.138)
DOMG	−0.058 (0.101)	−0.183* (0.106)	−0.245* (0.109)
AFF_TRAN		0.207*** (0.049)	0.194*** (0.050)
OWN_RD			1.167*** (0.112)
Observations	3679	3679	3679
χ^2	162.504	180.324	296.806
P	0.000***	0.000***	0.000***
−2LL	3069.456	3051.636	2935.153
Nagelkerke R^2	0.089	0.099	0.159

Note: Standard errors are in parentheses. The estimates are robust maximum-likelihood logit estimates.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

probability that the firm innovates increases with an increase in a particular independent variable, holding other independent variables constant. The constant has in all three regressions a negative sign and is significant.[9] The signs of most coefficients are as expected. The variable for company size (LSIZ) and for the three industry dummies (SUPD, SCB and SPS) have been positive and significant. We found non-significant results for the variable for market growth (MG) in all three regressions. This seems somewhat surprising but has an intuitive explanation if the nature of the variable is taken into account. As the variable MG measures the market growth of a particular firm, it seems that companies do not invest in innovative activities as long as their market is (still) growing. As expected the variable for export intensity (EXP) has been positive and significant in model (1), but became negative and significant in model (3). This indicates that export intensive firms are more innovative with respect to imitative innovations, however, this relationship seems reversed in the case of real innovations. The variable for newly established firms (NEW) has not been significant in the any of the models. This control variable has been included in the model to investigate the general belief that newly established firms are more innovative compared to older ones. As can be seen in Table 4, we did not find any support for this view.

However and more interestingly, we could confirm the conventional wisdom that there is a positive relationship between foreign ownership and innovativeness. In model (1), we found that foreign affiliates (denoted as FOR) have a higher probability to provide 'imitative' innovations compared to domestic firms. The variable FOR has been positive and highly significant. In addition, model (3) showed that foreign affiliates are also more likely to develop 'real' innovations compared to non-innovating domestic firms. These findings verified the results obtained earlier in an univariate setting (see Table 3). For companies belonging to a domestic grouping (DOMG) positive effects could only be observed for 'imitative' innovations (model (1)).

In spite of this, foreign affiliates have been not more likely to introduce 'real' innovations in comparison with other innovating firms. In model (2), the variable for foreign ownership (FOR) did not exert – as expected – significant positive effects on the probability of introducing 'real' innovations. These results raise two questions: first, to what extent foreign affiliates are more innovative because they invest more in R&D, and second, to what extent they are more innovative because they are linked to an associated company.

As we have seen for the whole sample of 4780 companies, foreign firms have been more inclined to produce 'imitative' innovations compared to domestic companies and they have also been more active in developing 'real' innovations in contrast to non-innovating domestic firms. However, it would be interesting to examine whether or not this higher innovative performance has also been due to higher investment in R&D or due to the utilization of knowledge transfer from associated companies. Initial results presented in Table 3 based on univariate analysis suggest that knowledge transfer are of greater importance to foreign affiliates compared to domestic companies and companies in domestic groupings. For R&D intensity, we found significant differences between the foreign affiliates and firms in domestic groupings but not with respect to domestic firms. The following models (see Table 5) has been aimed at finding out whether these results can be verified in a multivariate setting.

The CIS-2 survey includes information about the research and development activities of companies if they have indicated that they have introduced an innovation. For companies that have no innovation (non-innovators), there has been no further information on innovative activities within the company. This limited the number of observations that could be used for the analysis from 4780 to 3679 observations. In order to provide some information on these samples we have included the correlations for the different samples. As can be seen from these tables (see Appendix 2), there have been no problems of multicollinearity.

In order to further distinguish between factors that contribute to the innovativeness of foreign affiliates, the models (4)–(6) have been estimated. They include two additional variables that should give an indication on sources of innovativeness within foreign affiliates. The first variable (denoted as AFF_TRAN) measures the extent to which incoming transfer from an associated company have been an important source for innovative activities within a company and the second variable (denoted as OWN_RD) characterizes whether (or not) own research and development efforts have contributed to innovativeness. These models include a control variable for innovation intensity (RDINT) which is in the CIS-2 survey only reported for companies indicating that they have introduced some kind of innovation.

The three models (3)–(5) presented in Table 5 have been aimed at estimating the probabilities for different characteristics of innovative firms that they would intro-

[9] The value of the constant partly reflects the fourth Pavitt category of supplier dominated as it was taken as a base category with respect to the other three categories (SUPD, SCB and SPS). However, it includes also other effects.

duce ‘real’ innovations. All three models (4)–(6) have a high explanatory power of independent variables as indicated by significance level and the Chi-squared. Due to the additional variables for incoming knowledge transfer from associated companies (AFF_TRAN) and own R&D efforts (OWN_RD), the overall fit improved from models (4) to (5) and finally to model (6) as indicated by an increase in the Chi-square.

In all three models, the constants show a negative sign and are highly significant. Furthermore, the variables for size (LSIZ) has been, as expected, positive and highly significant. The variable for export intensity (EXP) became insignificant. Similar to the models (1)–(3) presented earlier, the variables for market growth (MG) and newly established firm (NEW) have not been significant. The dummy variables for the three Pavitt sectors (SUPD, SCB and SPS) have been positive and highly significant in all models. The variables for foreign ownership (FOR) and domestic grouping (DOMG) have been negative and significant in models (5) and (6). As expected the variable for R&D intensity (RDINT) has been positive and significant similar to the variables for affiliate knowledge transfer (AFF_TRAN) and own local technological efforts (OWN_RD). Two interesting results emerge from these models: first, as the variables for research intensity (RDINT) and own technology efforts (OWN_RD) have been positive and significant, it can be concluded that innovative companies have a higher probability of introducing ‘real’ innovations if they invest more in R&D and undertake more local technological efforts. Second, the group of foreign affiliates investing in R&D has been very heterogeneous ranging from firms exploiting incoming knowledge transfer from an associated company to firms that do not make use of this knowledge transfer at all. When controlling for incoming knowledge transfer from an associated company, the variable for foreign affiliates (FOR) changed from insignificant (model (4)) to negative (model (5)). This indicates that foreign affiliates are less likely to introduce ‘real’ innovations when they do not rely on incoming knowledge transfer from an associated company compared to other innovative firms.

5. Summary and conclusions

Our analysis has demonstrated that foreign affiliates are more innovative compared to domestic firms in The Netherlands. This is in line with the current literature on multinational enterprises and innovativeness. In addition, we have shown that foreign affiliates are more inclined to develop ‘imitative’ innovations and are more involved in the production of ‘real’ innovations. A new insight provided by our analysis is that foreign affiliates are not more likely to develop ‘real’ innovations when compared to the population of innovative companies. However, this observation has to be further specified as the group of foreign affiliates has been heterogeneous. It has not been valid for foreign affiliates that benefited from external knowledge transfer from an associated firm. Based on this transfer, foreign affiliates have also been more likely to develop ‘real’ innovations. In other words, external knowledge transfer from associated firms as well as local technological efforts are vital for innovating firms to introduce ‘real’ innovations, i.e. products that are new to the market.

The results of our analysis demonstrate that perceptions which take the innovativeness of foreign affiliates for granted should take a deeper look at (different forms of) innovativeness of foreign affiliates which should be of some concern for policy-makers as this relationship is not only affected by differences across countries but also by the particular time period under consideration. The available evidence shows that there are wide variations across developed countries with respect to the contribution of foreign affiliates to innovativeness (UNCTAD, 2002). Therefore, the results of our analysis for The Netherlands have to be put in the context of studies undertaken in other advanced countries in order to draw some more general conclusions. Furthermore, even if The Netherlands has remained a “frontrunner” in inward FDI with a high potential for FDI since the early 1990s, further studies have to take changes in the sectoral composition of inward FDI since the 1990s in particular the shift towards service sectors into account (UNCTAD, 2004). In addition, policy makers should take a deeper look at the different forms of innovativeness in evaluating the contribution of MNE to the national economy. A positive contribution of foreign affiliates to the production of ‘imitative’ innovations surely is desirable and should be stimulated. The development of ‘real’ innovations, i.e. products and services that are new to the market, however, becomes increasingly important for the competitiveness of national economies in advanced countries like The Netherlands.

Acknowledgements

We thank the acting editor Nick van Tunzelmann for his encouragement and the anonymous referees of the journal for their in-depth comments. We are grateful to C. van Beers for his input into an earlier version of this paper and the Dutch Central Bureau of Statistics (CBS) for providing access to the data. All remaining errors are ours.

Appendix 1. Variables used in the model

No.	Variable	Description	Measurement
1	INN	Propensity to innovate	Binary Variable: 1 if firm innovated in 1994–1996; 0 if firm did not innovate in 1994–1996
2	RDINT	Innovation intensity	Total innovation expenditure divided by total sales expenditure in 1996
3	LSIZ	Firm size	Log (employment in numbers of employees) in 1994
4	AFF_TRAN	Link with associated company	Variable explains the extent to which an associated company was important as a source of knowledge for the firm's innovation process ranging from not relevant (0), hardly relevant (1), relevant (2) and highly relevant (3)
5	OWN_RD	Own technology effort	Binary variable equals 1 if company was investing in R&D with own personnel (otherwise 0)
6	EXP	Export	Share of export in turnover in 1994
7	MG	Market growth	Sales growth between 1994 and 1996
8	SUPD	Supplier dominated sector	Binary variable firm belongs to the supplier dominated sector according to Pavitt's taxonomy (1984)
9	SCB	Science based sector	Binary variable firm belongs to the science based sector according to Pavitt's taxonomy (1984)
10	SPS	Specialized supplier sector	Binary variable firm belongs to the specialized suppliers sector according to Pavitt's taxonomy (1984)
11	NEW	Newly established firm	Binary variable newly established firms between 1994 and 1996
12	FOR	Foreign affiliate	Binary variable indicating if a firm is an affiliate of a foreign multinational (1), otherwise 0
13	DOMG	Domestic group	Binary variable indicating if the business unit is part of a domestic firm grouping (1), otherwise 0

Appendix 2. Correlation

	OWN_RD (1)	AFF_TRAN (2)	RDINT (3)	LSIZ (4)	EXP (5)	MG (6)	NEW (7)	FOR (8)	DOMG (9)
N = 4780									
1	1.000								
2	0.130	1.000							
3	0.025	0.024	1.000						
4	0.230	0.288	−0.039	1.000					
5	0.018	0.036	−0.002	0.004	1.000				
6	0.026	−0.002	−0.015	0.013	−0.001	1.000			
7	0.006	−0.010	0.050	−0.050	−0.002	0.077	1.000		
8	0.098	0.396	−0.005	0.214	0.050	0.000	−0.002	1.000	
9	0.053	0.106	0.016	0.122	−0.011	−0.017	0.015	−0.242	1.000
N = 3679									
1	1.000								
2	0.131	1.000							
3	0.025	0.023	1.000						
4	0.229	0.352	−0.039	1.000					
5	0.018	0.033	−0.002	0.006	1.000				
6	0.026	0.009	−0.021	−0.002	−0.001	1.000			
7	0.006	−0.008	0.051	−0.051	−0.002	0.093	1.000		
8	0.099	0.374	−0.006	0.255	0.048	0.009	0.002	1.000	
9	0.053	0.124	0.015	0.113	−0.012	−0.007	0.018	−0.274	1.000

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