

The innovativeness of foreign firms in China

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The Innovativeness of Foreign Firms in China

Branka Urem, Ludovico Alcorta and Tongliang An

The Innovativeness of Foreign Firms in China*

Branka Urem^{1§}, Ludovico Alcorta² and Tongliang An³

¹ UNU-MERIT, Maastricht, The Netherlands

² Maastricht School of Management, Maastricht, The Netherlands

³ Nanjing University, Nanjing, Jiangsu, China

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Abstract:

This paper studies the relationship between foreign ownership and innovations of high novelty in context of advanced developing countries. We develop hypotheses about a direct relationship in terms of two dimensions, propensity and intensity of innovations of high novelty, and a contingency hypothesis about the moderating impact of R&D internationalisation on the relationship with propensity. The analysis is based on innovation survey data on manufacturing firms from Jiangsu province of China. Hypotheses are tested using non-parametric methods. We find that foreign firms do not have a higher propensity of innovations of high novelty, not even when they engage in formal R&D. However, the evidence suggests that foreign firms have a higher intensity of innovations of high novelty than domestic firms.

JEL codes: F23; L60; O31

Keywords: multinational enterprises, foreign firms; innovation; manufacturing; China

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§ Corresponding author: UNU-MERIT, Keizer Karelplein 19, 6211 TC Maastricht, The Netherlands; urem@merit.unu.edu

1. Introduction

While the traditional literature on the role of multinationals in innovation in host countries has emphasised the significance of multinationals in international technology transfer, in the recent literature the emphasis has been on the increasing role of multinationals in the generation of innovations in host countries. Consistent with these developments it seems important to raise the issue of the impact of foreign ownership on the novelty of innovations in host countries.

The research on the novelty of innovations in relationship to the nationality of foreign ownership is recent and relatively limited. Existing studies typically make a distinction between two levels of novelty, innovations new to the firm and innovations new to the market, consistent with the distinctions in the Community Innovation Survey (CIS). The focus is typically on the impact of foreign ownership on innovations new to the market, as a high level of novelty, and on propensity indicators. In the case of developed countries there are several studies based on CIS data, but evidence on the impact of foreign ownership is mixed. Sadowsky and Sadowsky-Rasers (2006) report a positive impact among firms in the Netherlands that include both innovators and non-innovators but, among innovators only, they find no impact or a negative impact when controlling for sources of innovation. Dachs, Ebersberger and Lööf (2007), in a group of five small European countries, detect a positive impact of at least one category of foreign firms (grouped by the home-country corporate governance into three categories) in three countries (Denmark, Finland and Sweden), and no impact on the introduction of new to the market innovations in two (Austria and Norway). Disaggregating the effect

associated with foreign firms, Frenz and Ietto-Gillies (2007) find positive impact of high multinationality on the introduction of new to the market innovations in UK, but no impact of corporate-group, multinational and foreign-multinational membership. With regard to (advanced) developing countries there is limited evidence, with the exception of a study on Brazil, which finds that foreign firms have a higher propensity to introduce product innovation new to the market than domestic firms (Kannebley, Porto and Toldo Pazello, 2005).

This chapter is also focused on the relationship between the nationality of ownership of firms and innovations of high novelty, but with an approach that differs from the literature in three ways. First, while existing studies focus only on direct effects of foreign ownership on propensity of innovations of high novelty, building on the literature on the internationalisation of R&D by multinationals this study also examines a moderating impact of R&D on the relationship. Up to now studies on the impact of foreign ownership on innovation in host countries have considered the direct effects of R&D only despite the role of R&D in the generation of innovations in foreign affiliates. Second, unlike other studies that are based on a single indicator of innovation of high novelty, propensity, here the analysis is based on two indicators, propensity and intensity. The propensity indicator (measuring whether firms have introduced an innovation) rates an ability to introduce innovations on the market. In contrast, the intensity indicator (calculated as a share of innovation sales in total sales) measures the degree of the commercial success of introduced innovations, and thus represents a direct measure of the innovation output. While the propensity indicator shows whether a firm is an innovator, the intensity indicator measures the volume of sales generated by

introduced innovations, that is the extent of economic benefits of innovative activities (see more in Arundel, Smith, Patel and Sirilli, 1998). However, the intensity indicator has been neglected in prior studies on the impact of foreign ownership on innovation in host countries. Third, the relationship between the nationality of ownership of firms and innovation novelty is examined in context of advanced developing countries. While these countries attract not only an increasing share of foreign direct investments, but also an increasing proportion of foreign R&D investments (UNCTAD, 2005), studies on effects of foreign ownership on innovation novelty have primarily been oriented on developed countries (with an exception of Kannebley et al., 2005).

The empirical analysis is based on data from China that represents a suitable research context for two main reasons. First, in the last decades China has achieved remarkable progress in building of innovation capabilities in the enterprise sector but despite this its patent performance remains low both relative to its share in R&D as well as in comparison to foreign firms (OECD, 2007). Second, up to recently foreign firms have been primarily established as low cost manufacturing operations, but China currently has the highest inward foreign direct and R&D investments in the world (European Commission, 2004). These conditions provide a suitable setting to examine the relationship between foreign ownership and innovations of high novelty, and to assess the moderating effect of R&D internationalisation on propensity of innovations of high novelty.

The remainder of the chapter is organised as follows. The next section provides a conceptual background and develops hypotheses about the relationship between foreign

ownership and propensity and intensity of innovations of high novelty. Section 3 describes the innovation survey data used, the variables and the method of analysis. The results are presented in section 4. The last Section contains discussion of empirical findings and main conclusions.

2. Theoretical background and hypotheses

2.1 Multinationals and innovation in host countries

Building on eclectic theory of international production (Dunning, 1993, 1988), two issues are considered particularly important in the understanding of the role of multinationals in innovations in host countries, on one side the internationalisation of exploitation and generation of innovation by multinationals, associated with the issue of *ownership advantages* of multinationals, and on the other side, the *locational* aspect associated with the context of advanced developing host countries.

Regarding the role of multinationals in the generation and transfer of innovation and implications for the novelty of innovations of foreign affiliates in advanced developing host countries, a starting point is a conceptual distinction between international exploitation of home developed innovations and international generation of innovation (following Archibugi and Michie, 1995). Internal (intra-firm) *international technology transfer* processes are considered associated with pre-existing ownership advantages on the basis of which multinational firms exploit innovations developed in home countries

through international production as postulated by the traditional theories (Caves, 1982; Vernon, 1966; Dunning, 1993). Multinationals have generally been seen as the most efficient institutional form for the transfer of technological knowledge across national borders due to either the transaction costs based arguments about imperfect markets in the intangible assets (Teece, 1981), or the knowledge based arguments about characteristics of the tacit technological knowledge (Kogut and Zander, 1993). In traditional approaches foreign affiliates are mainly seen as more passive recipients of the parent technology. The argument is that both development and first commercial application of new products and processes take place in home countries of multinationals, while foreign affiliates primarily engage in production activities (for example, Vernon, 1966).

Consistent with recent trends of increasing internationalisation of generation of innovation by multinationals, foreign production affiliates seem increasingly likely to also engage in development of improved or new products and processes. It has been argued that the *generation of innovation* in foreign affiliates in host countries can be driven by two motives. The asset exploitation (Dunning and Narula, 1995) or home-base exploiting (Kuemmerle, 1999a) motive is associated with generation of innovations in response to local conditions either by adapting the parent innovation or by creating new innovations for the local market. In addition, the asset-seeking (Dunning and Narula, 1995) or home-base augmenting (Kuemmerle, 1999a) motive for the internationalisation of innovation drives generation of innovations for the global market. The nature of the motives for internationalisation of innovation generation by multinationals imply that foreign production affiliates are unlikely to remain passive

recipients of the technology transfer from the parent, but are likely to also engage in innovation generation, especially as they become more established. Affiliates recombine learning in host markets with the knowledge from home countries through the evolutionary process of knowledge accumulation (Kogut and Zander, 1993). The increasing involvement of foreign affiliates in the process of innovation generation is associated with the creation of a variety of innovation networks within multinationals (Zander, 1999), in which, in addition to traditional parent-affiliate technology flows, reverse flows from affiliates to parent, as well as lateral technology flows among affiliates are gaining on importance.

When considering the impact of foreign ownership on the innovation of high novelty in host countries, the *locational conditions* in host countries have to be considered also. The empirical evidence on recent trends of internationalisation of generation of innovation by multinationals reveals that foreign R&D investments are primarily located in developed countries but have recently also been increasing in advanced developing countries, particularly in South East Asia and China (UNCTAD, 2005). Since in generation of innovations foreign affiliates rely not only on access to the knowledge of the parent, but also on sources of innovation in the local environment (Cantwell and Santangelo, 1999), availability of complementary local scientific and technological capabilities is an important locational factor for foreign R&D. More specifically, asset exploiting foreign R&D investments seem to be primarily attracted to countries with large markets and asset augmenting R&D to countries with a strong science base (Kuemmerle, 1999b). While advanced developing countries may have

started to build specialised innovation capabilities¹ for generation of innovations in certain firms and sectors (Mahmood and Singh, 2003), in these countries innovations of lower novelty still predominate.

2.2 Hypotheses

In studies of the impact of foreign ownership on innovation in host countries it is typically argued that foreign firms will be more innovative than domestic firms because of existing ownership advantages. Since Hymer (1976) it has been widely accepted that due to advantages of domestic firms in own national environment, the internalised ownership advantages represent a precondition for the entry into production in foreign countries. The international production is based on intra-firm transfer of technology developed in home countries. According to the transaction-cost-based theory transfer of technological knowledge is internalised within multinationals because of transactional difficulties in the market for technological knowledge (Teece, 1981). The knowledge-based theory argues that multinationals internally transfer technological knowledge that cannot more efficiently be obtained by either international inter-firm technology transfer or by imitation (Kogut and Zander, 1993). Given a national technology gap between home countries and host advanced developing countries these arguments imply a higher

¹ On the growing importance of emerging countries (for example China, Singapore, South Korea) in the world system of science see Leydesdorff and Zhou (2005). The authors attribute the exceptionally high growth rates of Chinese science to the almost unlimited supply of human resources with scientific competence.

level of innovation novelty of foreign firms on the basis of exploitation of innovations generated in home countries. Consistent with these arguments it is hypothesised:

Hypothesis 1a. Foreign firms will have higher propensity of innovations of high novelty than domestic firms.

An inherent aspect of the internationalisation of the generation of innovations by multinationals is the internationalisation of R&D. Studies on the internationalisation of R&D suggest that there are both centripetal as well as centrifugal forces influencing the location of R&D by multinationals in home versus host countries (see Hirschey and Caves, 1981). The main centralising forces include the protection of firm-specific technology, home-market conditions as a basis for firm-specific technological advantages, economies of scale in R&D and minimisation of costs of coordination and control (Granstrand, Håkanson and Sjölander, 1992). Decentralising forces include both demand-oriented factors, such as an adaptation of products and processes to local conditions and government regulations, as well as supply-oriented factors, including scientific infrastructure, cost of R&D and R&D subsidies (Granstrand et al., 1992). Regarding foreign R&D investments in developing countries it has been argued that they are primarily driven by the availability of local science and technology resources and their lower costs (Reddy, 1997). The dual motives for the location of R&D in foreign countries (Kuemmerle, 1999a; Dunning and Narula, 1995) suggest that the internationalisation of R&D by multinationals is a precondition for the generation of innovations in host countries. A higher propensity of innovations of high novelty in

foreign firms is not expected on the basis of the existing ownership advantages, that is innovation exploitation. Therefore it is hypothesised:

Hypothesis 1b. Foreign firms with formal R&D will have higher propensity of innovations of high novelty than domestic firms.

It has been argued that the successful commercialisation of introduced innovations depends on access to capabilities or assets complementary to innovation capabilities, typically those in manufacturing and marketing (Teece, 1988). Ownership advantages of foreign affiliates over domestic firms typically include not only technology related advantages, but a variety of other intangible and complementary asset advantages, for example in relation to input sourcing, marketing, finance, management, knowledge of international markets, and so on (Dunning, 1993). While established affiliates in many ways resemble independent firms, it is the intra-firm access to assets of the parent that distinguishes them from independent firms (Penrose, 1956). This implies access to capabilities and resources of the corporation that are likely to be superior to those accessible by local firms. Therefore, foreign firms are more likely to have access to the relevant complementary assets needed to successfully commercialise introduced innovations than domestic firms. This is especially likely in the case of developing and transition economies because of the gap in capabilities and resources between home and host country firms (Hitt, Dacin, Levitas, Arregle and Borza, 2000). Thus, it is hypothesised:

Hypothesis 2: Foreign firms will have higher intensity of innovations of high novelty than domestic firms.

3. Data and method

The empirical analysis is based on data from Jiangsu province of China. The province, located on the East coast, is one of the most developed provinces, and has the characteristics of an advanced developing economy of relevance for the research in this study. First, it has significant domestic innovation capabilities, ranked third by its share of R&D in the country's total (OECD, 2007). Next, it has considerable inflow of foreign direct investments, the second largest after Guandong (Invest in China, 2006), with important presence of foreign R&D too (23 per cent share of industrial R&D) (OECD, 2007). Lastly, within the innovation system of the province multinationals and small and medium size enterprises are more important than state-owned enterprises or public research organisations (OECD, 2007).

The data were collected by an innovation survey conducted in 2003 by the second and the third author. Since the official business register of the firms in Jiangsu province was not available, the sampling frame was based on telephone directories of the capitals of 13 municipal counties of Jiangsu. In contrast to typical official Chinese surveys, it includes firms of all sizes (from 10 or more employees). Firms were randomly sampled from a population of urban manufacturing firms. The sample was restricted to one fifth

of the estimated population of 12 000 firms. The data collection started with a postal survey, with follow-up visits to non-responding firms, resulting in a response rate of 15 per cent. The innovation survey was single-respondent, subject-based and consistent with the Oslo manual, with several modifications: it covered both incremental and significant innovations; it included sales-based output measurement of product innovations of all levels of novelty; and it covered innovations during one year (2002).²

Analysis is restricted to those innovating firms that introduced product innovations (defined as the commercial adoption of a new product), and reported product innovation sales and the associated levels of innovation novelty, resulting in a sample of 173 firms.

It is taken here that innovation novelty distinctions based on the Oslo manual provide a basis for categorisation of innovations by novelty that is relevant when considering the role of multinationals in the transfer and generation of innovations in host economies, that is across national borders. Apart from new to the firm innovations, as the lowest level of novelty (considered in other classifications in the literature as well), the Oslo manual distinguishes, on the basis of geographical criteria, new to the region (in case of large countries), new to the country and new to the world innovations, in increasing order of novelty. Consistent with the manual, the innovation survey distinguished between first to the firm, first to Jiangsu, first to China and first to the world innovations.³ For the purpose of this study the first to the China innovations and first to

² For a full description of the main results of the survey see Alcorta, Urem and An (2008).

³ Canada is the only country that is implementing the geographical criteria of innovation novelty in its official survey. However, there are three differences in comparison to the Jiangsu innovation survey: 1) novelty is considered only for the most significant innovation; 2) the questionnaire considers whether firms introduced innovations of different levels of novelty, not the amount of innovation sales generated by such innovations, and 3) the new to the region innovations are not included among innovation novelty categories.

the world innovations are considered as the innovations of high novelty. Thus, innovations of high novelty as defined here are at least new to the host country.⁴

Product innovation novelty is analysed on the basis of two indicators, innovation propensity and innovation intensity. The innovation propensity variable is dichotomous with value one if the firm reported sales of innovations of high novelty and value zero if the firm did not report sales of innovations of high novelty. Reporting sales of innovations of high novelty is interpreted as their successful introduction. The innovation intensity is measured by the ratio of sales of product innovations of high novelty in the total sales. The innovation intensity variable is defined as dichotomous with value one if a firm has a share of sales of innovations of high novelty in total sales above mean and value zero if the share is below the mean (calculated for the pooled sample of foreign and domestic firms).

The independent variable, the nationality of ownership, is dichotomous with value 1 if the firm is foreign and value 0 if it is domestic. Foreign firms are defined as firms in majority foreign ownership and in majority Hong Kong, Macao and Taiwan (that is overseas Chinese) ownership. This definition is consistent with the ownership categories of foreign invested enterprises and Hong Kong, Macao and Taiwan invested enterprises in the Chinese official statistics.

⁴ In contrast to the novelty levels considered here, other studies on the relationship between the nationality of ownership and innovation novelty are based on CIS, which makes a distinction between innovations new to the firm and innovations new to the firm's market. Regarding the comparability of the novelty levels used here and the CIS distinctions, following Mohnen and Therrien (2001), it is taken that all innovations that are new beyond the firm (that is except new to the firm innovations) correspond to new to the market innovations (as nearest concepts). This implies that the concept of high novelty adopted here is narrower than the concept equivalent to the new to the market innovations as used in the studies

The moderator variable, formal R&D, is measured as a dichotomous variable with value 1 if the firm has a separate R&D department and value 0 if it does not. In case of foreign firms it indicates whether a decentralisation of R&D to the affiliates of foreign multinationals located in Jiangsu has taken place.

Consistent with the innovation literature it is controlled for the influence of size and industry. The size variable is defined as a dichotomous variable, with value 1 if firms are large-and-medium (that is, have 300 or more employees), and 0 if they are small, consistent with the employment criteria, one of the three criteria used for the complex official statistical classification of firms by size (see Lundin, Sjöholm and Qian, 2006). The influence of industry is controlled by a dichotomous variable sector. It is based on a categorisation of sectors by Robson, Townsend and Pavitt (1988), who distinguish between core sectors, which are highly innovative and primarily characterised by product innovations, secondary sectors that are less innovative and have similar levels of both product and process innovations, and the sector other that is low innovative. The core and secondary sectors are considered here “high innovative”, and the sector other “low innovative”. The variable sector has value 1 if the firm is from the “high innovative” sector, and value 0 if it is from the “low innovative” sector. The “high-innovative” sector includes chemicals, plastics, metal products, non-electrical machinery, electrical machinery and vehicles, and the “low innovative” sector food, textile, wood and non-metal industries and other manufacturing.

The analysis of the relationship between foreign ownership and innovation of high novelty is based on testing of the difference between domestic and foreign firms. The

based on CIS data.

analysis includes bivariate analysis of a direct relationship, and three variable analysis of contingency relationship, and of the effect of control factors. All tests are based on Chi-square non-parametric tests. Descriptive statistics is presented in Table A.1 in the Appendix.

4. Results

4.1 Propensity of innovations of high novelty

Results of the Chi-square non-parametric tests for independent, moderator and control variables for the propensity of high novelty innovations are presented in Table 1. Foreign firms are expected to have a higher propensity of innovations of high novelty in Hypothesis 1a. In contrast, Hypothesis 1b predicts that foreign firms will have a higher propensity of innovations of high novelty contingent on the presence of formal R&D. While the propensity of innovations of high novelty was higher among foreign firms than among domestic firms, the Chi-square test shows that the difference is not statistically significant. Thus, the evidence does not support Hypothesis 1a. Contrary to our expectation, the findings reveal that the propensity of innovations of high novelty among foreign firms is higher both in the subgroup of firms with formal R&D as well as in the subgroup of firms without formal R&D, but the Chi-square test shows that the

Table 1. Innovations of high novelty by nationality of firm ownership, propensity indicators (% of number of firms)^a

	Innovations of high novelty	Nationality of ownership		Chi-Square Test Significant? ^b
		Domestic	Foreign	
<i>Without controls</i>				
	Introduced	75,5	86,7	No
	Not introduced	24,5	13,3	
		100,0	100,0	
<i>Control for R&D</i>				
With separate R&D dpt.	Introduced	82,9	85,7	No
	Not introduced	17,1	14,3	
		100,0	100,0	
Without separate R&D dpt.	Introduced	65,6	88,9	No
	Not introduced	34,4	11,1	
		100,0	100,0	
<i>Control for main sector of activity</i>				
High innovative	Introduced	82,6	81,8	No
	Not introduced	17,4	18,2	
		100,0	100,0	
Low innovative	Introduced	62,7	100,0	Yes**
	Not introduced	37,3	0,0	
		100,0	100,0	
<i>Control for firm size^c</i>				
Large and medium	Introduced	76,3	92,3	No
	Not introduced	23,8	7,7	
		100,0	100,0	
Small	Introduced	75,0	72,7	No
	Not introduced	25,0	27,3	
		100,0	100,0	

Source: Jiangsu innovation survey.

^a Number of observations is 173, unless otherwise stated.

^b Whether the difference between foreign and domestic firms is statistically significant: * at 0.10 %, ** at 0.05 %, *** at 0.01 %.

^c Number of observations is 152.

difference is not statistically significant in either subgroup of firms. Thus, the relationship between foreign ownership and propensity of innovations of high novelty does not appear to be moderated by the presence of formal R&D. Hypothesis 1b is therefore not supported either. It appears that the successful market introduction of innovations of high novelty is not associated with foreign firms either directly or indirectly, through the relationship contingent on the R&D internationalisation.

The results for one of the control variables are also interesting. The relationship between foreign ownership and the propensity of innovations of high novelty appears to be contingent on the sector. In the highly innovative sector the propensity of innovations of high novelty among foreign firms is marginally lower than among domestic firms and the Chi-square test shows that the difference is not statistically significant. However, in the “low-innovative” sector (including food, textile, wood, non-metal and other manufacturing), the Chi-square test shows that the propensity of innovations of high novelty is statistically significantly higher among foreign firms than among domestic firms.

4.2 Intensity of innovations of high novelty

Results of the Chi-square non-parametric tests for independent and control variables for the intensity of high novelty innovations are reported in Table 2. Hypothesis 2 predicts that foreign firms will have a higher intensity of innovations of high novelty than domestic firms. Consistent with expectations, the Chi-square test suggests that

Table 2. Innovations of high novelty by nationality of firm ownership, intensity indicators (% of number of firms)^a

	Innovations of high novelty	Nationality of ownership		Chi-Square Test Significant? ^b
		Domestic	Foreign	
<i>Without controls</i>				
	Above mean	27,3	63,3	Yes****
	Below mean	72,7	36,7	
		100,0	100,0	
<i>Control for R&D</i>				
With separate R&D dpt.	Above mean	32,9	61,9	Yes**
	Below mean	67,1	38,1	
		100,0	100,0	
Without separate R&D dpt.	Above mean	19,7	66,7	Yes****
	Below mean	80,3	33,3	
		100,0	100,0	
<i>Control for main sector of activity</i>				
High innovative	Above mean	31,5	63,6	Yes****
	Below mean	68,5	36,4	
		100,0	100,0	
Low innovative	Above mean	19,6	62,5	Yes**
	Below mean	80,4	37,5	
		100,0	100,0	
<i>Control for firm size^c</i>				
Large and medium	Above mean	27,5	53,8	Yes*
	Below mean	72,5	46,2	
		100,0	100,0	
Small	Above mean	22,9	54,5	Yes**
	Below mean	77,1	45,5	
		100,0	100,0	

Source: Jiangsu innovation survey.

^a Number of observations is 173, unless otherwise stated.

^b Whether the difference between foreign and domestic firms is statistically significant: * at 0.10 %, ** at 0.05 %, *** at 0.01 %.

^c Number of observations is 152.

statistically foreign firms have significantly higher intensity of sales of innovations of high novelty.⁵ This evidence supports the proposition that foreign firms are more intensive than domestic firms in innovations of a high novelty level. Foreign firms seem to have higher commercial success from introduced innovations of high novelty than domestic firms.

5. Discussion and conclusions

The objective of this study was to examine the relationship between foreign ownership and innovations of high novelty in the context of an advanced developing country. Two dimensions of innovation novelty were considered, innovation propensity and innovation intensity. The results have provided support for one of the three formulated hypotheses.

The direct Hypotheses 1a predicted that foreign firms will have a higher propensity of product innovations of high novelty than domestic firms while, in contrast, the contingency Hypotheses 1b predicted that only foreign firms with formal R&D will have a higher propensity of innovations of high novelty than domestic firms. The results did not support the direct hypothesis. This is not consistent with a single prior study that found a positive impact of foreign ownership on the introduction of new to the market

⁵ The tests on the median-based definition of the innovation intensity variable have resulted in the same findings, except for small firms, where no statistically significant results were found.

innovations in Brazil (Kannebley et al., 2005). However, the finding is not surprising in light of the arguments for the alternative contingency hypothesis, which suggest that foreign firms are not likely to have a higher propensity of innovations of high novelty on the basis of the exploitation of existing innovations generated in home countries. Yet, no support was found for the hypothesised moderating impact of the propensity of formal R&D on the relationship between foreign ownership and the propensity of innovations of high novelty either. Thus it seems that the proportion of firms that introduce innovations of high novelty is not higher among foreign firms than among domestic firms, not even when the internationalisation of R&D is taken into account. While unexpected, this finding seems consistent with foreign R&D that is primarily driven by asset exploitation motive. It is congruent with preceding studies on China that have reported that the initially high number of R&D units were established because of regulatory requirements (Walsh, 2003) and that the majority of R&D units aimed at adaptive innovations for the local market (von Zedtwitz, 2004). Moreover, the finding appears consistent with the empirical evidence on the role of locational factors, which suggests that in countries with relatively larger markets and a weaker science base foreign R&D is primarily oriented towards exploitation of existing innovations (Kuemmerle, 1999b).

Hypothesis 2 predicted the higher intensity of product innovations of high novelty of foreign firms in comparison to domestic firms and was supported by the results. This seems to show that foreign firms generate a higher proportion of sales from introduced innovations of high novelty than domestic firms. In other words, foreign and domestic firms do not seem to create similar commercial output from innovations of high novelty.

The implication is that economic benefits obtained by the market introduction of high novelty innovations are higher in foreign than in domestic firms. This is consistent with the argument that foreign affiliates have ownership advantages over domestic firms in intangible and other assets complementary to technological assets. The results seem also consistent with the evidence that firms from advanced developing countries have relatively weaker resource endowments than firms from developed countries. For example, empirical evidence suggests that firms from emerging market economies during partner selection place more emphasis on partner's financial, technological, and intangible assets and willingness to share expertise than firms from developed economies (Hitt et al., 2000). Similarly, the evidence suggests that international partnering by Chinese firms is primarily motivated by learning, in particular with regard to marketing expertise and managerial skills (Luo, 2002).

The findings of the study contribute to the literature in three ways. First, the results suggest that the relationship between foreign ownership and propensity of innovations of high novelty in advanced developing host countries might be more complex than is typically assumed. The evidence does not seem to provide support for the argument that there is a positive direct relationship based on existing ownership advantages. A more complex contingency relationship was examined also, consistent with the arguments that a relationship between foreign ownership and propensity of innovations of high novelty is moderated by the creation of ownership advantages through internationalisation of R&D, yet the evidence does not seem to support this argument either. Second, this is a rare attempt to examine a relationship between the foreign ownership and the intensity of innovations of high novelty. The results seem to support

the argument about a positive direct relationship based on the existing ownership advantages in complementary assets. Third, the findings on the relationship between foreign ownership and propensity and intensity of innovations of high novelty taken together seem to suggest that different resources and capabilities of multinationals are associated with the two dimensions of the innovation novelty. The important implication of these findings is that the current focus in the literature on the single indicator, propensity of innovations of high novelty, represents a limitation.

The finding suggests two important policy implications for China, and other advanced developing and transition economies. First, the lower degree of commercial success of innovations of high novelty of domestic firms relative to foreign firms suggests relatively weak capabilities for commercialisation of innovations among Chinese firms. This seems to imply that access to relevant complementary assets is likely to depend on further increasing partnering with foreign firms. While the Chinese government has so far supported international alliances primarily because of access to advanced technologies, it appears that support for alliance with non-technological motives may be also justified. Second, while in relation to the presence of foreign firms the emphasis is often on technological spillovers, foreign firms seem likely to also provide an opportunity for non-technological spillovers, as an important source of learning about complementary capabilities, especially management, financial and marketing skills, which seems to be weak in majority of firms from advanced developing and transition economies. In this sense, the findings seem to provide partial support for the current policy of attracting foreign direct investments, in particular of foreign R&D and high-tech investments in China. A further shift in foreign direct investments away from low

cost manufacturing operations is likely to contribute to the positive impact of foreign firms on the propensity of innovations of high novelty too.

Certain caveats concerning this research should be mentioned. First, the study is focused on urban enterprises only. Since rural firms (that is private firms in rural areas) are less innovative than urban firms in Jiangsu (Sun and Wang, 2004:28), the evidence presented here likely overestimates innovation level of firms in this province. Including rural firms in the analysis in further research might be fruitful. Lastly, the data on innovation refer to one year only. While the weakness of a single year is that it may be atypical for the relevant period, the decision to focus on a year rather than on a three-year period, common in CIS, was primarily made to increase the recall by respondents and make answering the relevant questions easier, thus increasing the response rate. An implication is that the empirical results should be considered primarily as indicative. Further research should aim to cover a common three-year period.

The study shares a weakness with other studies of innovation novelty based on a broad concept of innovation and a dual categorisation of innovation novelty. The concept of high novelty applied here includes two levels defined by geographical criteria of novelty (innovations new to the country and innovations new to the world), and this aggregation is likely to affect the results. For example, a result of no apparent difference in the propensity of innovations of high novelty could be obtained in an extreme case in which domestic firms would introduce only innovations new to the country while foreign firms would introduce only innovations new to the world.⁶ Therefore, the aggregation-based

⁶ Similarly, a weakness of the concept of new to the market innovations is related to the fact that firms are likely to operate in different markets, from regional or national to the World market (see Kleinknecht, van

results presented should be interpreted with caution. While in this study the emphasis is primarily on the relationship between foreign ownership and two indicators of a given (high) level of innovation novelty, further research should pursue the issue of the relationship between foreign ownership and propensity of different individual levels of novelty (which we also follow up on in another study). Furthermore, this is to our knowledge the first study that considers the moderating impact of R&D internationalisation on the relationship between foreign ownership and innovations of high novelty. Since the moderator variable measured the presence of formal R&D, rather than its nature, there is an opportunity for further research into the moderating role of the motivation and composition of R&D activities in the relationship between foreign ownership and propensity of innovations of high novelty.

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Appendix.

Table A.1. Descriptive statistics^a

	Nationality of ownership	
	Domestic	Foreign
	(% of number of firms)	
Dichotomous variables		
Nationality of ownership	82,70	17,30
Propensity of innovations of high novelty		
Introduced	75,50	86,70
Not introduced	24,50	13,30
Intensity of innovations of high novelty		
Above mean	27,30	63,30
Below mean	72,70	36,70
(Mean of continuous data	0,30	0,66)
(Standard deviation of continuous data	0,34	0,40)
Separate R&D dpt.		
Yes	57,30	70,00
No	42,70	30,00
Main sector of activity		
High innovative	64,30	73,30
Low innovative	35,70	26,70
Firm size ^b		
Large-and-medium	62,50	54,20
Small	37,50	45,80

Source: Jiangsu innovation survey.

^a Number of observations is 173, unless otherwise stated.

^b Number of observations is 152.

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