

FOREIGN DIRECT INVESTMENT AND INDUSTRY CHARACTERISTICS: EVIDENCE FROM CHINESE INDUSTRIES

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ABSTRACT

This paper examines empirically the determinants of foreign direct investment (FDI) in Chinese industry using cross-sectional data. The relationship between industry characteristics and the sectoral distribution of FDI is tested based on different sample groups. A test for endogeneity justifies the use of two-stage least square estimation in order to avoid inconsistent results. The evidence suggests that FDI in Chinese industries is significantly influenced by the market size, exports, firm size and the policy towards FDI. The findings from this study generate important policy implications regarding how governments can encourage FDI into technology-intensive industries.

Keywords: Chinese industries, sectoral distribution, FDI, cross-sectional analysis

INTRODUCTION

Since starting the process of economic reform, and opening up to the outside world in 1979, China has attracted a huge amount of inward foreign direct investment (FDI), and annual inflows of FDI had increased from US \$1.91 billion in 1983 to US \$46.85 billion in 2001. China has become the largest recipient of FDI in the developing world (UNCTAD, 2002). This phenomenon has inspired considerable research on various issues regarding China's inward FDI. Several studies have investigated the main determinants, general pattern and impact of inward FDI at national and regional level (see, for example, Wang and Swain 1997, Zhang 1999, Hu 2000, Wu 2000, Liu et al. 2002). The extent to which the main determinants and the regional distribution of FDI can be explained by the open door policy and abundant labour resources has been the primary focus of attention. Others have examined the determinants of entry mode and ownership of foreign firms in Chinese industry using either cross-sectional or firm level data (Luo and Tan 1997, Zhao and Zhu 1998, Tse et al. 1997, Pan and Li 1998). These studies have provided insights into FDI issues and have generated important implications for managers and policy makers.

Despite the fact that a large proportion of FDI has flowed into industry, accounting for 68.8% of total FDI in 2001 (MOFTEC, 2002), only a few studies (Broadman and Sun, 1997, Sun, 1998) have noted characteristics of industrial FDI. Comparatively little empirical research exists on the relationship between industry characteristics and the sectoral distribution of FDI. Among the different factors influencing the industrial pattern of FDI, the links between FDI and exports need particular attention, as two-way causal relationships may exist between these two under the export-orientated FDI policy.

This paper represents a step towards addressing this issue by examining empirically the impact of key industry factors on FDI using cross-sectional analysis, and exploring how FDI responds to industry specific advantages. The data used in this study are drawn from the Third National Industrial Census (1997), which contains relatively disaggregated data, and detailed information for broad industrial sub-sectors. The data set allows the testing of a wide range of industry factors affecting industry level FDI. By using relatively detailed data combined with disaggregated measures of industry characteristics, this study will increase the likelihood of capturing the relationship between industry characteristics and the industrial pattern of FDI, which may not be detected at the aggregate level.

The evidence from the research will provide governments and business sectors with important information about factors influencing industrial selections by multinational enterprises (MNEs) in a large developing country, and help governments to design policies reflecting the mutual interests of both host countries and MNEs. The information on the features of industrial FDI is also potentially useful for host countries in formulating or creating industry specific characteristics or advantages in order to attract technologically advanced FDI.

This paper is organized as follows: The next section reviews briefly the determinants of industry level FDI and addresses the theoretical considerations for this empirical work. Section 3 specifies the empirical model and introduces the data. The empirical results and analysis are presented in Section 4. The last section concludes with policy implications.

LITERATURE REVIEW AND THEORETICAL CONSIDERATIONS

Previous empirical research on industry level FDI falls roughly into two groups. The first group of studies has investigated the factors affecting the sectoral composition of FDI in developed countries. Caves (1974) has explored the relationship between industrial variations and foreign firms' share in Canadian and United Kingdom manufacturing industries. The main findings from his study indicate that intangible assets are an important factor influencing the foreign ownership in both countries' manufacturing industries. Pugel, et al. (1995) have examined Japanese FDI in US

manufacturing, and tested the relationship between intangible assets and inward FDI in both host and home countries. Their study reveals that the intangible assets possessed by Japanese MNEs (represented by R&D intensity) are a significantly positive determinant of their FDI. However, US technology assets are not significant either as an entry barrier or as an attraction to FDI. Milner and Pentecost (1996) have studied the determinants of US FDI in the UK manufacturing sector, and the main results show that inter-industry variations do systematically influence the extent of localization and internalization advantages for US investors in the UK economy. Therefore, competitive advantages of the host economy, the level of protection, and the host market size positively affect the distribution of FDI in UK manufacturing. Hubert and Pain (2002) have tested the industrial pattern of FDI in the European Economic Area on outward investment by German companies and found that fiscal policies have a significant influence on the location of FDI.

The studies in the second group mainly focus on FDI in developing countries. Lall and Mohammad (1983) and Aswicahyono and Hill (1995) have examined the factors determining foreign ownership of large private corporations in the Indian and Indonesian manufacturing sectors. The main results from their studies suggest that R&D expenditure and marketing intensity are not so important as in developed economies, and firm specific assets possessed by MNEs, such as high technology and know-how, play a smaller role in developing countries. It seems that MNEs do not exploit their intangible assets if they focus on labour intensive and low value-added manufacturing activities. Resmini (2000) has studied the determinants of European Union FDI in the CEECs at the sectoral level, and found that labour costs and country specific variables, such as the stage reached in the transition process have played an important role in affecting the sectoral level FDI.

Several studies have been conducted on the relationships between industry characteristics and FDI behavior in China. Luo and Tan (1997) have assessed the impact of industry structure attributes on the performance of foreign-funded enterprises (FFEes). It is found that there is a positive linkage between industry profitability, sales growth, economies of scale and the performance of FFEes. Zhao and Zhu (1998) have investigated the factors affecting ownership preference of joint ventures by applying theories of transaction costs and bargaining power. The results from their study indicate that industry specific factors, such as skill intensity, market concentration, market potentials, and foreign agglomerations positively affect the ownership preference of foreign firms, while local R&D intensity and productivity are negatively associated with the ownership preference. Tse, et al. (1998), and Pan and Li (1998) have also studied how MNEs form alliances in equity joint ventures. The findings from their studies show that investment risks and growing markets encourage firms to form alliances with other foreign firms in fast growing host markets.

Based on a questionnaire survey, Sanyal and Guvenli (2000) have investigated the

importance of the relationship between MNEs and the host government in China. Maintaining favorable relationships with the host government is found to be a key task for managers. Their study has also raised an interesting issue regarding the importance of government policy on FDI location at industry level.

Extending previous studies on the sectoral distribution of FDI, the current study constructs and tests an empirical model which links industrial FDI as a dependent variable with measures of industry characteristics as explanatory variables. The theoretical basis for this link is drawn from Dunning's eclectic paradigm in which the main elements of the various explanations for FDI are synthesised, and three conditions, notably ownership, location and internalisation (OLI) advantages are necessary for the existence of FDI (Dunning, 1993). Data constraints and econometric modeling make it impracticable to test all OLI advantages. Therefore, taking ownership and internalisation advantages as given, a model is designed to test whether and to what extent industry characteristics affect industrial FDI, and whether Chinese industry is compatible enough to accommodate MNEs with advanced technology. In so doing, two types of explanatory variables are selected. One set reflects the location advantages of an industry, represented by the market size, openness, quality and skills of labour forces and government preferential policy toward FDI. The other set takes account of the industrial capacity to absorb FDI, measured by R&D intensity. How the selected explanatory variables influence industry level FDI will be discussed explicitly below.

Export Intensity

The relationship between exports and inward FDI has long been discussed. Export intensity, viewed as an indicator of a country or industry's degree of openness, is an important factor determining the industry selection by MNEs. Frequent trading activities enable business partners to acquire more about the economic characteristics of a sector and facilitate a rapid flow of information on investment opportunities. The existing evidence on the effect of exports on FDI is mixed. Some cross-country studies have indicated that exports and FDI are substitutes and negatively correlated if market-seeking FDI or 'tariff jumping' FDI is dominant (Jeon 1992, Belderbos and Sleuwaegen 1998), while others have found that there is a positive association between exports and FDI if resource-seeking FDI is prevalent in host countries (Grosse and Trevino 1996, Sun 2001).

In the case of China, given that export-orientated FDI is actively encouraged, it has been found that causal links exist between FDI and exports at aggregate level (Liu et al. 2002). Thus, a positive association between these two at industry level is expected.

Market Size

Market size reflects a country's capacity to absorb products. The market size hypothesis has been tested in a number of studies in both developed and developing countries. Culem's (1988) study has shown that US FDI in the EEC was mainly attracted by the market size of this region. Nigh (1985) has found that German/US FDI is positively affected by the market size of developing countries. More recent studies (Wang and Swan 1997, Urata and Kawai 2000) have also indicated that FDI is sensitive to the market size in developing countries. In particular, the Chinese market has been found to be one of the most important factors attracting inward FDI at either country or regional level (Liu et al. 1997). One would expect industry level FDI to be positively associated with market size, the larger the sales value in an industry, the larger the proportion of FDI flowing into it.

R&D Intensity

According to the received theory of FDI (Caves 1996, Dunning 1993), firms that become MNEs must possess firm-specific assets such as high technology. Such ownership advantages provide MNEs with valuable market power or cost advantages, so that they can overcome the disadvantages of producing abroad. It is estimated that more than 80 percent of R&D activities are conducted by large MNEs in developed countries. The main task of foreign subsidiaries in developing countries is to adapt technologies developed in home countries to meet local needs (Borensztein et al. 1998, Asiedu et al. 2001). Therefore, MNEs may enter a sector with high R&D intensity. The more R&D expenditure a sector has, the more attractive it will be to foreign investors.

In studies of developed countries, R&D has been found to influence industrial FDI. In developing countries, however, the technology factor may play a less important role than that in developed countries. This is because many industries in developing countries consist primarily of assembly and processing activities rather than technologically sophisticated manufacturing. Moreover, there is a lack of effective enforcement on intellectual property protection in developing countries, MNEs perceive that their firm-specific assets may be dissipated by counterfeiting, and thus the result of testing R&D intensity is unpredictable in the case of China.

Economies of Scale

Dunning's (1993) eclectic paradigm contends that MNEs can enjoy low production costs, and achieve efficiency by increasing economies of scale through cross-border production. Since MNEs not only target the host country's market but also world market, economies of scale in an industry are an important factor influencing MNEs' investment decisions. MNEs are expected to enter a sector with large-scale operations. Such a sector, however, requires large capital investment and incurs high sunk costs

and exiting costs. This is because investment is partially or completely irreversible, and investment expenditures are sunk costs when they are firm or industry specific (Dixit and Pindyck 1993). Conversely, industrial sectors with small-scale operations are more flexible and incur lower exiting costs, and may attract the MNEs who tend to concentrate in labour intensive industries in developing countries. Thus, the sign of this variable is unpredictable.

Skill Intensity

There are different views about the relationship between skill intensity and FDI inflows at country and industry levels. It is widely accepted that FDI flowing into China is particularly attracted by low labour costs. Most studies about the determinants of FDI in China show that labour costs have an inverse relationship with FDI (Liu et al. 1997, Brodaman and Sun 1997). The larger the gap between labour costs, the more the expected FDI flows into China. On the other hand, in some studies, the average wage is also treated as a proxy for labour quality (Dunning 1980, Veugelers 1991). Higher wage rates imply higher skills, which foreign investors are seeking, and the skills of labour forces are expected to have an impact on industry level FDI. Even though the decision to invest in China is, no doubt, heavily influenced by the country's prevailing low wage rates, once the production location is decided, MNEs are more likely to enter the sectors, which require intensive skilled activities. Therefore, the sign of this variable is undetermined prior to test.

Policy towards the Sectoral Level FDI

Generally, developed countries take a more liberal attitude to the sectoral distribution of FDI. For example, the US government has few restrictions on foreign entry into US industries. One exception is that FDI in the defense industry may be impeded by national security policies, but otherwise other industries are open to FDI (Pugel et al., op.cit). Controversial policies towards FDI, however, have been adopted in developing countries. On the one hand, there is strong competition for FDI so that these countries are obliged to provide incentives. For instance, China encourages FDI to enter some sectors with the provision of preferential incentives. On the other hand, various restrictions have been imposed on foreign entry into industries. Preferential policies toward FDI may create industry advantages and encourage FDI into a sector supported by the government (Hubert and Pain, op. cit). A dummy variable is used to capture the effect of government regulations on foreign presence in industrial sectors.

THE MODEL AND DATA

According to the theoretical considerations outlined in the last section, the following model is tested.

$$FDI = f(EX, DS, FS, R \& D, SI, PDV) \quad (1)$$

This is, FDI (foreign presence) in industrial sub-sectors is affected by export intensity (EX), domestic sales (DS), firm size (FS), R&D intensity (R&D), skill intensity (SI) and policy dummy variable (PDV), taking the value, 1 when a sector is the subject of government special incentives, zero otherwise (MOFTEC, 1996).

From Eq. (1) a log-linear functional form is adopted to reduce the possibility or severity of heteroscedasticity and directly obtain FDI elasticity with respect to various explanatory variables.¹ The model is of the form:

$$\ln FDI_i = \beta_0 + \beta_1 \ln DS_i + \beta_2 \ln EX_i + \beta_3 \ln FS_i + \beta_4 \ln R \& D_i + \beta_5 \ln SI_i + \beta_6 PDV_i + v_i \quad (2)$$

where i denotes the cross-sectional unit and v represents the error term.

The relationship between FDI and exports, from a theoretical point of view, is not clearly asserted. FDI and exports can be either substitute or complementary to each other (Markusen and Venables, 1998). Particularly, export-orientated FDI has been actively encouraged by the Chinese government, which makes the relation between these two variables even more complicated. As mentioned earlier, export intensity or openness is found to be an important factor affecting the inflow of FDI at aggregate level. In turn, FDI is also expected to boost China's exports. Therefore, bi-causal links between these two may exist at industry level. The presence of endogeneity would lead to spurious results if the OLS method is applied. In order to seek an appropriate estimation method, the endogeneity between these two variables is tested explicitly by taking account of the special feature of China's export orientated FDI in the current study.

The endogeneity between FDI and exports is tested by applying the Hausman test in Eqs. (2) and (3).

$$\ln EX_i = \gamma_0 + \gamma_1 \ln FDI_i + \gamma_2 \ln LI_i + \gamma_3 \ln R \& D_i + \varepsilon_i \quad (3)$$

where ε is the error terms and LI represents labour intensity. The justification for including above variables in the export equation is in line with the traditional trade theory, new trade theory and endogenous growth theory in which abundant factor endowments, FDI and capacity of innovation are considered as the main determinants of exports in industries. Equations are likely to be simultaneously determined if the residual of the reduced form of one equation has a significant

¹ The reset test has been carried out and the F value was 0.874 with the probability 0.35, indicating that there is no serious mis-specific problem with the functional form.

impact on the dependent variable in the other equation. The following procedure has been applied to detect the endogeneity between FDI and exports.

First, the following reduced form equation is estimated:

$$\ln EX_i = \alpha_0 + \alpha_1 \ln DS_i + \alpha_2 \ln FS_i + \alpha_3 \ln LI_i + \alpha_4 \ln R \& D_i + \alpha_5 \ln SI_i + \alpha_6 PDV_i + \eta_i \quad (4)$$

the residual, named u , can be obtained.

Second, equation (2) is estimated by including u as one of the explanatory variables. If the coefficient of u , denoted as λ , is statistically different from zero, then exports are endogenous. As a result, the OLS estimate is inconsistent and instead the two-stage least squares (TSLS) method should be used. If λ is not statistically significant, then it is justified to use the OLS method to estimate equation (2).

One common problem facing cross-sectional studies is that heteroscedasticity is generally encountered because small-medium and large size industrial sectors are sampled together. If heteroscedasticity exists, the estimators are inefficient. The White's heteroscedasticity test is conducted to examine whether heteroscedasticity is present in the current study, and the estimation procedure is then adapted accordingly.

In order to investigate how FDI responds to manufacturing industry specific advantages in more detail and obtain the robustness of empirical results from the overall sample, manufacturing industries are classified into two sub-samples, low-technological sectors (LTSs) and high-technological sectors (HTSs) using R&D expenditure as a criterion.² The Chow test is applied to test the equivalence of regression estimates for equation (2) between sub-samples of industries. If differences between estimations are statistically significant, then the division of industries into these sub-samples based on their technological characteristics is justified.

The Data

The data used in this research are drawn from 'The Data of the Third National Industrial Census of the People's Republic of China (DTNICPRC)'. The industrial survey was conducted by the China State Statistic Bureau (SSB) in 1995, and the data were published in 1997. In the DTNICPRC, the industry level data are classified into 192 sub-sectors according to the industry classification system adopted by the SSB. The data start with coal mining and processing (with 17 sub-sectors in mining), followed by food processing (with 168 manufacturing sub-sectors), and end with 7 sub-sectors in public utilities such as electricity, gas and water supply. This is the most up-to-date and detailed data on Chinese industrial sub-sectors currently available. The sample used for estimations consists of 189 of the 192 sub-sectors due to some of the data being missing. From the data source, the following measurements for the variables discussed in Section 2 are chosen.

² A sub-sector with R&D expenditure over 1million Yuan is included in the group of HTSs.

Dependent variable:

FDI: the ratio of foreign direct investment to total assets in a sub-sector

Independent variables:

DS: the domestic sales value of a sub-sector, which represents the market size

EX: export intensity, the ratio of exports to total output value of a sub-sector

FS: firm size, the ratio of sales value to the total number of firms in a sector which is used as a proxy for economies of scale

LI: labor intensity, the ratio of total wage to gross value added in a sub-sector.

PDV: policy dummy variable, based on the categories for encouraging FDI across sub-sectors, published in 1996 (MOFTEC, 1996).

R&D: R&D intensity, the ratio of R&D expenditure to total sales value in a sub-sector

SI: skill intensity, the ratio of total wage to total employees, used to proxy the level of skilled labour in a sub-sector

EMPIRICAL RESULTS

The endogeneity test for detecting the two-way relationship between FDI and exports shows that λ is statistically different from zero at the 1% level. This justifies that the TSLS method should be applied in order to obtain the consistent estimate for equation (2).

White's heteroscedasticity test generates a highly significant result ($nR^2=29.11$, probability=0.02), indicating the existence of heteroscedasticity in the cross-section regression. Thus, the t statistics from Eq. (2) are corrected for inference using the White's heteroscedasticity estimators that are heteroscedasticity consistent. The resulting standard errors are provided in Table 1.

Most of the results from Eq. (2) shown in Table 1 are consistent with theoretical predictions about the determinants of industry level FDI in China. The coefficients of all explanatory variables are correctly signed and most of them are statistically significant at either the 1% or 5%. In addition, the high value of adjusted R^2 (0.68, Table 1) indicates that independent variables are able to explain nearly 70% of the dependent variable, justifying the model and variable selection.

The results suggest that domestic sales value is one of the most important factors determining foreign investors' industrial selection in China. That is, other things being constant, a 1% increase in DS in an industry would raise FDI by 1.079%. The positive relationship between DS and FDI supports the hypothesis that a large domestic market has a positive impact on FDI. Other significant factors affecting FDI are exports, firm size and policy dummy variable.

Table 1. Results from Eq. (2)

Dependent variable: FDI in a sector

Variables	TSLS Results		White
	Coefficient	Standard Errors	Standard Errors
EX	0.994	0.133**	0.111***
DS	1.079	0.094***	0.108***
R&D	0.09	0.062	0.061
FS	-0.761	0.142***	0.242**
SI	0.08	0.629	0.665
PDV	0.903	0.250***	0.320***
Constant	-1.855	5.47	6.022
R ²	0.698		
Adjusted R ²	0.681		
Observations	189		

*, ** and *** represent the significant level of 10 %, 5% and 1%, respectively.

The coefficient on EX is positively significant, indicating that openness encourages inward FDI in Chinese industry. The variable of R&D intensity is correctly signed according to the hypothesis, but statistically insignificant. This may suggest that the R&D infrastructure in Chinese industries is not compatible with high R&D intensive FDI as many industries consist primarily of assembly and processing activities. This finding corroborates that obtained in the cases of India and Indonesia where R&D intensity is insignificant in determining the entry of foreign firms (Lall and Mohammad, op. cit, Aswicahyono and Hill, op. cit).

Firm size acts as a proxy for economies of scale of a sector, and it is also suggestive of sunk costs and replacement costs. The negative sign and statistically significant result indicate that FDI enters a sector with small economies of scale. There are two possible reasons for this. First, a sector with large economies of scale might be one that the state-owned enterprises dominate, or it may be a key industrial sector protected by industrial policies. The entry barriers of the sector could be so high as to deter the MNEs' entry. Second, investment from overseas Chinese accounts for more than 60% of total FDI (China Statistic Yearbook, 1995), which is mainly family-business orientated with small-scale operations and concentrates in labour intensive industries, such as food processing, textiles and footwear sectors. This evidence is contrary to that in developed countries where FDI mainly flows into sectors with a few large firms (Pugel et al., op. cit).

The skill intensity variable has a positive sign but it is nevertheless insignificant. It seems that it is not powerful enough to explain industrial FDI, compared with the determinants of the country level FDI in China. This suggests that the wage differentiation cross sectors may not be sufficient enough to affect the sectoral distribution of FDI (Broadman and Sun, op cit).

The dummy variable, which is correctly signed according to the hypothesis, is significant at the 1% level, indicating that the policy towards FDI is an effective way to direct FDI into different sectors. This result also suggests that policies or regulations towards FDI in developing countries play an important role, and this kind of institutional factor is one of the main determinants of industrial pattern of FDI.

Results from Sub-Sample Estimate

As mentioned in the last section, the overall sample is classified into two sub-samples – low tech sectors (LTSs) and high tech sectors in order to investigate the effect of industry characteristics on industrial FDI in more detail, based on their technological characteristics. The result from the Chow test is statistically significant at the 5% level ($F=2.155$ with probability = 0.03). Therefore, it is appropriate to divide the overall sample into these two sub-samples. The LTSs include labour intensive manufacturers, such as textiles, garments, footwear, toys, simple metal and plastic products, furniture and glassware. HTSs consist of industrial machinery, fine chemicals, pharmaceuticals, electrical machinery & equipment, electronics & telecommunication equipment and instruments & meters.

The results from sub-samples shown in Tables 2 and 3 generally confirm those from the overall sample. The following three factors are considered as the main determinants of industrial FDI: market size, exports and firm size. These results indicate that a sector with high export intensity, a high level of domestic sales and small-scale operations attracts a large proportion of FDI no matter whether it is a high or low tech sector.

It is noteworthy that the policy dummy variable is not statistically significant, even at the 10% level in the sub-sample of LTSs. This may suggest that the policy towards industrial FDI in LTSs is not effective enough to influence the industrial selection by MNEs. It may reflect the fact that local governments compete for FDI without imposing any restriction on low tech FDI, therefore in LTSs the central government policy fails to encourage FDI into sectors supported by the government.

R&D intensity is not statistically significant either in the sub-sample estimate of HTSs or LTSs, and it even exhibits a negative sign in the estimation of HTSs. This is surprising since one of the motivations of industrial FDI is to exploit firm-specific assets represented by R&D intensity. It is likely that both market-seeking and export-orientated FDI are dominant in Chinese industries, therefore R&D intensity has little impact on industrial FDI.

Table 2. Results from Sub-Sample of LTSs

Dependent variable: FDI in LTSs

Variables	TSLS Results		White
	Coefficient	Standard Errors	Standard Errors
EX	1.324	0.204***	0.177***
DS	1.225	0.119***	0.134***
R&D	0.082	0.098	0.082
FS	-1.415	0.219***	0.201***
PDV	0.493	0.351	0.343
Constant	-2.082	1.77	1.715
R ²	0.688		
Adjusted R ²	0.659		
Observations	118		

Note: The variable of skill intensity is deleted from the sub-sample estimate since it is not statistically significant.

Table 3. Results from the Sub-Sample of HTSs

Dependent variable: FDI in HTSs

Variables	TSLS Results		White
	Coefficient	Standard Errors	Standard Errors
EX	0.942	0.175***	0.151***
DS	0.963	0.159***	0.153***
R&D	-0.019	0.069	0.066
FS	-0.557	0.153***	0.236**
PDV	0.796	0.385**	0.371**
Constant	-1.882	1.473	1.552
R ²	0.818		
Adjusted R ²	0.795		
Observations	71		

CONCLUSIONS

This research has investigated empirically the main determinants of FDI in Chinese industries using cross-sectional data. The evidence from this study suggests that industrial FDI is significantly influenced by the market size, exports, firm size and the policy towards FDI. These results suggest that market-seeking and export-orientated FDI are dominant, indicating that MNEs are motivated by the market size and the locational comparative advantages of Chinese industries. The main findings from sub-samples also support those obtained from the overall sample.

One interesting result is that FDI enters an industry sub-sector with small-scale economies in China. This indicates that MNEs attempt to avoid entering an industry requiring large capital investment and incurring high sunk costs. This distribution pattern is in sharp contrast with that in developed countries where MNEs tend to locate in industries characterized by relatively high economies of scale (OECD 2002). Surprisingly, this study finds that R&D intensity is insignificant in different sample estimations. This may suggest that the R&D infrastructure in Chinese industries is not compatible with high R&D intensive MNEs, which mainly locate in industries that have become mature in their home countries.

The findings offer a number of implications for policymakers. First, the government should build on an economic environment where MNEs are encouraged to introduce advanced technology and conduct R&D activities in Chinese industries. It is imperative to attract high technology FDI to Chinese industries as FDI has been found to be an effective way of improving technological progress (Xu 2000). Second, the government needs to provide incentives for MNEs to upgrade their production in China and foster innovation in industrial sectors. Finally, China's accession to the WTO will create great opportunities that further encourage technologically intensive FDI if foreign investors can be granted WTO's principle of national treatment. In addition, a fully transparent system for regulating FDI will need to be established together with effective protection of intellectual property rights.

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