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Location choice of foreign direct investment in technical KIBS in China: impact of human capital and intellectual property rights protection

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Abstract

Purpose – This study considers the "technology creation" characteristic of technical knowledge-intensive business services (T-KIBS) and examines how human capital and intellectual property rights (IPR) protection affect the location choice of foreign direct investment (FDI) in China for two types of T-KIBS: (1) information transmission, software and information technology (ICT) services and (2) scientific research and technology (SCI) services.

Design/methodology/approach – Our empirical analysis is based on panel data on 22 Chinese provinces from 2009 to 2017. We use the generalized method of moments estimation for the regression analysis.

Findings – FDI in ICT services prefers regions with high human capital, while FDI in SCI services favors regions with good IPR protection.

Research limitations/implications – Future research could use more comprehensive data and qualitative interviews to enhance the findings.

Practical implications – These findings provide a foundation for China's future policy on attracting FDI into T-KIBS, especially in areas related to human capital and IPR protection.

Originality/value – This study bridges the research gap on the FDI location choice of T-KIBS in China by clarifying the influences of human capital and IPR protection and providing theoretical support for the location choice of T-KIBS FDI.

Keywords T-KIBS, FDI, Location choice, OLI paradigm, Human capital, IPR protection

Paper type Research paper

1. Introduction

Foreign direct investment (FDI) in China's knowledge-intensive business services (KIBS) has grown rapidly over the past decade, particularly in (1) information transmission, software and information technology (ICT) services and (2) scientific research and technology (SCI) services. KIBS refers to companies heavily reliant on specialized knowledge in a particular field to provide knowledge-based intermediate products or services; they are categorized into professional KIBS (P-KIBS) such as consulting, legal and financial services and technical KIBS (T-KIBS) such as ICT and SCI services (Miles *et al.*, 1995). KIBS plays an important role in promoting regional innovation, technological progress and economic competitiveness (Wood, 2002) and can be considered a crucial industry for China's future economic and social

JEL Classification — F21, F23, O53

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development. Thus, it is necessary to understand their location determinants and formulate effective investment policies to continue to attract FDI in T-KIBS into China.

The literature on FDI location choice widely adopts Dunning's Ownership-Location-Internalization (OLI) paradigm (Xiao and Tian, 2023). Under Dunning's (1993) OLI paradigm, firms require three types of advantages to engage in FDI: ownership-specific (O), location-specific (L) and internalization-incentive (I) advantages. O-advantages refer to company-specific advantages such as patents, brands and management skills that make them competitive in international markets. L-advantages refer to the particular advantages of the destination country, such as market size, resources and the legal and political environment that attract firms to invest there. I-advantages explain why firms choose to use their ownership advantages through direct investment rather than in other ways (e.g. exporting or licensing) to manage cross-border operations more efficiently, such as by reducing transaction costs, protecting intellectual property rights (IPR) and better adapting to local markets. However, as the OLI paradigm was initially used to explain FDI in manufacturing, its application to FDI in services has remained largely theoretical (Van Lente and De Goey, 2008), despite Dunning (1989) arguing that it is equally applicable to services.

In an early study, Bass *et al.* (1977) found that FDI location determinants differ across industries. However, current research on FDI in China as well as studies on FDI location choice outside China have lacked a focus on T-KIBS. Existing studies have drawn conclusions that are more often used to explain the location preferences of FDI as a whole or of specific industries other than T-KIBS, such as manufacturing, logistics, hospitality and finance. For example, although Li (2020) analyzed the location choice of ICT services FDI in China, the study period of his analysis was only five years, resulting in a small sample size and the questionable accuracy of the findings. Additionally, the study did not clarify the characteristics of T-KIBS or their relationship with location choice.

Given the "technology creation" characteristic of T-KIBS (Santos-Vijande *et al.*, 2013), this study focuses on whether human capital and IPR protection affect their FDI location choice. We construct a regression model of FDI location choice in T-KIBS and empirically compare the role played by human capital and IPR protection in attracting ICT and SCI services FDI using panel data on 22 Chinese provinces [1] from 2009 to 2017. The findings of this study contribute to theoretical and practical implications in two main ways. First, they enrich existing empirical studies on the location choice of FDI in T-KIBS and further validate and refine the application of the OLI paradigm in this area. Second, they can guide future policies on attracting FDI into T-KIBS in China.

2. Literature review and hypotheses development

2.1 FDI location determinants in China

In the literature, some studies focus on the location choice of overall FDI flows in China. Broadman and Sun (1997) found that market size, transportation infrastructure and coastal zones have positive effects on FDI inflows, while adult non-literacy rates show a negative effect. Coughlin and Segev (2000) discovered that market size, labor productivity, and coastal location positively correlate with FDI inflows, whereas high wages and non-literacy rates are negatively associated. Na and Lightfoot (2006) noted that market size and education levels positively affect FDI, whereas state-owned enterprises have a negative effect. Salike (2016) found that human capital, market size, wages, infrastructure and coastal location positively impact FDI inflows. Hsu *et al.* (2019) observed that prior FDI and market size have a positive effect on FDI inflows, whereas distance to major cities shows a negative effect.

There have also been some studies on the location choices of specific industries in China. Hong and Chin (2007) noted that market size, transportation infrastructure, labor quality and agglomeration effects have positive effects on attracting foreign logistics firms, while wages have a negative effect. Du *et al.* (2008) found that IPR protection, agglomeration effects, infrastructure and education level have positive effects on attracting manufacturing multinationals, while government intervention, corruption and wages have negative effects. Zhang *et al.* (2012) observed that the number of hotels from global chains shows positive correlations with the number of inbound tourists in a region, the average consumption of inbound tourists, GDP per capita, agglomeration effects, governmental policies and megaevents. Chen *et al.* (2014) found that the location choices of foreign financial institutions are influenced by a city's economic size and participation in global markets. Li (2020) noted that the market growth rate, the education level, agglomeration effects and openness show positive correlations with the inflow of ICT services FDI.

2.2 Hypotheses development

KIBS have been defined as industries that rely on new technologies and knowledge (Miles *et al.*, 1995); however, P-KIBS focus on new technology adoption and T-KIBS focus on technology shaping (Santos-Vijande *et al.*, 2013). This implies that one of the main characteristics of T-KIBS is "technology creation" and that they are often more involved in research and development (R&D) activities than P-KIBS (Niosi and Bas, 2014). Following this, T-KIBS may emphasize human capital and IPR protection in the host country, which serve as the main observables in our study.

(1) Human capital

Del Canto and González (1999) suggested that highly qualified human capital in firms stimulates R&D activities. Human capital also tends to be seen as a major factor in the innovation and performance of the complex intellectual operations of KIBS (Carmona-Lavado *et al.*, 2013; Chichkanov *et al.*, 2021). Miles *et al.* (2018) argued that KIBS employees must combine their expertise with the information provided by customers to develop innovative services; therefore, KIBS tends to employ highly educated employees with advanced knowledge. Freel (2006) argued that innovation in T-KIBS is more influenced by highly qualified employees than in P-KIBS. Therefore, we conjecture that to stimulate R&D activities, T-KIBS tends to choose a region with a highly qualified human capital endowment and the following hypothesis is proposed:

H1. Human capital positively impacts FDI inflows in ICT and SCI services.

(2) IPR protection

In addition to stimulating R&D activities, T-KIBS must consider how to protect the gains from R&D activities. The knowledge gained from their R&D activities can then be used as intellectual property for T-KIBS firms to generate revenue and defend their competitive position (Blomqvist *et al.*, 2004). However, as intellectual property is fundamentally a public good with two properties (non-rivalry and non-excludability), the risk of free-riding can occur (Shughart and Thomas, 2016). This means that the knowledge and services created by T-KIBS companies during the R&D process, once marketed, can easily be copied and used by others without compensation (Päällysaho and Kuusisto, 2008). This not only reduces the profits of the T-KIBS firms that created the knowledge but also risks discouraging future R&D and innovation. IPR protection is considered an important tool to prevent this from happening (Falvey *et al.*, 2006; Shughart and Thomas, 2016). Therefore, we propose the following hypothesis:

H2. IPR protection positively impacts FDI inflows in ICT and SCI services.

3. Methodology

3.1 Variables and data sources

Based on these hypotheses, the regression model includes human capital (HC) and IPR protection (*IPR*) as independent variables and FDI inflows to ICT services (*ICTFDI*) and to SCI services (*SCIFDI*) as dependent variables. Additionally, following the literature, our regression model includes market size (*SIZE*), the market growth rate (*GR*), market openness (*OPEN*), agglomeration effects (*AGG*) and prior FDI as the control variables. These factors are considered to have a significant impact on attracting FDI and are therefore considered in the model to ensure the accuracy and comprehensiveness of the analysis.

The measurement indices for the variables used in this study are as follows. For the dependent variables *ICTFDI* and *SCIFDI*, we use actual FDI inflows to ICT and SCI services (in USD 10,000), respectively, following Coughlin and Segev (2000), Salike (2016), Hsu *et al.* (2019) and Li (2020). For the independent variables *HC* and *IPR*, we employ the number of students enrolled in higher education per 10,000 population and the number of patents granted per capita, respectively, following Salike (2016) and Li (2020) for *HC* and Du *et al.* (2008, 2012) for *IPR*. For the control variable *SIZE*, we use GDP (in 1,000 million yuan) following Na and Lightfoot (2006), Salike (2016) and Hsu *et al.* (2019). For *GR*, we use the growth rate of GDP (%), following Hsu *et al.* (2019) and Li (2020). For *OPEN*, we use the proportion of nonstate-owned investment in fixed asset investment (%), following Li (2020), Li and Ljungwall (2021) and Zhang and Qian (2022). For *AGG*, we use employment density (10,000 employees/km^2) following Ciccone and Hall (1996) and Ciccone (2002).

The sources for these data are the Statistical Yearbook of each province/municipality, National Economic and Social Development of each province/municipality, *China Commerce Yearbook*, *Shanghai Municipal Commission of Commerce* and *China Statistical Yearbook on Science and Technology*. Table A1 [2] presents the definitions of the variables above.

We do not examine provincial policies, which were previously a key factor for attracting FDI; however, the recent abolishment of many investment and tax incentives in China and stricter regulation have limited their impact (Wong *et al.*, 2020). To mitigate simultaneity or reverse causality, all the independent and control variables were lagged by one year. Table A2 [2] shows the descriptive statistics. To handle potential heteroskedasticity and improve explanatory power, *ICTFDI*, *SCIFDI* and *SIZE* are log-transformed. For those dependent variables with zero values, we adopt MaCurdy and Pencavel's (1986) method for assigning a value of 1 before log transformation. Furthermore, the model incorporates time dummies to account for year-specific factors.

This study selects panel data on 22 Chinese provinces (including municipalities and autonomous regions) from 2009 to 2017 for two reasons. First, as information on FDI released by Chinese provinces is variable, data collection can be difficult. Therefore, we chose 2009–2017 as the study period to maximize the size of the sample. Second, companies' decisions to choose China for their FDI before 2009 and after 2017 may have been affected by numerous policies and unexpected events, including the global financial crisis in 2007–2008, USA–China trade war from 2018 and COVID-19 pandemic from 2020. Hence, we chose a period during which the external environment was relatively stable.

3.2 Regression model

We develop the following regression models to analyze the FDI location determinants of ICT and SCI services. The model for ICT services FDI is

$$\begin{aligned} ln\,ICTFDI_{i,t} &= \beta_0 + \beta_1 HC_{i,t-1} + \beta_2 IPR_{i,t-1} \\ &+ \beta_3 lnSIZE_{i,t-1} + \beta_4 GR_{i,t-1} + \beta_5 OPEN_{i,t-1} + \beta_6 AGG_{i,t-1} + \beta_7 lnICTFDI_{i,t-1} \\ &+ \mu_i + \upsilon_t + \varepsilon_{it} \end{aligned} \qquad \text{Eq. (1)}$$

The model for SCI services FDI is

$$ln\ SCIFDI_{i,t} = \beta_0 + \beta_1 HC_{i,t-1} + \beta_2 IPR_{i,t-1} + \beta_3 lnSIZE_{i,t-1} + \beta_4 GR_{i,t-1} + \beta_5 OPEN_{i,t-1} + \beta_6 AGG_{i,t-1} + \beta_7 lnSCIFDI_{i,t-1} + \mu_i + \upsilon_t + \varepsilon_{it} \qquad \text{Eq. (2)}$$

In both models, the dependent variables $lnICTFDI_{i,t}$ and $lnSCIFDI_{i,t}$ denote the inflow of ICT services FDI and SCI services FDI in province i in year t, respectively. The independent and control variables denote the respective attributes in province i in year $t-1$. Further, μ_i denotes unobservable fixed effects (e.g. geographic location and city level), υ_t denotes macrolevel volatility factors over time and $\varepsilon_{i,t}$ is the random error term.

3.3 Generalized method of moments (GMM) estimation

The regression model used in this study is a dynamic panel model because it includes the lagged term of the dependent variable. GMM estimators are widely used to overcome estimation bias owing to the endogeneity of the lagged dependent variable when using general estimation methods such as ordinary least squares and fixed effects estimation (Nickell, 1981; Bond, 2002). The origin of GMM estimators can be traced back to the instrumental variable (IV) estimation proposed by Anderson and Hsiao (1981, 1982). The general dynamic panel model is as follows:

$$y_{i,t} = \alpha + \rho y_{i,t-1} + x'_{it}\beta + z'_i\delta + \mu_i + \varepsilon_{it}\ (i = 1, \cdots, N;\ t = 2, 3, \cdots, T) \qquad \text{Eq. (3)}$$

To eliminate the individual effect μ_i, we apply a first-order difference operation on both sides of Eq. (3) to obtain Eq. (4):

$$\Delta y_{it} = \rho \Delta y_{i,t-1} + \Delta x'_{it}\beta + \Delta \varepsilon_{it}\ (i = 1, \cdots, N;\ t = 2, 3, \cdots, T) \qquad \text{Eq. (4)}$$

$\Delta y_{i,t-1}$ is still correlated with $\Delta \varepsilon_{it}$, an endogenous variable, necessitating IVs to address endogeneity. Anderson and Hsiao (1981) proposed using $y_{i,t-2}$ as an IV and two-stage least squares estimation. However, this approach is limited if higher-order lag variables $\{y_{i,t-3}, y_{i,t-4}, \cdots\}$ are also valid IVs but not included, leading to imprecise estimates. Arellano and Bond (1991) introduced all lagged variables as IVs in GMM estimation, known as difference GMM (DIF-GMM), which enhanced the effectiveness of two-stage least squares estimation. However, DIF-GMM cannot estimate the coefficients of time-varying variables and is susceptible to weak IVs.

To address these drawbacks, Arellano and Bover (1995) returned to the level equation, using $\{\Delta y_{i,t-1}, \Delta y_{i,t-2}, \cdots\}$ as IVs for $y_{i,t-1}$ in the GMM estimation of the level equation, known as horizontal GMM. However, this method does not eliminate individual effects μ_i like DIF-GMM, assuming these IVs are uncorrelated with the composite error term $\mu_i + \varepsilon_{it}$. Blundell and Bond (1998) then proposed the system GMM estimator (SYS-GMM), which integrates the advantages of both DIF-GMM and horizontal GMM. SYS-GMM uses first-order difference methods to remove individual effects, employing the horizontal lag term of the independent variable as the IV for the difference term. It also addresses weak IVs by increasing the number of IVs and introducing moment condition constraints to the horizontal equation, thereby improving the estimation efficiency.

The SYS-GMM estimation applies to "small T, large N" panels, or short and many cross-section units (Roodman, 2009), which is consistent with this study's panel data type conditions. We adopt the SYS-GMM estimator for dynamic panel regressions and use the higher-order lagged terms of $ICTFDI_{i,t}$ and $SCIFDI_{i,t}$ (two-order and higher lag terms) as the GMM-style IVs for the endogenous variables $ICTFDI_{i,t-1}$ and $SCIFDI_{i,t-1}$ in our estimation.

4. Results

4.1 Correlation analysis

We conduct correlation analyses and variance inflation factor (VIF) tests of the independent and control variables in Eqs. (1) and (2) to observe whether there are high correlations between these variables, which may lead to multicollinearity and distort the regression results. Generally, a VIF value below 5 indicates that these variables are not co-integrated (Hair *et al.*, 2019). Table A3 [2] shows that the VIF values of all the independent and control variables are below 5; therefore, there is no multicollinearity problem in the two regressions.

4.2 Estimation results

The SYS-GMM estimator includes the one-step (1SYS-GMM) and two-step (2SYS-GMM) estimators. 2SYS-GMM improves accuracy by using 1SYS-GMM residuals in its second step, enhancing autocorrelation and handling heteroskedasticity. However, the results of 1SYS-GMM are better than those of 2SYS-GMM when standard errors are low (Bond, 2002). Moreover, the 2SYS-GMM estimator relies on the estimated residuals of the 1SYS-GMM estimator, which may lead to unreliable asymptotic statistical inference, especially when the cross-sectional dimensions of the data samples are small (Bond and Windmeijer, 2002). Therefore, this study reports both estimator results for robustness. Additionally, fixed effects and random effects (RE-GLS) estimates from standard panel data regressions, excluding the lagged dependent variables, are employed to validate the estimation results. The Hausman test results (ICT services: p-value $= 0.9926 > 0.05$, SCI services: p-value $= 0.9299 > 0.05$) indicate that the RE-GLS estimates are more suitable and are therefore also reported.

The validity of the GMM estimator hinges on two key assumptions. First, IVs must be valid and uncorrelated with the error term, as verified by the Sargan–Hansen test. Higher p-values in this test imply better IV validity. Second, the error term should not show serial correlation, as assessed using the Arellano–Bond test. This test should reject the null hypothesis of no first-order serial correlation AR (1) but not second-order AR (2), meaning that the p-values for AR (1) should be below 0.1, whereas those for AR (2) should be above 0.1. To ensure the validity of the IV, this study tests the nearest lag term using the first- to fifth-order lagged terms of the endogenous variable as the IVs for the ICT services FDI regression and the first-to fourth-order lagged terms for the SCI services FDI regression.

This study employs Roodman's (2009) "xtabond2" command in STATA for the SYS-GMM estimation. An excessive number of IVs may lead to overfitting endogenous variables and fail to eliminate endogeneity (Roodman, 2009). The number of IVs should not typically exceed the number of cross-sections; thus, we use the "collapse" option in "xtabond2" to limit the number of IVs. Concurrently, all the regressions use robust standard errors that correct for heteroscedasticity, while Windmeijer's (2005) finite sample correction for standard errors is employed in the 2SYS-GMM estimates. Table 1 shows the estimation results.

Table 1 shows that the Sargan–Hansen test outcomes for the IVs in both estimators are not statistically significant. Furthermore, they are all correlated with the first-order serial AR (1) but not with the second-order serial AR (2). This confirms the validity of the IVs in both estimators. The SYS-GMM and RE-GLS estimation results show that HC_{t-1} demonstrates statistically significant positive correlations ($p < 0.01$) in all the ICT services FDI regressions but not in the SCI services FDI regression. However, IPR_{t-1} exhibited statistically significant positive correlations ($p < 0.01$) in all the SCI services FDI regressions but not in the ICT

Dependent variable	RE-GLS	*lnICTFDI* 1SYS-GMM	2SYS-GMM	RE-GLS	*lnSCIFDI* 1SYS-GMM	2SYS-GMM
Independent variables						
HC_{t-1}	0.0081**	0.0073***	0.0060***	−0.0001	0.0001	0.0005
	(0.0031)	(0.0025)	(0.0014)	(0.0025)	(0.0019)	(0.0018)
IPR_{t-1}	0.0129	0.0037	0.0177	0.0820***	0.0598**	0.0487***
	(0.0217)	(0.0264)	(0.0181)	(0.0210)	(0.0261)	(0.0185)
Control variables						
$lnSIZE_{t-1}$	3.5497***	1.9473***	1.9080***	1.8977***	1.4940***	1.1811***
	(0.9390)	(0.5687)	(0.5629)	(0.6421)	(0.4994)	(0.3547)
GR_{t-1}	0.1742	0.0372	−0.0004	−0.0470	−0.0840	−0.0421
	(0.1022)	(0.0894)	(0.0646)	(0.1439)	(0.1004)	(0.0984)
$OPEN_{t-1}$	0.8845	1.7478	0.7396	6.9767**	6.1418	4.1836
	(5.1360)	(4.5675)	(3.0091)	(3.2603)	(4.1702)	(2.9494)
AGG_{t-1}	15.0686***	5.6127**	5.4349**	6.9958***	5.7211***	4.2376**
	(4.5073)	(2.7355)	(2.3398)	(2.5302)	(2.1362)	(1.8141)
$lnICTFDI_{t-1}$		0.3877**	0.3827***			
		(0.1622)	(0.0914)			
$lnSCIFDI_{t-1}$					0.1992	0.3672***
					(0.1869)	(0.1261)
Constant	−31.0865***	−18.0199***	−16.3937***	−14.4808***	−13.6831***	−10.4536***
	(6.9002)	(5.6256)	(5.2097)	(4.3830)	(4.0027)	(2.4351)
Year dummy	Included	Included	Included	Included	Included	Included
Observations	198	176	176	198	176	176
Provinces	22	22	22	22	22	22
R2 within	0.2273			0.0642		
R2 between	0.6770			0.8219		
R2 overall	0.6094			0.5507		
Instruments		20	20		19	19
Wald test	502.99***	31789.51***	115028.92***	841.92***	11549.32***	33116.52***
AR (1)		0.004	0.003		0.011	0.023
AR (2)		0.970	0.957		0.818	0.554
Sargan test		0.878	0.878		0.874	0.874
Hansen test		0.924	0.924		0.838	0.838

Note(s): The table reports the coefficients and robust standard errors (in parentheses), ***p < 0.01 and **p < 0.05
Source(s): Compiled by the author

Table 1. Estimation results

service regression. That is, Hypothesis 1 is supported in ICT services FDI but not in SCI, while Hypothesis 2 is supported in SCI services FDI but not in ICT. This indicates that ICT services FDI prefer regions with high human capital, while SCI services FDI favors regions with good IPR protection.

4.3 Robustness test

To verify the robustness of the estimation results, we replaced the measurement indices of *HC* and *IPR* in the GMM estimator with the number of undergraduate students enrolled and the number of lawyers (both per 10,000 population), respectively. The first variable is used because of the high percentage of undergraduates working in ICT and SCI services (China Labor Yearbook, 2022). The second variable was used following Fan *et al.* (2013) and Yano *et al.* (2013). As shown in Tables A4 [2] and A5 [2], both these new *HC* and *IPR* indicators have the same effect as before, demonstrating the robustness of these two location determinants.

5. Discussion

The SYS-GMM estimation results show that *HC* and *IPR* have different impacts on the location choices of ICT and SCI services FDI in China. The result that human capital has an attracting effect on ICT services FDI is consistent with the findings of Li (2020). However, we find that human capital does not impact SCI services FDI. This may be because the SCI service sector is more focused on R&D and technological innovation capabilities and therefore, requires experienced researchers and technologists, which is not reflected by the human capital measurement index used in this study. Second, IPR protection attracts SCI services FDI; however, it does not affect ICT services FDI. This may be because the legal protection measures for China in the ICT sector are relatively well established. The Chinese government introduced the “Regulations on the Protection of Computer Software” as early as 1991 and then improved and supplemented them in 2002 and 2013. Additionally, the Chinese government formulated “Measures for the registration of computer software copyright” in 2002 to better implement the regulations after China’s accession to the World Trade Organization. The implementation of these regulations and measures has greatly improved IPR protection in computer software and reduced infringement. Therefore, in this environment, ICT services FDI focuses its location choice on other determinants.

5.1 Theoretical implications

Although Dunning’s OLI paradigm remains a key framework in international business theory for analyzing FDI location choice, attention must be paid to industry characteristics when using this paradigm to explain FDI location choice. This study enhances and extends Dunning’s OLI paradigm’s explanatory power related to T-KIBS FDI using an empirical approach, providing a theoretical basis for future research. Furthermore, although both ICT and SCI services FDI are types of T-KIBS, some of their location determinants (e.g. human capital) still differ.

5.2 Practical implications

The results of our analysis allow us to propose the following FDI policies: First, the policy for attracting FDI in ICT services must focus on the construction of human capital. In particular, the host country must invest more in education, especially in higher education, because education is usually regarded as the basic means to promote human capital development. Second, the policy for attracting FDI in SCI services must aim to formulate and improve relevant IPR protection and strengthen awareness of IPR.

In addition, the implementation of these policies must be discussed by region. Since China’s reform and opening up, its economic development has been concentrated in the eastern region, which has led to the educational resources and IPR awareness in the central and western regions lagging far behind; therefore, the relevant policies should focus more on central and western China. First, to enhance human capital, the government should actively promote the construction of new colleges and universities and the expansion of enrollment in existing colleges and universities in central and western China to enrich the region’s educational resources. Colleges and universities in eastern China can also help alleviate the lack of educational resources by launching large-scale enrollment campaigns in central and western China. Second, to strengthen IPR protection, the government should make greater efforts to train IPR professionals in central and western China and raise public awareness of the importance of IPR through publicity and educational activities. Moreover, it should consider introducing the successful experiences of the eastern region to central and western China to promote interregional cooperation and exchange.

5.3 Limitations and future directions

First, SCI services may require experienced researchers and technologists. However, our study's human capital proxy index may not align with this demand. Hence, future research could use more measurement indexes to examine the impact of SCI services on FDI. Second, our analysis was conducted for a period during which the external environment was relatively stable, which may have limited our understanding of the impact of special events on FDI location choice in China. Future research should thus further explore the impact of FDI location choice in China during special events. Finally, research on FDI location choice in KIBS remains in its infancy. Beyond the determinants listed in this study, future research could use qualitative interviews with foreign companies to examine additional influencing factors.

6. Conclusions

This study investigates the factors influencing FDI location choice in ICT and SCI services based on the "technology creation" characteristic of T-KIBS, focusing on the roles of human capital and IPR protection. Utilizing panel data from 22 Chinese provinces between 2009 and 2017 and employing GMM estimation, the findings reveal that ICT services FDI is attracted to regions with high human capital levels, whereas SCI services FDI prefers regions with strong IPR protection. By bridging the existing gap in the literature, this study further strengthens the explanatory power of the OLI paradigm in the T-KIBS sector as well as provides suggestions for future policies to attract T-KIBS FDI in China.

Note

1. The 22 provinces are Anhui, Beijing, Chongqing, Gansu, Guangdong, Guizhou, Hebei, Henan, Heilongjiang, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Inner Mongolia, Shandong, Shanxi, Shaanxi, Shanghai, Sichuan, Xinjiang and Zhejiang.
2. Please see it on the Online Appendix

References

Anderson, T. and Hsiao, C. (1981), "Estimation of dynamic models with error components", *Journal of the American Statistical Association*, Vol. 76 No. 375, pp. 598-606, doi: 10.1080/01621459.1981.10477691.

Anderson, T. and Hsiao, C. (1982), "Formulation and estimation of dynamic models using panel data", *Journal of Econometrics*, Vol. 18 No. 1, pp. 47-82, doi: 10.1016/0304-4076(82)90095-1.

Arellano, M. and Bond, S. (1991), "Some tests of specification for panel data: monte Carlo evidence and an application to employment equations", *The Review of Economic Studies*, Vol. 58 No. 2, pp. 277-297, doi: 10.2307/2297968.

Arellano, M. and Bover, O. (1995), "Another look at the instrumental variable estimation of error-components models", *Journal of Econometrics*, Vol. 68 No. 1, pp. 29-51, doi: 10.1016/0304-4076(94)01642-D.

Bass, B., McGregor, D. and Walters, J. (1977), "Selecting foreign plant sites: economic, social and political consideration", *Academy of Management Journal*, Vol. 20 No. 4, pp. 535-551, doi: 10.2307/255355.

Blomqvist, K., Hara, V., Koivuniemi, J. and Aij, T. (2004), "Towards networked R&D management: the R&D approach of Sonera Corporation as an example", *R&D Management*, Vol. 34 No. 5, pp. 591-603, doi: 10.1111/j.1467-9310.2004.00365.x.

Blundell, R. and Bond, S. (1998), "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics*, Vol. 87 No. 1, pp. 115-143, doi: 10.1016/S0304-4076(98)00009-8.

Bond, S. (2002), "Dynamic panel data models: a guide to micro data methods and practice", *Portuguese Economic Journal*, Vol. 1 No. 2, pp. 141-162, doi: 10.1007/s10258-002-0009-9.

Bond, S. and Windmeijer, F. (2002), "Finite sample inference for GMM estimators in linear panel data models", Cemmap Working Paper No.CWP04/02, Centre for Microdata Methods and Practice, Institute for Fiscal Studies, London. doi: 10.2139/ssrn.311061.

Broadman, H. and Sun, X. (1997), "The distribution of foreign direct investment in China", *World Economy*, Vol. 20 No. 3, pp. 339-361, doi: 10.1111/1467-9701.00073.

Carmona-Lavado, A., Cuevas-Rodríguez, G. and Cabello-Medina, C. (2013), "Service innovativeness and innovation success in technology-based knowledge-intensive business services: an intellectual capital approach", *Industry and Innovation*, Vol. 20 No. 2, pp. 133-156, doi: 10.1080/13662716.2013.771482.

Chen, K., Bao, S., Mai, Y. and Lv, W. (2014), "Agglomeration and location choice of foreign financial institutions in China", *GeoJournal*, Vol. 79 No. 2, pp. 255-266, doi: 10.1007/s10708-013-9486-x.

Chichkanov, N., Miles, I. and Belousova, V. (2021), "Drivers for innovation in KIBS: evidence from Russia", *The Service Industries Journal*, Vol. 41 Nos 7-8, pp. 489-511, doi: 10.1080/02642069.2019.1570151.

Ciccone, A. (2002), "Agglomeration effects in Europe", *European Economic Review*, Vol. 46 No. 2, pp. 213-227, doi: 10.1016/S0014-2921(00)00099-4.

Ciccone, A. and Hall, R. (1996), "Productivity and the density of economic activity", *American Economic Review*, Vol. 86 No. 1, pp. 54-70.

Coughlin, C. and Segev, E. (2000), "Foreign direct investment in China: a spatial econometric study", *World Economy*, Vol. 23 No. 1, pp. 1-23, doi: 10.1111/1467-9701.t01-1-00260.

Del Canto, J. and González, I. (1999), "A resource-based analysis of the factors determining a firm's R&D activities", *Research Policy*, Vol. 28 No. 8, pp. 891-905, doi: 10.1016/S0048-7333(99)00029-3.

Du, J., Lu, Y. and Tao, Z. (2008), "Economic institutions and FDI location choice: evidence from US multinationals in China", *Journal of Comparative Economics*, Vol. 36 No. 3, pp. 412-429, doi: 10.1016/j.jce.2008.04.004.

Du, J., Lu, Y. and Tao, Z. (2012), "Institutions and FDI location choice: the role of cultural distances", *Journal of Asian Economics*, Vol. 23 No. 3, pp. 210-223, doi: 10.1016/j.asieco.2010.11.008.

Dunning, J. (1989), "Multinational enterprises and the growth of services: some conceptual and theoretical issues", *The Service Industries Journal*, Vol. 9 No. 1, pp. 5-39, doi: 10.1080/02642068900000002.

Dunning, J. (1993), *Multinational Enterprises and the Global Economy*, Addison-Wesley, Wokingham.

Falvey, R., Foster, N. and Greenaway, D. (2006), "Intellectual property rights and economic growth", *Review of Development Economics*, Vol. 10 No. 4, pp. 700-719, doi: 10.1111/j.1467-9361.2006.00343.x.

Fan, J., Gillan, S. and Yu, X. (2013), "Innovation or imitation?: the role of intellectual property rights protections", *Journal of Multinational Financial Management*, Vol. 23 No. 3, pp. 208-234, doi: 10.1016/j.mulfin.2013.03.001.

Freel, M. (2006), "Patterns of technological innovation in knowledge-intensive business services", *Industry and Innovation*, Vol. 13 No. 3, pp. 335-358, doi: 10.1080/13662710600859157.

Hair, J., Black, W., Babin, B. and Anderson, R. (2019), *Multivariate Data Analysis*, 8th ed., Cengage Learning, London.

Hong, J. and Chin, A. (2007), "Modeling the location choices of foreign investments in Chinese logistics industry", *China Economic Review*, Vol. 18 No. 4, pp. 425-437, doi: 10.1016/j.chieco.2006.07.001.

Hsu, M., Lee, J., Leon-Gonzalez, R. and Zhao, A. (2019), "Tax incentives and foreign direct investment in China", *Applied Economics Letters*, Vol. 26 No. 9, pp. 777-780, doi: 10.1080/13504851.2018.1495817.

Li, S. (2020), “An empirical analysis of foreign direct investment’s (FDI’s) determinants in knowledge-intensive business services (KIBS) in China: a focus on location-specific advantages”, *Waseda Review of Socio-Science*, Vol. 26, pp. 76-94, doi: 10.20556/00070476.

Li, S. and Ljungwall, C. (2021), “Access to knowledge and knowledge production: the case of China”, *Journal of Chinese Economic and Business Studies*, Vol. 19 No. 2, pp. 163-172, doi: 10.1080/14765284.2021.1905481.

MaCurdy, T. and Pencavel, J. (1986), “Testing between competing models of wage and employment determination in unionized markets”, *Journal of Political Economy*, Part 2, Vol. 94 No. 3, pp. S3-S39, doi: 10.1086/261398.

Miles, I., Kastrinos, N., Flanagan, K., Bilderbeek, R., Den Hertog, P., Huntink, W. and Bouman, M. (1995), “Knowledge-intensive business services: their role as users, carriers and sources of innovation”, *European Innovation Monitoring System (EIMS) Reports*, pp. 1-96.

Miles, I., Belousova, V. and Chichkanov, N. (2018), “Knowledge intensive business services: ambiguities and continuities”, *Foresight*, Vol. 20 No. 1, pp. 1-26, doi: 10.1108/FS-10-2017-0058.

Na, L. and Lightfoot, W. (2006), “Determinants of foreign direct investment at the regional level in China”, *Journal of Technology Management in China*, Vol. 1 No. 3, pp. 262-278, doi: 10.1108/17468770610704930.

National Bureau of Statistics and Ministry of Human Resources and Social Security (2022), *China Labour Statistical Yearbook 2022*, China Statistics Press, Beijing.

Nickell, S. (1981), “Biases in dynamic models with fixed effects”, *Econometrica*, Vol. 49 No. 6, pp. 1417-1426, doi: 10.2307/1911408.

Niosi, J. and Bas, T. (2014), “Services sector in the biotechnology firms of South America: a focus in Argentina, Brazil, Chile and Uruguay”, *International Journal of Learning and Intellectual Capital*, Vol. 11 No. 4, pp. 357-373, doi: 10.1504/IJLIC.2014.066678.

Päällysaho, S. and Kuusisto, J. (2008), “Intellectual property protection as a key driver of service innovation: an analysis of innovative KIBS businesses in Finland and the UK”, *International Journal of Services Technology and Management*, Vol. 9 Nos 3-4, pp. 268-284, doi: 10.1504/IJSTM.2008.019707.

Roodman, D. (2009), “How to do xtabond2: an introduction to difference and system GMM in Stata”, *The Stata Journal*, Vol. 9 No. 1, pp. 86-136, doi: 10.1177/1536867X0900900106.

Salike, N. (2016), “Role of human capital on regional distribution of FDI in China: new evidences”, *China Economic Review*, Vol. 37, pp. 66-84, doi: 10.1016/j.chieco.2015.11.013.

Santos-Vijande, M., González-Mieres, C. and López-Sánchez, J. (2013), “An assessment of innovativeness in KIBS: implications on KIBS’co-creation culture, innovation capability, and performance”, *Journal of Business and Industrial Marketing*, Vol. 28 No. 2, pp. 86-102, doi: 10.1108/08858621311295236.

Shughart, W. and Thomas, D. (2016), “Intellectual property rights, public choice, networks, and the new age of informal IP regimes”, *Supreme Court Economic Review*, Vol. 23 No. 1, pp. 169-192, doi: 10.1086/686477.

Van Lente, D. and De Goey, F. (2008), “Trajectories of internationalization: knowledge and national business styles in the making of two Dutch publishing multinationals, 1950-1990”, *Enterprise and Society*, Vol. 9 No. 1, pp. 165-202, doi: 10.1093/es/khm078.

Windmeijer, F. (2005), “A finite sample correction for the variance of linear efficient two-step GMM estimators”, *Journal of Econometrics*, Vol. 126 No. 1, pp. 25-51, doi: 10.1016/j.jeconom.2004.02.005.

Wong, D., Lee, H., Zhao, S. and Pei, Q. (2020), “Region-specific determinants of the foreign direct investment in China”, *Geographical Research*, Vol. 58 No. 2, pp. 126-140, doi: 10.1111/1745-5871.12398.

Wood, P. (2002), “Knowledge-intensive services and urban innovativeness”, *Urban Studies*, Vol. 39 Nos 5-6, pp. 993-1002, doi: 10.1080/00420980220128417.

Xiao, S. and Tian, X. (2023), "Performance feedback and location choice of foreign direct investment", *International Business Review*, Vol. 32 No. 4, 102104, doi: 10.1016/j.ibusrev.2023.102104.

Yano, G., Shiraishi, M. and Hu, H. (2013), "Property rights, trade credit and entrepreneurial activity in China", *Journal of the Asia Pacific Economy*, Vol. 18 No. 1, pp. 168-192, doi: 10.1080/13547860.2012.742712.

Zhang, G. and Qian, X. (2022), "The impact of officials' turnover on interregional capital flows: evidence from China", *Applied Economics*, Vol. 54 No. 7, pp. 749-763, doi: 10.1080/00036846.2021.1965533.

Zhang, H., Guillet, B. and Gao, W. (2012), "What determines multinational hotel groups' locational investment choice in China?", *International Journal of Hospitality Management*, Vol. 31 No. 2, pp. 350-359, doi: 10.1016/j.ijhm.2011.05.008.

Appendix

Appendix for this article can be found online.

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