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Assessing the Scale and Potential of Chinese Investment Overseas: An Econometric Approach

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Abstract

The recent rise in Chinese outward direct investment (ODI) has significant global implications and impacts on host country policy. The present paper attempts to provide a theoretical basis and to define a robust econometric approach to assess the performance and potential of Chinese ODI. In this paper, foreign direct investment (FDI) performance is estimated using a frontier FDI model to measure how foreign investors, especially China, and the recipients of this direct investment perform relative to a benchmark of potential FDI. The results show that Chinese ODI achieves less of its potential compared with other investors. However, its ODI to Australia has performed much better than investment to other destinations. The results suggest that Chinese policy-makers should look at the pattern of China's ODI and, in light of superior performance in destinations like Australia, adjust policy strategies and institutional arrangements to enhance performance and reduce barriers to Chinese ODI.

Key words: Chinese investment, foreign direct investment, spatial linkage

JEL codes: F21, F23, F50

I. Introduction

Foreign direct investment (FDI), both in and out of China, is one of the most important dimensions of China's economic engagement and integration into the global economy. China is now the second largest trading nation, the second largest FDI recipient and the second largest economy globally. It is no surprise that China is rapidly becoming a major

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source of FDI and is already the sixth largest source of FDI for the rest of the world.

Chinese outward direct investment (ODI) started from a very low base at the start of the reform period in 1979 but became the sixth largest source of FDI flows globally by 2009, at US$48bn a year.[1] The growth of Chinese ODI has come in stages but has seen particularly spectacular growth since its WTO accession in 2001 (see Hurst, 2011).

The rapid growth with still large potential growth and the state ownership of a large proportion of Chinese ODI has attracted policy attention and caused problems for Chinese investors in recipient countries, where there have been both populist and reasoned reactions to its growing presence (Woo and Zhang, 2006; Drysdale and Findlay, 2009; Globerman and Shapiro, 2009). However, is the level and growth of Chinese ODI particularly high given the scale of the Chinese economy? In addition, have investment barriers or adverse responses perceived to be political barriers to Chinese ODI in recipient countries, such as Australia, significantly affected the ODI flows?

The rapid rise of Chinese ODI and the growth of policy interest have led to a number of studies of Chinese investment abroad; however, there is little careful empirical analysis on this subject. The present paper reviews the theoretical FDI literature to provide an empirically sound model for assessing FDI, and specifically Chinese ODI, which is currently absent in the literature. The present study measures how Chinese ODI is performing relative to its potential using a benchmark measure estimated using other FDI relationships and economic fundamentals. It answers the question of given the economic determinants of FDI, is the level of FDI that is observed what we would expect? A stochastic frontier is applied to an FDI model that accounts for different types of FDI and also accounts for network or third party country effects for a proper counterfactual measure of FDI.

Whether ODI from China is from a state-owned enterprise (SOE) or a private enterprise is not an issue of concern in the present paper. The paper only looks at aggregate FDI. The structure of the present paper is organized as follows. Section II explains why conventional gravity model variables often used in explaining trade flows are not appropriate for explaining FDI, and reviews the related FDI models. Section III applies those important related theories to the Chinese ODI experience to provide foundations for our empirical study. Section IV introduces the model and the data used in the present paper. Section V discusses the results. Section VI explains the ODI performance of China using governance and institutional explanators. Finally, conclusions are drawn in Section VII.

[1] UNCTAD Investment Database 2010. Available from: http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

II. Related Theories of FDI

Models that seek to explain FDI flows are not as widely used as, and do not have the theoretical underpinnings of, theoretical models of trade, such as the gravity model of trade. Reflecting in part the recent and rapid rise in the importance of FDI in the analysis of international economic relations, the link between FDI and trade has led to a rush of studies using traditional gravity variables of economic size and distance to explain FDI flows (e.g. Cheng and Ma, 2007). Contemporary research suggests that FDI is better explained when differences in modes of FDI are taken into account (Egger and Pfaffermyer, 2004; Blonigen, 2005).

The earlier general equilibrium models of FDI by Markusen (1984) and Helpman (1984) set the foundations for the current understanding of multinational enterprise (MNE) behavior. Markusen develops a model of horizontal FDI where MNEs produce offshore from the country of their headquarters to avoid trade costs, such as transportation and tariffs. This form of FDI can be characterized as market-seeking FDI, where a firm will set up a plant to produce and sell in a host market (Dunning, 1977). This development in the literature came concurrently with Helpman's model of vertical FDI, where MNEs take advantage of different factor prices across countries to cut production costs. Simply put, vertical FDI is trade-increasing and horizontal FDI tends to be trade-reducing.[2]

Recognition of the existence of a combination of both vertical and horizontal types of FDI within MNEs led to knowledge capital (or knowledge-based) models of FDI, where R&D, and other skilled labor-intensive, or knowledge-intensive activities, are geographically separated from production (Carr *et al*., 2001). These models have resulted in significant steps towards understanding MNE behavior, but are general equilibrium models in a simple two-country framework and, therefore, are not adequate to explain or characterize MNEs that made their FDI decisions based not only on home and host country characteristics, but also on other countries' characteristics.

The strong interdependencies between trade and investment led to many studies in which FDI was modeled using gravity model determinants of trade, and these models were relatively successful for explaining FDI (e.g. Eaton and Tamura, 1994; Brenton *et al*., 1999; Razin *et al*., 2002; Eichengreen and Tong, 2005). Empirical studies confirm that the cross-country pattern of FDI is well approximated by the gravity relationship (Barba Nevaretti and Venables, 2004). However, as some studies (e.g. Blonigen and Davies, 2000) show, the knowledge capital models of FDI, and models that include third country effects allowing for such multilateral factors, explain FDI better than the gravity model-type FDI models. This is

[2] Horizontal FDI is not necessarily trade-reducing, especially when component trade is involved in an MNE's operations.

not to say that the determinants are different, but the method for incorporating multilateral resistances, measures of scale (the difference between separate GDP variables and other measures, such as similarities in scale or multiplicative scale variables) and relative factor endowments are different. Perhaps more importantly, gravity type FDI models are not theoretically based (Bloningen, 2005).

There are many different models that explain FDI and some are similar to gravity models of trade. However, gravity models do not account for FDI entering countries for different reasons. Cheng and Ma (2007) attempt to model Chinese ODI using a traditional gravity approach with data from 2003 to 2005. Their results are not strongly significant, with the only significant variables being distance (negative) and a dummy for being landlocked (negative).

No two economies can operate and interact exclusively with each other in a bilateral world. Bilateral relationships are conducted in an increasingly globalized setting and involve a complex range of multilateral interactions. To ignore third country influences will distort analysis of bilateral economic relations.

An MNE's decision to invest in one country is dependent on the factors in the country of origin, factors in the potential host country and also on neighboring countries that could act as both a substitute or complement for FDI. The multilateral resistances in Baltagi *et al*. (2007) are captured differently from the case of gravity models and include inverse distance weighted averages of all third-country effects for all determinants. Blonigen (2005), Baltagi *et al.* (2007) and other FDI models of MNE behavior show the importance of scale, distance, relative factor endowments and multilateral effects in explaining FDI. Those determinants are chosen from models derived from firm-level behavior and are confirmed through empirical results that are superior to those studies using only gravity model variables.

Many studies model a two-factor world, some using skilled and unskilled labor (e.g. Davis, 2008) and others using capital and labor. Results of Egger and Pfaffermayer (2004), Baltagi *et al*. (2007) and Dee (2007) show that a three-factor world with skilled labor (or human capital), unskilled labor and physical capital provides a better explanation of FDI flows.

The analysis of the present paper is based on the models of Baltagi *et al*. (2007) and Dee (2007). The analysis applies a stochastic frontier and also adds a natural resource variable that is important in explaining China's FDI (Buckley *et al.*, 2007). The present study measures the resistances to FDI flows in aggregate using a stochastic frontier model and incorporates the analysis of MNE activity, such as country resource endowment differences reflecting comparative advantage, spatial effects in a multilateral sense and also scale of economies (Helpman, 1984; Markusen, 1984; Carr *et al*., 2001; Markusen, 2002). The FDI modeling literature does not often justify inclusion of resistances in a systematic manner. An example is the ad hoc inclusion of country risk into a model that is otherwise derived from micro foundations and, therefore, has theoretical underpinnings in Baltagi *et al.* (2007). A second stage of the current paper is to explain performance of FDI by taking into account governance and risk measures. The frontier FDI model allows the explanation of the determinants and structure of FDI and the measurement of a counterfactual amount of FDI, which give a performance measure that can be compared with other FDI source and destination countries.

III. Modelling Chinese Outward Direct Investment

Since 1979, China has opened its doors to the outside world, and, consequently, its global trade has flourished. However, its ODI has been an insignificant factor in the global economy, until recently. Over the past decade, and significantly through the global financial crisis, Chinese investment flowed throughout the developed and developing world. According to data from the Ministry of Commerce (MOF), Chinese ODI flows to non-OECD countries increased from US$1.47bn in 2003 to US$49.42bn in 2008, and ODI flows to OECD counties increased from US$364.00m to US$2.99bn, (MOF, 2008). In 2009, UNCTAD data placed China sixth in terms of global FDI flows and 16th in terms of stocks.

Chinese ODI, at this stage of development, does not involve MNEs creating complex FDI networks abroad but focuses more on natural resources (Kolstad and Wiig, 2009; Huang and Wang, 2011; Hurst, 2011) and the purchase of manufacturing firms that have established technological capabilities (Buckley *et al.*, 2007; Sauvant and Davies, 2011).

However, comparing China's ODI with its determinants, it is necessary to compare Chinese ODI with other FDI relationships globally, including FDI that is both complex or natural resource-seeking. There is not only a need to account for the complex FDI from other sources but also to account for potential third party destinations and the characteristics of alternative FDI destinations and sources. For example, Chinese ODI into one African country can be affected by a large discovery of natural resources in a neighboring country. The resource-based economics of one state depends on the transport infrastructure, energy and social stability of neighbors.

The rapid growth of FDI to China has not necessarily come at the expense of potential FDI to other East Asian countries to the extent that the production network literature has described (Athukolara and Yamashita, 2006). Having a large FDI recipient country as a neighbor often creates network activity and agglomeration forces that benefit smaller countries. FDI in one location can both increase or decrease FDI in another.

On average, FDI will flow to countries that are less distant. Distance is not only measured in terms of geography, but in terms of economic distance, where explicit and implicit barriers to investment play a significant role. Economic distances vary because of the ease or resistance to flows of capital and other economic transactions between countries. In recent years, the economic barriers have risen against Chinese ODI in some of its closest neighbors, driven by concerns about political factors behind the investment decisions of large SOEs. For example, increasing political interest in Chinese SOE investment pushed the Australian Senate to launch an enquiry, *Foreign Investment by State-owned Entities*, in 2009, and has led to changes in the guidelines for reviewing foreign investment by the Australian Treasury's Foreign Investment Review Board (Drysdale, 2011). However, there has been no empirical study to assess how these political and policy changes have affected the penetration of Chinese investment in Australia and whether increased government scrutiny has, in fact, translated to lessening the flow of Chinese ODI into the Australian economy or lowered the level of investment compared to its potential level. Assessing these issues is a focus of the present paper.

IV. Model and Data

The model used in this study follows Dee (2007), which is based on Baltagi *et al*. (2007). The difference between our model and Dee's model is that the model here does not include a risk variable and that a non-negative disturbance term is included that makes it a stochastic frontier model, which is as follows:

$$\begin{aligned} F_t &= b_0 + b_1 dist + b_2 G_t + b_3 S_t + b_4 K_t + b_5 N_t + b_6 H_t + b_7 L_t + b_8 \Gamma_t + b_9 \Theta_t + b_{10} FTA_t \\ &+ b_{11} WG_t + b_{12} WS_t + b_{13} WK_t + b_{14} WN_t + b_{15} WH_t + b_{16} WL_t + b_{17} W\Gamma_t + b_{18} W\Theta_t + b_{19} WFTA_t + v_t + u_t \end{aligned} \quad (1)$$

For the detailed definition of each variable in Equation (1) see Table 1.

Our initial analysis focuses on estimating an FDI frontier (see Equation 1), which then gives results for FDI performance, defined as the actual amount of FDI relative to the frontier. Those FDI relationships between source and host countries that perform well have lower resistances compared to those that do not perform well that face higher resistances. The second stage of the analysis explains some of the performance results with various resistances, including political distance.[3] The period under study is from 2000 to 2008 and all data are in that range. The two data sources for FDI stock and flow data are from the OECD (available from http://stats.oecd.org/) and China's MOF (2008). FDI source countries are China, the USA, Japan, Canada, Germany, France, the UK and the Netherlands, comprising China plus seven of the largest eight FDI sources globally.[4] The share of world

[3] See Armstrong (2009a) for extended discussion of the FDI frontier.

[4] Switzerland ranks higher than the Netherlands but is not used as the coverage of recipient countries and is not as wide ranging as Dutch FDI.

Table 1. Definition of Variables in Equation (1)

Variable	Definition
F_t	Log of FDI for both stock and flow
Dist	Log of the great circle distance between capital cities of *d* and *i*
G_t	Log of the sum of country *d* (source country) and country *i* (destination or host country) GDP: $\ln(GDP_d + GDP_i)$
St	A measure of GDP similarity: $(1 - S_d^2 - S_i^2)$, where $S_d = GDP_d / (GDP_d + GDP_i)$ and $S_i = GDP_i / (GDP_d + GDP_i)$
K_t	Log of the ratio of source country to destination country capital stock: $\ln(K_d/K_i)$
H_t	Log of the ratio of source country to destination country human capital: $\ln(H_d/H_i)$
L_t	Log of the ratio of source country to destination country unskilled labor: $\ln(L_d/L_i)$
N_t	Log of the ration of source country to destination country natural resource endowment: $\ln(N_d/N_i)$
Γ_t	Interaction term between G_t and K_t: $G_t K_t$
Θ_t	Interaction term between distance and the difference in capital and labor ratios: $dis(K_t - L_t)$
FTA_t	It takes the value of one if country *d* and *i* have a free trade agreement in force in year *t*
W	A measure of multilateral effects interacted with each term. WG_t, for example, is the inverse distance weighted average of G_t between the source country and all third country markets
v_t	An independently and identically distributed normal residual term that captures the usual model disturbance from measurement error and other shocks that are not associated with resistances to FDI
u_t	An independently and identically distributed non-negative variable that captures the resistances to FDI

FDI covered by these countries ranges from 50 to 70 percent depending on the year.[5] These source countries are chosen to minimize the missing data and to make the panel as balanced as possible. There are 90 recipient countries, which is a significant sample of the rest of the world. The panel is highly unbalanced from 2000 to 2008. Dummy variables for time are included and results for FDI stocks and flows using maximum likelihood estimation are presented.

Using aggregate FDI data instead of sectoral-level data is a limitation of our analysis. The disaggregated data are sparse and not reliable or widely available on a global scale. There are also questions surrounding the reliability of China's MOF data given that a large proportion of ODI is to tax havens, such as the Bahamas (Morck *et al.*, 2008; Hurst, 2011); however, as there are no more reliable sources, the present paper can only use the MOF data.

The stochastic frontier method that is applied, giving a composite error term of *u* and *v*, allows an estimation of an FDI frontier. With an FDI frontier, economic distance can be measured for FDI and to explain whether, for example, FDI from China to Australia faces similar economic distance to that which Chinese ODI faces elsewhere. Once there is a

[5] See OECD Stata and UNCTAD FDI data. Available from http://stats.oecd.org/ and http://www.unctad.org/Templates/Page.asp?intItemID=4979.

potential amount of FDI calculated, given the core or natural determining factors and predicted parameters, the distance from the frontier can be measured, which will help explain the resistance to FDI. Egger (2010) conducts a similar exercise but without the frontier and using predicted values of FDI given the mean determinants of FDI. The model of FDI he uses is not consistent with theoretically derived models and, therefore, it is not clear that his choice of core or natural determinants is appropriate. In fact, Egger models FDI activity (three models using foreign assets, number of foreign affiliates and number of foreign employees) using GDP as the only explanatory variable, ignoring all other variables. In addition, the lack of a frontier method in such studies means that resistances are not separated from random shocks (and measurement error); therefore, these shocks are attributed to resistances to FDI (Aigner *et al*., 1977).

For the GDP variable, GDP at purchasing power parity is used and is from the World Bank's *World Development Indicators* (WDI) (available from: http://data.worldbank.org/indicator), along with labor force and gross fixed capital formation data, also from the World Bank's WDI. Capital stock is calculated from the perpetual inventory method from Leamer (1984). Following Leamer (1984) and, as is common practice (see Baltagi *et al*., 2007; Dee, 2007), the capital stock is calculated using the perpetual inventory method. This is calculated using gross fixed capital formation, K, at time t with the formula $K_t = 2\sum_{t-2}^{t+2} I_t$, where I is investment with t sufficiently less than (prior to) 1982, the period under study.

The human capital data, from the International Labor Organization (available from http://laborsta.ilo.org/) and various national statistical agencies, is the absolute number of graduates from tertiary institutions, such as universities, in that country. The sum of the unskilled labor population and the population with a tertiary qualification is equal to the total labor force.

The zero values in the analysis do not bias the frontier regression coefficients as the frontier is defined by the most liberal and free flowing FDI relationships.

V. Results

The results of the estimated frontier FDI are presented in Table 2. Two sets of results for both FDI flows and stocks are presented.

As shown in Table 2, most variables are statistically significant in explaining FDI stock. All bilateral variables (without a W before them) are statistically significant. The similar Baltagi *et al*. (2007) specification and the even closer specification of Dee (2007) do not have as many variables with statistical significance. This is because of the different country

Table 2. Stochastic Frontier FDI Determinants

	FDI flows		FDI stocks	
Log of distance	–0.00016***	–0.00015***	–0.00015***	–0.00014***
	(–29.80)	(–28.40)	(–30.97)	(–29.95)
Bilateral GDP (G)	1.164***	0.506***	1.36***	0.496***
	(51.28)	(7.97)	(59.52)	(8.98)
GDP similarity (S)	4.14***	2.05***	5.36***	3.09***
	(27.30)	(7.84)	(38.38)	(13.36)
Rel. capital ratio (K)	1.80***	1.39***	1.92***	1.03***
	(7.85)	(3.32)	(8.76)	(2.81)
Rel. resource ratio (N)	–0.011***	–0.015***	–0.023***	–0.032***
	(–3.912)	(–2.55)	(–8.80)	(–6.59)
Rel. human *K* ratio (H)	–0.042*	0.090*	–0.131***	–0.112***
	(–1.667)	(1.833)	(–5.726)	(–2.82)
Rel. labor ratio (L)	–0.726***	1.127***	–0.906***	1.671***
	(–5.08)	(5.94)	(–6.53)	(9.68)
*G*t.*K*t (Γ_t)	–0.035***	–0.096***	–0.030***	–0.096***
	(–4.58)	(–6.78)	(–4.35)	(–7.89)
Dist(*K*t-*L*t) (Θ_t)	–0.062***	0.092***	–0.074***	0.151***
	(–3.89)	(4.37)	(–4.77)	(7.93)
FTA	1.892***	1.683***	2.020***	1.841***
	(20.813)	(16.792)	(25.439)	(21.625)
WG		0.732***		0.979***
		(12.12)		(19.37)
WS		2.279***		2.271***
		(7.943)		(8.616)
WK		0.835*		1.642**
		(1.85)		(4.04)
WH		–0.146***		0.023
		(–2.57)		(0.48)
WL		–3.188***		–4.302***
		(–14.9)		(–22.4)
WN		–0.0004		0.0099*
		(–0.054)		(1.79)
$W\Gamma_t$		0.0923***		0.0953***
		(5.965)		(–6.901)
$W\Theta_t$		–0.289***		–0.392***
		(–12.11)		(–18.29)
WFTA		0.00002		–0.00007***
		(–0.96)		(–3.04)
Constant	–28.09***	–30.36***	–31.45***	–35.046***
	(–38.76)	(–44.12)	(–41.87)	(–46.23)
Sigma-squared	13.99	19.10	11.04	15.52
	(3.64)	(3.11)	(9.87)	(6.31)
Gamma	0.612	0.733	0.364	0.757
	(6.48)	(8.91)	(27.71)	(23.83)
Mu	–2.825	–7.484	0.769	–2.705
Log likelihood fn	–32 238	–31 771	–37 464	–36 734
N	13 421	13 421	15 696	15 696

Notes: Standard errors are in parentheses. ***, ** and * represent significance at the 1, 5 and 10-percent levels, respectively. There are two columns each for estimation with FDI stocks and flows. The first column for each is estimation without multilateral terms and the second column including the multilateral terms. Rel. stands for relative.

coverage and time period used and the different model specifications, including a frontier approach in this paper and no explicit inclusion of distance in the Baltagi *et al.* (2007) model. The frontier model fits this FDI model better than an OLS or fixed effects model (see Armstrong, 2009a, b). As is the case in Baltagi *et al.* (2007), the multilateral variables (those weighted by inverse distance) are jointly significant, confirming their importance in explaining FDI. An *F*-test on the multilateral variables in the OLS model confirms joint statistical significance and, applying the likelihood ratio, the same conclusion is reached for the frontier case.

A significant proportion of the variation is because of the non-negative term, and a stochastic frontier is suitable for the data. A truncated normal distribution is the most appropriate distribution for the one-sided error term, instead of a half normal distribution.

In Table 2, distance is negative and highly significant. Baltagi *et al.* (2007) do not include distance as they are implicitly controlling for it in the spatially correlated error terms. The inclusion here explicitly confirms previous empirical studies that find that distance matters.[6] Bilateral economic size and similarity of GDP are positive and significant, concurring with the horizontal models of FDI (Markusen, 1984).

The source to destination fixed capital ratio is positive and significant across all model specifications, indicating relative capital abundance and scarcity. A negative natural resource ratio coefficient means that a relative abundance of host country natural resources is a significant factor in explaining larger flows and amounts of FDI. The signs of all other coefficients are as expected and are interpreted in a similar manner.

Foreign direct investment performance is defined as a ratio of actual to potential FDI and ranges between 0 and 1: a performance of 1 means full potential is reached and the actual FDI lies on the frontier. The higher the performance, the less economic distance affects the FDI relationship. Results for China's ODI to selected destinations are shown in Table 3.

The average performance of Chinese ODI ranges from 31 percent of potential to 40 percent over the period 2000 to 2008 (see last row in Table 3). Importantly, Chinese ODI to Australia faces relatively less resistance than does Chinese ODI to many other destinations, indicated by the high level of actual to potential FDI. The reasons for this are set out in Section VI. ODI to Hong Kong, given the special relationship with Chinese mainland, is the most liberal (67 percent in 2008). Distance and other determinants are controlled for, so low performance to Zimbabwe and high performance to Chinese Hong Kong are explained by other factors, which are discussed and estimated in Section VI. Chinese ODI to the USA performs above the Chinese mainland average while below that to other destinations, such as the UK. The important inference from these results is that

[6] See Carr *et al.* (2001), Egger and Pfaffermayr (2004) and Blonigen (2005) for a survey.

Table 3. Chinese Outward Direct Investment Flow Performance, Selected Countries, 2000–2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Australia	—	—	0.38	0.45	0.50	0.50	0.48	0.46	0.57
Brazil	—	—	—	0.46	0.45	0.37	0.34	0.42	0.38
Germany	0.45	0.49	—	0.50	0.46	0.45	0.47	0.31	—
Chinese Hong Kong	—	—	—	0.55	0.57	0.62	0.64	0.65	0.67
Indonesia	—	—	—	0.48	0.51	0.29	0.37	0.39	0.41
Japan	0.18	0.16	0.14	0.14	0.20	0.30	0.30	0.30	0.35
South Korea	0.39	0.37	0.40	0.43	0.49	0.26	0.39	0.41	0.48
Malaysia	—	—	—	0.33	0.40	0.43	0.32	—	0.39
Mexico	0.45	0.37	—	0.48	0.44	0.29	0.28	0.31	—
Papua New Guinea	—	—	—	—	—	—	—	0.15	0.29
Philippines	—	—	—	0.33	0.16	0.25	0.28	0.23	0.33
Russia	—	—	—	0.44	0.48	0.42	0.45	0.45	0.44
Singapore	—	—	—	—	0.46	0.44	0.51	0.55	0.53
UK	0.27	0.36	—	0.29	—	0.35	0.34	0.36	—
USA	—	—	—	—	0.45	0.40	0.43	0.38	0.42
Vietnam	—	—	—	0.48	0.49	0.31	0.34	0.39	0.38
Zimbabwe	—	—	—	0.21	0.38	0.28	0.32	0.38	—
Chinese mainland average	0.35	0.35	0.37	0.38	0.40	0.31	0.34	0.36	0.38

Note: — indicates that the FDI data for that year and flow are unavailable or missing.

Table 4. FDI Flow Performance for Selected Countries, 2000–2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Destination									
Australia	0.48	0.47	0.50	0.52	0.52	0.51	0.53	0.54	0.53
Brazil	0.50	0.47	0.41	0.46	0.48	0.43	0.42	0.47	0.46
Canada	0.47	0.40	0.39	0.42	0.39	0.47	0.47	0.50	0.47
Chinese mainland	0.43	0.44	0.39	0.42	0.42	0.36	0.34	0.38	0.36
Germany	0.40	0.39	0.40	0.43	0.40	0.43	0.41	0.43	0.42
Chinese Hong Kong	0.47	0.44	0.42	0.42	0.47	0.51	0.51	0.52	0.51
South Korea	0.35	0.35	0.36	0.35	0.36	0.35	0.35	0.34	0.33
USA	0.51	0.45	0.43	0.42	0.43	0.43	0.45	0.46	0.44
Source									
Australia	0.45	0.43	0.42	0.44	0.46	0.47	0.47	0.51	0.46
Chinese mainland	0.35	0.35	0.37	0.38	0.40	0.31	0.34	0.36	0.38
Germany	0.43	0.41	0.42	0.42	0.44	0.41	0.41	0.41	0.42
Japan	0.42	0.41	0.41	0.43	0.41	0.42	0.43	0.42	0.41
South Korea	0.39	0.38	0.34	0.37	0.40	0.41	0.37	0.38	0.39
UK	0.50	0.49	0.49	0.49	0.47	0.46	0.47	0.48	0.49
USA	0.47	0.45	0.44	0.43	0.46	0.42	0.43	0.42	0.41
World average	0.40	0.39	0.39	0.40	0.40	0.40	0.41	0.41	0.41

Chinese investment has more open access to Australia than to any other country in the world, including Brazil and other target resource investment hosts.

Table 4 shows the average source and destination FDI performance results for other countries, including the world average. The world average is close to 40 percent for the sample period. Although it is expected that this number might be increasing over time, more FDI flows are reported in the later years than in the earlier years, and those additional non-zero FDI flows are much lower than the world average. The previous zero value relationships are then counted in the average, bringing the world average down.

Comparing performance with other FDI sources, China is still close to the lowest performers in the sample in Table 4, performing at the same level as South Korea. Both are below the world average. Australia and the UK stand out as high performing sources of FDI, with the USA also significantly above the world average in most years but falling over time.

Among the destination countries, Chinese mainland's ODI performance stands out as falling over time, with Australia, Chinese Hong Kong and Brazil consistently performing highly and Germany close to the world average.

VI. Explaining ODI Performance of China

To explain China's ODI performance, FDI performance for the global sample is analyzed as a larger sample size with more variation to shed light on the effect of resistances on FDI. The actual to potential FDI can be explained, at least partly, by language similarity and other governance or risk variables. Such measures can account for some of the economic distance that FDI flows face but many are unobservable resistances. It is important to understand what sort of risks deter investing firms, and whether institutional quality can attract more FDI.

The performance results from Equation (1) are explained from:

$$\begin{aligned} \exp(-u_{di}) &= d_0 + d_1 language_{di} + d_2 voice_i + d_3 pol\_stab_i + d_4 govt\_eff_i \\ &+ d_5 regulation_i + d_6 rule\_of\_law_i + d_7 corrupt_i + e_{di} \end{aligned}, \qquad (2)$$

where $language_{di}$ takes the value 1 if countries i and d share a common official language. The data are from the CEPII (Centre d'Etudes Prospectives et d'Informations Internationales) geodesic distances dataset.[7] Voice and accountability (*voice*), political stability (*pol_stab*), government effectiveness (*govt_eff*), regulation quality (*regulation*), rule of law (rule*_of_law*) and control of corruption (*corrupt*) are all from the World Bank *Governance Indicators*

[7] The dataset can be accessed from http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

Table 5. Results of FDI Performance

Language	0.125*** (0.0037)
Voice and accountability	–0.0022 (0.00248)
Voice and accountability	–0.0157*** (0.0058)
Regulation quality	–0.0336*** (0.0039)
Rule of law	0.04296*** (0.0038)
Control of corruption	0.044*** (0.0041)
Political stability	0.00096 (0.0029)
Constant	0.2535*** (0.0019)
R^2	0.162
Log likelihood fn	–32 238
N	15 317

Notes: Standard errors are in parentheses. *** indicates significance at the 1-percent level.

(available from: http://info.worldbank.org/governance/wgi/index.asp) and are scored between –2.5 and 2.5, with a higher value indicating better governance. The variables are regressed on the efficiency, or performance, results obtained from Table 2, which cover the same time period. Apart from language similarity, the other explanatory variables are all measures of host country governance. One shortcoming of the present study is that conclusions cannot be drawn regarding the source country characteristics that explain FDI performance; therefore, Chinese institutions and governance characteristics are not used in explaining China's ODI performance but instead used in explaining its performance as an FDI host. The results are presented in Table 5 using the OLS method.

Table 5 shows the results of the performance of FDI. Voice and accountability and political stability in the host country do not affect the performance of FDI. The source and host countries having the same official language, and the host having a high score for rule of law and control of corruption are associated with higher FDI performance. Language similarity, strong rule of law and control of corruption seem to reduce the economic distance between FDI source and host countries. Higher scores for government effectiveness and regulation quality are associated with lower FDI performance.

Actual Chinese ODI in Australia relative to potential FDI is high because Australia has strong governance scores in terms of rule of law and control of corruption. Regulation quality and government effectiveness being strong in Australia and other developed countries, on average, reduce FDI to those destinations. Some of this might explain the attractiveness of Africa and other less developed countries, which cannot effectively regulate. However, the positive effect of established and strong rule of law and control of corruption are important for attracting Chinese and other FDI. Language similarity increasing

FDI performance is as expected and helps to explain why Chinese mainland ODI performance to Hong Kong is so high.

The low R^2 of 16 percent is similar to that of Armstrong (2009b). Because FDI performance is thought to be a measure of economic distance, it captures and is influenced by all resistances other than geographical factors. The low R^2 is a reflection of the significant proportion of resistances that are difficult to measure or are unobservable. The low R^2 is also an indication of the difficulties that a simultaneous estimation of Equations (1) and (2) would face. The inclusion of a set of time dummy variables or a time trend does not change the results in any significant way.

VII. Conclusions

China's ODI achieves less of its potential compared with that of other major sources of FDI, given China's size, location in the global economy, and its endowments.

Despite the trouble Chinese firms are perceived to have encountered in investing in Australia with one or two highly publicized and politicized projects, Chinese investment into Australia has performed much better than the average of Chinese ODI to other destinations, at 57 percent of potential in 2008, which is one of the best performing of China's global investment relationships, significantly higher than the world average of 41 percent that year. The results suggest that Chinese policy-makers should look at the pattern of China's ODI and, in light of superior performance in destinations like Australia, adjust policy strategies and institutional arrangements to enhance performance and to reduce barriers to Chinese ODI elsewhere.

The study also finds that the quality of institutions and governance in the host economy affect FDI performance. In particular, the control of corruption and the rule of law explain higher performance of FDI globally, whereas less FDI is attracted in economies with higher regulation quality and government effectiveness.

There are also some constraints on ODI from China. Chinese investment into developing countries underperforms. The lack of control of corruption and rule of law appears to affect this, despite the more porous investment environment in developing countries sometimes being perceived as an advantage for Chinese investors.

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