# China's Outward FDI:
## An Industry-level Analysis of Host Country Determinants

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## Abstract

We provide an empirical analysis of host country determinants of Chinese outward FDI for the period 2003 to 2008, using data disaggregated by country and industry. We want to assess the relevance of market-seeking, resource-seeking and strategic asset seeking motivations suggested by the theory on FDI determinants. Our results show that only FDI in manufacturing is attracted by market seeking motivations. As expected, resource seeking is an important motivation for Chinese FDI in resource related sectors, which usually refers to countries with political fragile environments. Strategic asset seeking motivations are relevant for both manufacturing and services.

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# 1. Introduction

After being the largest recipient of foreign direct investment (FDI) among the developing countries for over a decade, China recently entered the top 10 ranked home economies for FDI (UNCTAD, 2010). From 2000 to 2010, the stock of Chinese outward FDI increased from US$4 billion to US$317 billion and total annual flows increased from less than US$1 billion in 2000 to US$68 billion in 2010, showing a steady increase since 2008 (MOFCOM, 2011).

The rapid expansion abroad of Chinese firms has generated worldwide interest, concern and controversy. Chinese investments are often viewed with a mixture of hope and fear. On the one hand, the input of fresh capital is attractive for host countries, especially in the current period of low growth. Also, in developing countries these investments potentially expand the opportunities for technology transfer. On the other hand, the Chinese State is often behind FDI and many Chinese companies are backed by political and financial support. The rich countries have concerns about the exploitative attitude of Chinese investors, and the developed countries fear the loss of key technological capabilities. These mixed feelings, however, are often based on scant information and personal opinion; there is an urgent need for robust empirical research to provide a better understanding of the phenomenon.

The empirical research on the determinants of outward expansion of Chinese firms is based mainly on descriptive evidence (see among others Taylor, 2002; Wong and Chan, 2003; Deng, 2003, 2004), on company case studies (see among others Liu and Li, 2002; Warner et al, 2004; Zhang and Filippov, 2009), studies of specific host countries (e.g. on Germany Schüler-Zhou and Schüller, 2009; on Italy Pietrobelli et al., 2011; on the UK Cross and Voss, 2008; Liu and Tian, 2008) and particular

industries (i.e. on the automotive sector Amighini and Franco, 2011). A few econometric studies are based on aggregate FDI data (Buckley et al., 2007; Cheng and Ma, 2008; Cheung and Qian, 2008; Cross et al., 2008; Pradhan, 2009; Kolstad and Wiig, 2010), but their results are mixed.

This paper adds to the empirical literature on the motives of Chinese FDI and extends existing work in a number of ways. Our analysis is disaggregated at the industry and host country levels, and the period considered is 2003 to 2008, which includes the recent and major wave of foreign expansion by Chinese firms. Industry level disaggregation allows account to be taken of the motivations for investing which may be different in different industries and sectors. The large share of FDI in resource-intensive sectors may be undermining the importance given in existing work based on aggregate FDI data, to motivations other than resource seeking (Buckley et al., 2007; Cheung and Qian, 2008; Kolstad and Wiig, 2010).

The *fDi Markets* database exploited in this paper registers greenfield investments, providing an industry disaggregation on which basis we can investigate the relevance of market-seeking, resource-seeking and strategic asset seeking motivations (Dunning, 1993) to explain Chinese outward FDI in different groups of countries. Our results show that only FDI in manufacturing is based on market seeking motivations. Resource seeking is an important motivation for Chinese FDI in resource related sectors, generally in countries with politically fragile environments. Strategic asset seeking motivations apply to investment in both manufacturing and services.

The paper is organized as follows. Section 2 reviews the literature on the determinants of Chinese FDI and presents the derived research hypotheses. Section 3 provides a detailed description of the geographic and sectoral distribution of Chinese

outward FDI from 2003 to 2008. Section 4 presents the empirical findings and Section 5 provides some concluding remarks.

## 2. The determinants of FDI on Chinese outward investments

### 2.1. The literature

The literature on host country determinants of FDI traditionally has focused on investments by developed countries, reflecting their larger share in international FDI flows.

A popular typology that takes account of the different motivations for outward FDI is provided in Dunning (1993) and is based on four categories: a) *market-seeking* investment aimed at entering new markets; b) *resource-seeking* investment aimed at searching for resources found in specific foreign locations (e.g. specific natural resources); c) *strategic asset-seeking* investment aimed at augmenting the set of the firm's proprietary resources; and d) *efficiency-seeking* investment within a cost reduction strategy.

This typology is used in some of the empirical studies on host country determinants of Chinese FDI (Buckley et al., 2007; Cheng and Ma, 2008; Cheung and Qian, 2008; Kolstad and Wiig, 2010), which mainly focus on the significance of the first three of Dunning's categories, the last so far being considered relatively unimportant for Chinese multinational companies (MNCs), because of the relatively low costs of domestic labour and other inputs (UNCTAD, 2006).

Many existing studies stress the peculiarity of Chinese MNC, which predominantly are state-owned enterprises and whose investment decisions, therefore, may reflect political objectives not necessarily consistent with the profit-maximizing strategies of private companies. This implies that their determinants may be different from those of any other country (Morck et al., 2008; Yeung and Liu, 2008). Also, Chinese

outward FDI might follow a different pattern to FDI from developed countries because of the peculiarity of China's institutional environment, which may represent advantage for Chinese companies investing in developing countries (Habib and Zurawicki, 2002; Quer et al., 2011).

So far, empirical studies of the determinants of Chinese outward FDI provide evidence favouring a number of factors that significantly affect the likelihood of a country to be chosen as a location for FDI. Some of these factors support the conventional knowledge in the international business literature, based on widespread evidence on the choice of FDI locations by multinational firms from a large number of industrialized countries. In fact, the empirical evidence provides support for market seeking motivations that attract Chinese firms to invest especially in the OECD countries (Buckley et al., 2007; Cheung and Qian, 2008; Kolstad and Wiig, 2010) and for resource seeking motivations in non-OECD countries (Pradhan, 2009; Kolstad and Wiig, 2010; Sanfilippo, 2010; Buckley et al., 2007).

Some other findings point to results that would seem to be peculiar to the case of China. For instance, contrary to the results in the literature on FDI from developed economies (Faeth, 2009), Chinese FDI seems to be attracted to destinations with high political and economic risks (Kolstad and Wiig, 2010; Buckley et al., 2007; Quer et al., 2011). Also, cultural factors, including the exploitation of relational assets when operating in countries with very different institutional settings, have been identified as being among the determinants of Chinese outward FDI (Buckley et al., 2007; Cheng and Ma, 2008).

Finally, and again rather surprisingly, there is no evidence in existing empirical work of strategic asset-seeking motivations, which some qualitative studies on Chinese FDI in Europe stress (Cross and Voss, 2008; Liu and Tian, 2008; Pietrobelli et al., 2011), especially relation to the white goods sector (Bonaglia et al., 2007) and well

known Chinese MNCs such as Haier, Lenovo, BOE and TCL (Li, 2007; Liu and Buck, 2009). According to these studies, Chinese companies invest abroad as a means of rapidly overcoming their disadvantages in terms of technology, knowledge and skills, to acquire brands, new and advanced management skills and to tap into pools of local knowledge (Amighini et al., 2010; Hong and Sun, 2006; Luo et al., 2010). This is also a declared aim of state-directed Chinese FDI (Deng, 2009).

In this paper, we explore the determinants of Chinese FDI at sectoral level using a different database. We conduct an analysis disaggregated by sector and country over the period 2003 to 2008. The sectoral disaggregation is a major contribution because it allows us to identify the determinants of Chinese FDI relevant to specific industries and countries, not possible in existing work using aggregated databases.

In the next section, we present our literature derived hypotheses, which we will test in the econometric analysis.

## 2.2. *The hypotheses*

There is a large body of evidence confirming that Chinese FDI are based on market-seeking motivations, a result that is in line with traditional FDI theory. A number of studies find that market size is positively and significantly related to Chinese FDI (see Buckley et al. (2007) on approved Chinese FDI[1] to 49 countries for the period 1984-2001; Cheung and Qian (2008) on approved Chinese FDI to 31 countries from 1991 to 2005; Cheng and Ma (2008) on actual Chinese FDI to 90 host countries in 2003 to 2006. Using UNCTAD data for 104 countries over the period 2003-2006, Kolstad and Wiig (2010) confirm this finding although when the sample is split into

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[1]These MOFCOM data underestimate the real value of investments because they do not include the financial sector up to 2006 and are based on the value arising from approval procedures rather than the effective value of bids (thereby excluding non-approved investments and private transactions not formally recorded). In addition, these data take no account of investments channeled via offshore destinations (such as the Cayman and Virgin Islands) or financial centers (Hong Kong) and thus not officially recorded in Chinese balance of payment records.

OECD (25) and non-OECD countries (79), GDP is significant only for OECD countries not non-OECD ones.

In our model, GDP is used as a measure of the absolute market size of the host country (Frankel and Wei, 1996; Kravis and Lipsey, 1982; Wheeler and Mody, 1992; Dunning, 1993). In line with the literature, we expect a positive relationship between Chinese FDI and market size.

In relation to the market-seeking hypothesis, our specification includes Chinese exports to and imports from host countries in the same sector.[2] With regard to exports, some studies point out that Chinese FDI is defensive (i.e. it follow exports) because firms set up foreign affiliates in order better to serve their customers and increase customer loyalty (Buckley et al., 2007). However, it is also possible that FDI substitutes for exports; this happens if investments are used as a springboard to leap trade barriers (Dasgupta, 2008; Luo and Tung, 2007).

China's imports from host countries also capture the intensity of trade relations. On the one hand, we could hypothesize that Chinese companies want to internalize these strategic flows through FDI abroad, in which case the expected sign will be positive (Buckely and Casson, 1976). On the other hand, the relationship between Chinese imports and FDI might be negative (Buckley et al., 2007) if Chinese firms relocate their processing activities abroad through FDI, which is common for tariff jumping investments, a modality adopted widely by Chinese companies in developing countries (OECD, 2008). Thus, given that the relationship between exports, imports and FDI could be positive or negative, we leave our prediction open.

In relation to exports and imports, we include distance from the home country as a proxy for trade costs. Conventional theory suggests that firms are more likely to

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[2]Each bilateral investment flow is matched to the corresponding bilateral export and import flows between the home country (in our case, China), and the recipient countries, according to the International Standard Industrial Classification of All Economic Activities (ISIC), Revision 3.

invest in FDI in more distant markets (Buckley and Casson, 1981; Barba Navaretti and Venables, 2004). The gravity model, however, predicts that the relationship could also be negative since the cost of investing increases with distance (Kolstad and Wiig, 2010; Pradhan, 2009); hence we leave this prediction open.

With regard to resource-seeking motivations, several empirical studies on Chinese FDI (Buckley et al., 2007; Cheung and Qian, 2008; Kolstad and Wiig, 2010; Sanfilippo, 2010; Pradhan, 2009) show that Chinese investments are motivated strongly by the need to satisfy growing demand for primary resources and this is true especially for investments going to developing countries. As a proxy for natural resources, our model includes variables for the share of fuels and the share of ores and metals in total merchandise exports by the host economy (Pradhan, 2009). For both variables, the expected signs are positive.

In relation to strategic asset seeking motivations, the proxy used in some studies is number of patents registered by the host country, which Buckley et al. (2007) and Kolstad and Wiig (2010) find to be not significant. In the present paper, we use gross secondary school enrolment as a proxy for the level of human capital. According to Noorbakhsh and Paloni (2001), the level of human capital is a statistically significant determinant of FDI inflows. Our expectation is that the availability of a literate labour force has a positive impact on the location choice of Chinese companies that want to upgrade their capabilities.

To test the strategic resource-seeking hypothesis, we also introduce a dummy variable for those countries that spend more than 1% of their GDP on research and development (R&D). Following work based mainly on case studies, which shows increasing interest among Chinese companies to invest in countries with advanced R&D capacities, with the aim of acquiring technological capabilities (Di Minin and

Zhang, 2008; Pietrobelli et al., 2011), we would expect a positive relationship between R&D in the host country and FDI.

In line with the existing literature, we also include a number of control variables that have been found to be significant in previous studies of the host country determinants of FDI (Chakrabarti, 2001; Blonigen, 2005).

Inflation, measured as the annual change in the consumer price index, is a standard indicator of macroeconomic instability (Asiedu, 2002). Unstable economic conditions and poor fundamentals, especially in developing countries, reduce the attraction of potential host markets by negatively affecting profit expectations. Nevertheless, in the case of Chinese FDI, Buckley et al. (2007) find a positive and significant association between inflation and FDI, explaining this result as being due to the unusual tolerance of Chinese companies towards unstable countries. Given these mixed results, we leave this prediction open.

Another important dimension of instability is represented by the political risks connected to the host country. In the conventional theory on FDI, high political risk is usually associated with low levels of attraction for FDI (Chakrabarti, 2001). However, the empirical literature on emerging MNCs shows that they are relatively indifferent to the institutional conditions in host countries and, according to some authors, these contexts even represent a comparative advantage (Cuervo-Cazurra and Genc, 2008). This would seem to apply to the case of China. Chinese FDI are attracted to countries with poor public institutions (i.e. high political risk), a result first documented by Buckley et al. (2007) and recently confirmed by Quer et al. (2011), using company level data. Kolstad and Wiig (2010) provide further support for this finding, pointing to poor institutions as attractors for Chinese firms investing abroad in natural resources. In their study, the interaction effect between institutions and natural resources abundance is significant and positive, showing that Chinese

FDI in non-OECD countries are based more on natural resources abundance than the institutional environment of the host country. This finding shows that Chinese FDI are attracted by countries with poor institutions because rents are more easily appropriated in institutionally weak environments.

In order to assess how risk influences Chinese FDI, our specification includes a variable from the World Governance Indicators (WGI), which is a measure of the "*perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests*".[3] This variable represents an important dimension of a country's political weakness and varies from -2.5 to 2.5, the lower value representing the worst performance (Kaufmann et al., 2009). The prediction again is open.

Finally, in line with the literature, we include the number of telephone mainlines to indicate the availability of infrastructures and communication facilities in the host country. Good infrastructure facilitates flows of goods and information and creates an environment conductive to knowledge spillovers.[4] Given that a well-developed network of infrastructures generally encourages investment, the expected sign is positive (Khadaroo and Seetanah, 2007).

Table 1 presents the variables included in our specification; Table 2 reports some descriptive statistics. The correlation matrix is presented in Table A in the Appendix.[5]

**Tables 1 and 2 here**

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[3] http://info.worldbank.org/governance/wgi/pdf/cc.pdf

[4] In principle, other measures of infrastructural endowments might be better for our analysis. We might expect that FDI in different sectors would be attracted to countries with different types of infrastructure. E.g., FDI in service sectors is likely to be oriented more to countries with good communications facilities; FDI in manufacturing is likely to be oriented to countries with good rail or road provision. However telephone mainlines is the only variable available for the whole sample of countries.

[5] The variance inflation factor (VIF) was computed after running a pooled regression, and does not suggest the presence of multicollinearity among the explanatory variables.

## 3. Chinese FDI: A descriptive overview

In this paper, data on FDI are from *fDi Markets*, an online database maintained by *fDi Intelligence*, a specialist division of the *Financial Times*, which monitors cross border greenfield investments, covering all sectors and countries worldwide since 2003. Only projects creating new jobs and investments (no minimum investment required) are included: mergers and acquisitions (M&A) and other equity investments are not included.[6] Therefore, our database covers the number of investments undertaken by Chinese companies in each country and each industry in the period 2003 to 2008. The advantage of this dataset with respect to MOFCOM and UNCTAD data is the availability of a sectoral classification for each investment project, aligned to the industrial classifications adopted at international level. The dataset contains information on countries of origin and destination of investments, and provides other relevant information, such as year of investment, employment, sector and business activity undertaken by the foreign affiliate.

Based on the World Bank classification for year 2006, host countries are aggregated in three groups based on their income level: (a) high income countries, which include the OECD and other high income countries (such as the Asian tigers and the oil rich Gulf states);[7] (b) upper middle income countries; (c) lower middle and low income countries (see Table A in the Appendix for the list of countries in each group). Regarding industry classification, we consider three sectors: manufacturing, resource intensive and services.[8] The dataset also provides a disaggregation according to the

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[6] This is an important difference from the FDI data provided by MOFCOM which does include M&A and equity investments.

[7] Within high-income countries we identify the sub-group of OECD countries because this eliminates possible biases due to the presence in the first group of countries such as Hong Kong and the Gulf states.

[8] The resource intensive sector includes the two digit ISIC level (rev. 3) between 1 and 14; manufacturing includes sector codes 15 to 37; services includes 40 to 90 (see Table B in the Appendix).

business activity performed: production, trade-related services such as retail or sales, marketing and after-sales support and all the other services subsumed in business services.

According to these data, there were 925 Chinese greenfield investments in the period 2003-2008. Compared to other Asian developing economies, China is ranked second, after India (with 1,438 FDI). The annual distribution of Chinese FDI grew rapidly after 2006. In terms of geographic distributions, Chinese FDI include 110 countries, developed, developing and transition economies (Table 1). Around 20 per cent total Chinese FDI went to other Asian economies (excluding Hong Kong), especially India (5.8%) and Vietnam (4.9%). USA and Russia are the largest recipient countries outside Asia, with respectively 7 per cent and 5 per cent of total Chinese FDI since 2003.[9] Table 3 shows that Chinese FDI are concentrated in a few countries with the top five recipients accounting for almost 30 per cent and the top 10 recipients for almost 40 per cent of total Chinese FDI. In relation to the distribution of the host countries by income level, almost half of Chinese FDI go to high income countries and the group receiving the second largest share is the low and lower-middle income countries (38%), followed by upper-middle income countries (14%).

**Table 3 here**

For sectoral distribution, overall, 54 per cent of Chinese FDI is in the manufacturing sector, 36 per cent in services and 10 per cent in resource-intensive sectors. The most attractive sectors seem to be Communications, Metals and Coal, Oil and Natural Gas, and Chinese firms have massively expanded their presence abroad to secure access to

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[9]The list of recipients in terms of *number* of investments (Table 3) differs from the major recipients of FDI outflows provided by MOFCOM (2011). The list of official destination is biased by the practice of round tripping, i.e. the channeling of large investment outflows to tax havens (such as the Cayman or Virgin islands) or financial centres (i.e. Hong Kong) to establish special purpose entities that reinvest capital in China or elsewhere (Morck et al., 2008; Davies, 2010; Sutherland and Ning, 2011). The discrepancy between the official data and the data in Table 3 could be due to the "inherent secrecy" of tax havens and the resulting difficulties related to disclosing information about which Chinese firms have investments there (Sutherland et al., 2010), and to the fact that most investments to financial offshore centres, such as Hong Kong, are M&A (Davies, 2010).

energy and other resources, which accounts for more than 17 per cent of total FDI (Table 4). The automotive industry accounts for almost 9 per cent of total Chinese FDI, with the remaining sectors attracting minor shares of investment.

**Table 4 here**

Taking account of the cross-classification of FDI by host country and sector, Table 5 presents Chinese FDI by level of host country income based on the World Bank definition, and by sector groups. As already stressed (Buckley et al., 2007), manufacturing and service sector investment is generally in high income countries, while investment in resource intensive sectors is usually in low and lower–middle income countries. Table 5(b) shows that in high income countries investments in service sectors dominate, in the upper-middle income most FDI is in the manufacturing sectors, and in the low income group the shares of manufacturing and resource intensive sector investments are very similar.

If we look at the disaggregation by business activities, the most frequent is production, followed by trade related activities and business services (Table 6).

**Tables 5 and 6 here**

To conclude our descriptive analysis of the database, Table 7 presents a comparison of country destinations, among China and Brazil, Russia and India. If we compare China with the rest of the world, Chinese outward FDI goes relatively more to low and lower-middle income countries than the average (38%vs. 21%) and this applies to India and Russia, but not Brazil. Compared to the world average, Chinese FDI in resource-intensive sectors is less likely to go to high-income countries (19% compared to a world average of 36$) and is much more attracted to low income countries than the world average (57%compared to a world average of 34%). It should be noted that this applies also to the other largest emerging economies of

Brazil, India and Russia, whose outward natural resources investments are generally to low income rather than high income countries.

**Table 7 here**

# 4. The empirical analysis

## *4.1    The model specification*

The econometric analysis is based on a panel dataset of the number of Chinese investments in the host country $i$ and in each industry $j$ at time $t$. The total number of observation is 613, covering 81 countries $i$, 29 industries $j$ over 6 years $t$.[10] Since in many cases there are no observations for a given country/industry investment in a given year, the panel is unbalanced. Our empirical strategy consists of estimating a probit model, which measures the partial effect of each explanatory variable on the response probability function, represented by a binary formulation of the dependent variable assuming the following values:[11]

$$FDI_{i,j,t} = \begin{cases} 1 & \text{if China has invested in sector } j \text{ in country } i \text{ in year t;} \\ 0 & \text{Otherwise} \end{cases}$$

(1)

Given that the pooled version of this model assumes independence over $i$, $j$ and $t$, which, in turn, leads to potential loss of efficiency, the cross-country time-series structure of the dataset is accommodated by employing a random effects probit model[12], which can be generalized as follows:

$$\Pr(FDI_{i,j,t} = 1 \mid X_{i,t}, \beta, \alpha_i) = \alpha_i + \beta X_{i,t} + \varepsilon_{i,j,t} \qquad (2)$$

where X is the vector of explanatory factors, β the vector of the coefficients associated with X, α is the vector of the individual (country) specific unobservable

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[10] Some countries were dropped from the original dataset because of the unavailability of some independent variables.

[11] A binary response model also reduces the risk of measurement error because in some cases the information provided on investment flows is an estimation.

[12] For an application of this method to the study of FDI determinants, see Altomonte (2000) and Altomonte and Guagliano (2003).

effects and ε is the error term (Wooldridge, 2002). The random effect probit model assumes that there is a constant correlation between the observations within the same group (in this case countries) and that the individual effects are normally distributed and are uncorrelated with the random error term and with the X.[13]

The final specification of the model is as follows:

$$\Pr(FDI_{i,j,t} = 1 \mid X_{ij,t}, \beta, \alpha_i) = \alpha_i + \beta_1 lGDP it + \beta_2 lM_{ijt} + \beta_3 lX_{ijt} + \beta_4 lDIST_i + \beta_5 FUELEX_{it} + \beta_6 ORMETEX_{it} + \\ + \beta_7 SEC\_EDU_{it} + \beta_8 R\&D_{it} + \beta_9 TEL_{it} + \beta_{10} INFL_{it} + \beta_{11} CORR_{it} + \varepsilon_{ijt}$$
(3)

*4.2 The results*

The empirical estimation findings are presented in three tables, one for each sector (i.e. manufacturing, resources, services), and include a disaggregation of the host countries by income level.

Table 8 shows the results for the host country determinants of Chinese outward FDI in the manufacturing industry. The model confirms the market-seeking hypothesis for the whole sample (Column I), in the sub-group of high-income countries (II) and in the OECD group (III). This is an interesting result which adds insights to the existing evidence because it clarifies that Chinese FDI are based on market seeking motivations only in relation to rich countries but not middle and low income countries (Columns IV and V).

**Table 8 here**

Related to the market-seeking hypothesis, Chinese FDI in the manufacturing industry are also positively associated with exports. This result confirms at all income levels the studies at the aggregate level (e.g. Buckley et al., 2007; Pradhan, 2009) and indicates the importance of Chinese FDI following trade and going to countries to which China already exports.

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[13]A random effect probit also assumes equicorrelation between successive disturbances belonging to the same individual (Baltagi, 2005).

It is interesting that the result for the variable measuring the bilateral distance between China and the host country complements the previous result and stresses the importance of greenfield investments substituting for exports in middle income countries (IV) and in production activities (VI) when trade costs increase.

For imports, the only significant (and negative) coefficient is for FDI in production activities (VI). Following Buckley et al. (2007), this can be explained by a decrease in the imports of intermediate products when Chinese firms relocate their production abroad via FDI.

To test the resource seeking motivation, the share of fuels in total export (FUELEX) is significant with a negative sign only in the general model (I). This hypothesis is discussed in more detail in the section of the results for investments in resource intensive sectors.

An interesting and original finding is related to strategic asset-seeking motives. We find that the availability of skilled human capital is positively associated with the probability of Chinese investment in the manufacturing sectors of high and middle-income countries (II, III and IV). We also find a positive and significant coefficient of R&D expenditures in the subgroup of OECD countries (III). These findings highlight the importance of the strategic asset-seeking motivation of Chinese investment in developed countries, hypothesized in a number of qualitative studies (among others Bonaglia et al., 2007; Cross and Voss, 2008; Li, 2007; Liu and Buck, 2009; Luo et al., 2010; Pietrobelli et al., 2011), but not confirmed by previous econometric analyses.

For the remaining control variables, the endowment of infrastructures matters for the probability for high income countries receiving Chinese FDI in manufacturing sectors, but this does not apply to other country groups, which suggests that lack of

infrastructures, often considered an impediment to inward FDI in low income countries, does not seem to be a barrier to Chinese FDI.

With respect to risk, the results are mixed. Inflation, a measure of macroeconomic risk, has a deterrent effect on Chinese FDI for the whole sample (I), meaning that Chinese investors tend not to invest in unstable countries. However, the impact of corruption on the probability of becoming a recipient of Chinese FDI varies according to the group of countries considered. In high-income countries, Chinese investments are negatively associated with corruption, while in low-income economies the opposite is true. In this latter case, this is further confirmation of the existing empirical evidence (Kolstad and Wiig, 2010; Quer et al., 2011), and shows that in low income countries, Chinese companies invest in countries with fragile political environments when seeking natural resources but also in manufacturing.

Table 9 presents the results of the model for investment in resource intensive sectors. [14] As expected, natural resources endowment (FUELEX) positively and significantly affects Chinese FDI for the whole sample (I) confirming the natural resources seeking motivation. The coefficient is positive and significant for investment in high-income countries, which includes the Gulf states. [15]

**Table 9 here**

For the perceived level of corruption in the host country, the coefficient is negative and significant for the low-income countries, a result that is consistent with previous econometric analyses (Buckley et al., 2007; Kolstad and Wiig, 2010). This has been explained as the preference of multinational firms to locate in countries with a similar business environment to their home country. It might also be that Chinese firms prefer to locate in countries with high levels of corruption because the rents

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[14] Due to the small number of investments in the resource sectors of OECD and middle-income countries, the model for these two groups does not converge.
[15] The not significant coefficient for low-income countries can be explained by the fact that most of these countries are resource rich countries and there is insufficient variation within this group.

from natural resource exploitation are more easily captured in such countries. However, we should take into account that natural resource rich countries tend to fare rather badly for transparency of their economic environments (Collier et al., 2004), so the positive correlation between corruption and Chinese FDI might simply be the result of a preference for locating in countries with high resource abundance, which also tend to be characterized by high levels of corruption. Note, that this result holds only for low-income countries, and a more conventional result might be obtained for high-income countries, that is, that countries with lower corruption levels are preferred.

In relation to infrastructure, the coefficient (TEL) is negative and significant for the group of low-income countries, a result that is consistent with other studies (Asiedu, 2002). It can be explained by the widespread location of natural resources oriented investments in remote areas with little basic infrastructure.

The negative sign of the coefficient of market size means that investments in natural resources sectors are more likely to go to low-income countries (and to those with the smallest markets).

Finally, the coefficients of exports and imports are the reverse of those for the manufacturing sector. The positive coefficient of imports shows that the probability of a country receiving FDI from China in the resource intensive sectors is higher for those countries already exporting to China from the same sector. This suggests that Chinese FDI is aimed at internalizing these resources through investment in extraction facilities. There is also evidence of a negative impact of Chinese exports of natural resources on the likelihood that the importing country will be chosen as a location for Chinese FDI in the natural resources sectors.

Table 10 reports the results for the service sectors. An interesting finding is the positive and significant sign of the coefficient of telephone mainlines for the higher

income countries, showing a propensity to invest when basic infrastructures are well established. The opposite is true for the group of lower income countries, where Chinese companies are currently heavily involved in the construction of basic infrastructures, as showed by their large investments in telecommunications in Africa (Sanfilippo, 2010).

**Table 10 here**

Also of interest is the positive coefficients of size of R&D spending and level of human capital in the OECD countries. This result is confirmed by the significant and positive sign of R&D in Column VII, showing that when investing in non-trade related services, including communications, business services and IT services, Chinese companies prefer to invest in countries with good technological capability.

With regard to trade, overall, FDI in services is a substitute for exports, that is, FDI and exports are alternative forms of internationalization for Chinese firms. However, for the OECD countries, Chinese FDI is driven by the need to support exports through the establishment of distribution networks, customer and marketing centres abroad. This seems to be consistent with the results for manufacturing of complementarity between FDI and exports, which reinforces the market-seeking motivation. This result also holds if the analysis is limited to investments in trade services (Column VI).

We find that Chinese FDI in services is negatively affected by distance from the host economy. This could indicate that cultural factors and geographical proximity matter for the attractiveness of investment destinations, especially in relation to intra-regional FDI, similar to the results of other studies on emerging market multinationals (Amighini et al., 2010).

Finally, the significant and negative sign of the corruption coefficient shows that similar to the other two sector groups, a stable political situation does not matter for

investment in lower income countries. However, the negative sign of the coefficient of inflation indicates that macroeconomic instability is a deterrent to Chinese investments in services.

## 5. Concluding remarks

We have investigated the host country factors affecting the probability of receiving Chinese FDI. We relied on a dataset on bilateral greenfield FDI by sector to disentangle the impact of different factors on various groups of sectors and countries to assess the nature of Chinese FDI in terms of the motivations of firms, distinguishing between market seeking, resource seeking and strategic asset seeking motives. Table 11 presents a summary of the main findings.

With regard to the market seeking motivation, this is clearly relevant for the manufacturing sectors with Chinese companies choosing to locate in countries with large markets. The opposite would seem to be true for investments in the resource-intensive sectors, which tend to go to countries with low levels of GDP, especially among the group of lower income countries.

We tested for the relationship between trade flows between China and host countries, and the probability of being chosen as a location by Chinese firms. Overall, Chinese firms tend to invest abroad through FDI to support their export activities, thus, the relationship is complementary rather than a substitute for exports. In resource intensive sectors, the complementarity between imports and FDI suggests that Chinese firms invest abroad to internalize the benefits from resource extraction.

**Table 11 here**

In terms of resource-seeking motivations, we found, as expected, that they are relevant for Chinese FDI in resource-intensive sectors, but not in other sector groups.

Relatedly, corruption levels in host countries do not deter Chinese firms investing in natural resources. It is interesting that this result holds for all sector groups not just the resource intensive sectors. Our results for macroeconomic risk are mixed. As would be expected, economically unstable countries are not the favourite destinations for FDI, but this is true in the case of China, only for the resource intensive and service sectors, not the manufacturing sectors, a controversial result that confirms previous findings by Buckley et al. (2007).

Finally, in the manufacturing and services sectors Chinese FDI in high income countries are based on strategic asset seeking motivations, especially countries with high R&D and human capital endowments. This finding adds to our understanding of Chinese FDI, since previous studies undertaken on aggregate databases do not capture it.

Overall, our results suggest that the factors increasing the probability of a country's being chosen as a location for Chinese FDI differ between high income and low-income countries, as do the motivations of investing firms. Also, investment from China is driven by different motivations in different sectors. The sectoral disaggregation allows us to confirm the strategic asset seeking motivation in investments to OECD countries, which is stressed in several case studies, but not confirmed econometrically.

Our results confirm the peculiarity of Chinese FDI with respect to FDI from other regions. To what extent our results apply only to Chinese FDI or can be generalized to FDI from other emerging economies is an interesting avenue for further research.

The main limitations of the paper are related to the fact that our dataset includes only greenfield investments. Greenfield investments are used mostly to establish productive plants or small scale activities, while M&As are increasingly used by Chinese firms to target strategic assets in OECD markets and in big deals in the

resources sectors. For a broader understanding of the determinants of Chinese firms investing abroad, the results in this paper should be complemented by an analysis of Chinese foreign investment through M&As.

Studies of Chinese FDI are in their infancy and would benefit from greater efforts to improve data availability.

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# Appendix

**Table A** *Correlation Matrix*

|  | limp_value | lex_value | lgdp | ldist | fuelex | ormetex | rd | infl | sec_edu | corr | tel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **limp_value** | 1 | | | | | | | | | | |
| **lex_value** | 0.829 | 1 | | | | | | | | | |
| **lgdp** | 0.1563 | 0.1015 | 1 | | | | | | | | |
| **ldist** | 0.0704 | 0.0669 | 0.192 | 1 | | | | | | | |
| **fuelex** | -0.0178 | -0.0776 | -0.1772 | 0.1015 | 1 | | | | | | |
| **ormetex** | -0.0732 | -0.0774 | -0.334 | 0.2064 | -0.0805 | 1 | | | | | |
| **rd** | 0.1025 | 0.0549 | 0.6532 | 0.1801 | -0.144 | -0.1815 | 1 | | | | |
| **infl** | -0.0974 | -0.0556 | -0.3328 | 0.1178 | 0.3829 | 0.2098 | -0.3464 | 1 | | | |
| **sec_edu** | 0.11 | 0.0481 | 0.473 | 0.2201 | -0.1288 | -0.138 | 0.5567 | -0.3246 | 1 | | |
| **corr** | 0.0574 | 0.0219 | 0.5101 | 0.1286 | -0.4438 | -0.1502 | 0.6869 | -0.5782 | 0.5914 | 1 | |
| **tel** | 0.0426 | 0.0144 | 0.5975 | 0.0781 | -0.3092 | -0.2669 | 0.7572 | -0.4827 | 0.6535 | 0.8563 | 1 |

**Table B** *List of countries in the sample by income level*

| High income | Middle up income | Middle low income | Low income |
|---|---|---|---|
| Australia (OECD) | Argentina | Angola | Afghanistan |
| Austria (OECD) | Chile | Armenia | Bangladesh |
| Bahrain | Costa Rica | Azerbaijan | Cambodia |
| Belgium (OECD) | Croatia | Belarus | Chad |
| Canada (OECD) | Czech Republic | Bolivia | Democratic Republic of Congo |
| Denmark (OECD) | Gabon | Brazil | Ethiopia |
| France (OECD) | Hungary | Bulgaria | Ghana |
| Germany (OECD) | Latvia | Cameroon | India |
| Greece (OECD) | Malaysia | Colombia | Kenya |
| Hong Kong | Mexico | Ecuador | Kyrgyzstan |
| Ireland (OECD) | Oman | Egypt | Laos |
| Israel | Poland | Georgia | Liberia |
| Italy (OECD) | Romania | Guyana | Madagascar |
| Japan (OECD) | Russia | Indonesia | Mongolia |
| Luxembourg (OECD) | Slovakia | Iran | Mozambique |
| Macau | South Africa | Jordan | Myanmar |
| Netherlands (OECD) | Turkey | Kazakhstan | Niger |
| New Zealand (OECD) | Uruguay | Micronesia | Nigeria |
| Norway (OECD) | Venezuela | Morocco | North Korea |
| Portugal (OECD) | | Peru | Pakistan |
| Qatar | | Philippines | Papua New Guinea |
| Saudi Arabia | | Syria | Rwanda |
| Singapore | | Thailand | Senegal |
| South Korea (OECD) | | Turkmenistan | Sudan |
| Spain (OECD) | | Ukraine | Tajikistan |
| Sweden (OECD) | | | Tanzania |
| Switzerland (OECD) | | | Uganda |
| United Arab Emirates | | | Uzbekistan |
| UK (OECD) | | | Vietnam |
| USA (OECD) | | | Yemen |
| | | | Zambia |
| | | | Zimbabwe |

**Table C** *List of sectors in the sample by main groups*

| Resources | Manufacturing | Services |
|---|---|---|
| Coal, Oil and Natural Gas | Aerospace | Alternative/Renewable energy |
| Metals (Extraction) | Automotive Components | Business Services |
| Minerals | Automotive OEM | Communications |
| | Beverages | Financial Services |
| | Biotechnology | Healthcare |
| | Building & Construction Materials | Hotels and Tourism |
| | Business Machinery & Equipment | Leisure & Entertainment |
| | Ceramics & Glass | Real Estate |
| | Chemicals | Software & IT services |
| | Consumer Electronics | Space & Defence |
| | Consumer Products | Transportation |
| | Electronic Components | Warehousing & Storage |
| | Engines & Turbines | |
| | Food & Tobacco | |
| | Industrial Machinery, Equipment & Tools | |
| | Medical Devices | |
| | Metals and Minerals (Manufacturing of) | |
| | Non-Automotive Transport OEM | |
| | Paper, Printing & Packaging | |
| | Pharmaceuticals | |
| | Plastics | |
| | Semiconductors | |
| | Textiles | |
| | Wood Products | |

## Table 1 Variable list and description*

| Variable | Description | Source |
|---|---|---|
| GDP | Log of host country GDP | World Development Indicators |
| IMP | Log of imports | UN Comtrade (accessed via WITS) |
| EXP | Log of exports | UN Comtrade (accessed via WITS) |
| DIST | Log of simple distance (most populated cities, in Km) | CEPII |
| FUEL | Share of fuels on total exports | World Development Indicators |
| ORMETE X | Share of ores and metals on total exports | World Development Indicators |
| SEC_EDU | Secondary gross enrolment rate | World Development Indicators and UNESCO |
| R&D | Dummy, 1 if R&D expenditures on GDP more than 1% | UNESCO |
| TEL | Telephone mainlines per 1,000 people | World Development Indicators |
| INFL | Inflation, % consumer price index | World Development Indicators |
| CORR | Perception of corruption | World Governance Indicators |

\* All the monetary variables are in constant dollars (2000=100).

## Table 2 Summary statistics

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| GDP | 683 | 26.495 | 1.955 | 19.257 | 30.220 |
| IMP | 686 | 10.375 | 12.202 | -8.459 | 24.114 |
| EXP | 686 | 11.541 | 12.682 | -8.459 | 24.328 |
| DIST | 686 | 8.704 | 0.631 | 6.696 | 9.868 |
| FUELEX | 619 | 17.252 | 23.407 | 0 | 98.028 |
| ORMETEX | 644 | 6.619 | 11.739 | 0.003 | 85.372 |
| SEC_EDU | 686 | 84.680 | 24.955 | 6 | 160.347 |
| R&D | 686 | 0.415 | 0.493 | 0 | 1 |
| TEL | 684 | 30.505 | 20.886 | 0.053 | 66.438 |
| INFL | 662 | 6.729 | 17.579 | -2.539 | 431.700 |
| CORR | 686 | 0.393 | 1.129 | -1.693 | 2.390 |

**Table 3 Geographical distribution of Chinese outward FDI flows, 2003-2008**

| Top recipients | No. | % on total |
|---|---|---|
| USA | 65 | 7.0 |
| India | 54 | 5.8 |
| Viet Nam | 45 | 4.9 |
| Russia | 44 | 4.8 |
| Hong Kong | 44 | 4.8 |
| Brazil | 24 | 2.6 |
| Indonesia | 23 | 2.5 |
| Philippines | 21 | 2.3 |
| Thailand | 19 | 2.1 |
| Australia | 15 | 1.6 |
| Pakistan | 13 | 1.4 |
| Mexico | 12 | 1.3 |
| Iran | 10 | 1.1 |
| Total | 925 | 100.0 |
| of which: | | |
| High income* | 439 | 48 |
| Upper middle income* | 133 | 14 |
| Low and lower middle income* | 353 | 38 |

*Countries are classified according to the World Bank definition.

*Source*: *FDIMarkets.com*

**Table 4 Sectoral distribution of Chinese outward FDI, 2003-2008**

| Sector | No. | % of total |
|---|---|---|
| Communications | 118 | 12.8 |
| Metals | 100 | 10.8 |
| Automotive industry | 81 | 8.8 |
| Financial Services | 74 | 8.0 |
| Consumer Electronics | 59 | 6.4 |
| Coal, Oil and Natural Gas | 58 | 6.3 |
| Industrial Machinery, Equipment & Tools | 53 | 5.7 |
| Alternative/Renewable energy | 21 | 2.3 |
| Chemicals | 17 | 1.8 |
| Transportation | 14 | 1.5 |
| Building & Construction Materials | 14 | 1.5 |
| Other sectors | 316 | 34.1 |
| Total | 925 | 100 |
| of which: | | |
| Manufacturing sectors* | 499 | 54 |
| Resource intensive sectors* | 96 | 10 |
| Services sectors* | 330 | 36 |

*See Table B in the Appendix.*

*Source*: Authors' computations on *FDIMarkets.com*

**Table 5 Chinese number of outward FDI by sector groups and host country's income level*,**

**2003-2008**

| (a) Host Countries | Sector groups | | | |
|---|---|---|---|---|
| | **Manufacturing** | **Resources** | **Services** | All Sectors |
| **High income** | 47% | 19% | 61% | 48% |
| **Upper-middle income** | 20% | 24% | 15% | 14% |
| **Low and lower-middle income** | 33% | 57% | 23% | 38% |
| Total | 100% | 100% | 100% | |

| (b) Host Countries | Sector groups | | | |
|---|---|---|---|---|
| | **Manufacturing** | **Resources** | **Services** | Total |
| **High income** | 37% | 12% | 51% | 100% |
| **Upper-middle income** | 50% | 16% | 35% | 100% |
| **Low and lower-middle income** | 39% | 38% | 24% | 100% |
| All Countries | 54% | 10% | 36% | |

*Source*: FDIMarkets.com

**Table 6 Chinese outward FDI by business activity performed by foreign affiliates, 2003-2008**

| **Business activity** | **No.** | **% on total** |
|---|---|---|
| Manufacturing | 328 | 35.5 |
| Sales, Marketing & Support | 209 | 22.6 |
| Business Services | 92 | 9.9 |
| Construction | 17 | 1.8 |
| Extraction | 57 | 6.2 |
| ICT & Internet Infrastructure | 15 | 1.6 |
| Logistics, Distribution & Transportation | 30 | 3.2 |
| Electricity | 19 | 2.1 |
| Total | 925 | 100.0 |

*Source*: Authors' computations on *FDIMarkets.com*

**Table 7 BRIC countries' outward FDI by income-level of recipient countries, 2003-2008**

| | Income level of recipient countries | | | |
|---|---|---|---|---|
| | Low and lower-middle | Upper middle | High | Total |
| Brazil | 18 | 41 | 41 | 100 |
| China | 38 | 14 | 48 | 100 |
| India | 27 | 14 | 59 | 100 |
| Russia | 42 | 28 | 30 | 100 |
| World | 21 | 15 | 43 | 100 |

*Source*: Authors' computations on *FDIMarkets.com*

**Table 8 Estimation results for the determinants of Chinese outward FDI in manufacturing sectors**

| | (I)<br>FDI_MAN | (II)<br>FDI_MAN_HIGH | (III)<br>FDI_MAN_OECD | (IV)<br>FDI_MAN_MIDUP | (V)<br>FDI_MAN_LOWER | (VI)<br>FDI_production |
|---|---|---|---|---|---|---|
| GDP | 0.100** | 0.291*** | 0.400*** | 0.664 | -0.189 | -0.0321 |
| | (0.0505) | (0.0871) | (0.0971) | (0.502) | (0.142) | (0.0489) |
| IMP | -0.0156 | -0.0506 | -0.0413 | -0.0779 | -0.00406 | -0.0194* |
| | (0.0117) | (0.0372) | (0.0476) | (0.0568) | (0.0165) | (0.0112) |
| EXP | 0.0983*** | 0.128*** | 0.118** | 0.210*** | 0.106*** | 0.0823*** |
| | (0.0120) | (0.0370) | (0.0471) | (0.0669) | (0.0172) | (0.0109) |
| DIST | 0.0629 | -0.294 | 0.238 | 2.944* | -0.0208 | 0.209* |
| | (0.123) | (0.213) | (0.236) | (1.518) | (0.344) | (0.125) |
| FUELEX | -0.00950*** | 0.00522 | -0.0156 | -0.0630 | -0.0124 | -0.00494 |
| | (0.00335) | (0.00694) | (0.0141) | (0.0506) | (0.00778) | (0.00329) |
| ORMETEX | -0.00490 | -0.0328 | -0.0188 | -0.0506 | -0.00922 | -0.00190 |
| | (0.00609) | (0.0254) | (0.0298) | (0.0530) | (0.0124) | (0.00600) |
| R&D | -0.151 | 0.0486 | 0.866* | -1.877 | -1.430 | -0.542** |
| | (0.216) | (0.346) | (0.448) | (1.854) | (0.892) | (0.216) |
| SEC_EDU | 0.00392 | 0.0118* | 0.0235*** | 0.0788** | 0.00317 | 0.00578 |
| | (0.00358) | (0.00648) | (0.00751) | (0.0380) | (0.00993) | (0.00363) |
| INFL | 0.0289* | -0.0264 | -0.0275 | 0.0415 | 0.0269 | 0.00686 |
| | (0.0168) | (0.0524) | (0.0699) | (0.0664) | (0.0227) | (0.0150) |
| CORR | -0.0949 | 0.666*** | 0.215 | -1.579 | -1.524*** | -0.521*** |
| | (0.128) | (0.210) | (0.219) | (1.114) | (0.494) | (0.131) |
| TEL | -0.000990 | 0.0212* | 0.0187 | -0.0563 | -0.0127 | -0.00267 |
| | (0.00700) | (0.0116) | (0.0134) | (0.0553) | (0.0194) | (0.00704) |
| Constant | -4.310*** | -9.740*** | -18.72*** | -54.45** | 2.412 | -2.192 |
| | (1.434) | (2.421) | (3.047) | (23.32) | (4.259) | (1.419) |
| | | | | | | |
| Observations | 613 | 613 | 613 | 613 | 613 | 613 |
| Number of panel | 89 | 89 | 89 | 89 | 89 | 89 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

*Note*: Probit random effects panel model. In the first column, the dependent variable is a dummy recording the value of 1 if China has invested in one of the j sectors in manufacturing and 0 otherwise. In the successive columns, the dependent variable is a dummy recording the value of 1 if China has invested in one of the j sectors in the manufacturing industry *and* in the specified group of countries, and 0 otherwise

**Table 9 Estimation results for the determinants of Chinese outward FDI in the resource sectors**

|  | (I) | (II) | (III) |
|---|---|---|---|
|  | FDI_RES | FDI_RES_HIGH | FDI_RES_LOWER |
| GDP | -0.268*** | 0.403 | -0.327*** |
|  | (0.0692) | (0.281) | (0.0925) |
| IMP | 0.0784*** | 0.123** | 0.0598*** |
|  | (0.0113) | (0.0491) | (0.0123) |
| EXP | -0.0652*** | -0.0813* | -0.0529*** |
|  | (0.0108) | (0.0442) | (0.0115) |
| DIST | 0.185 | -0.231 | 0.264 |
|  | (0.158) | (0.587) | (0.209) |
| FUELEX | 0.00999** | 0.0295* | -0.000528 |
|  | (0.00393) | (0.0161) | (0.00487) |
| ORMETEX | 0.00895 | 0.0380 | 0.00364 |
|  | (0.00647) | (0.0309) | (0.00749) |
| R&D | 0.236 | -1.209 | -5.898 |
|  | (0.295) | (1.102) | (29,508) |
| SEC_EDU | -0.00247 | -0.00475 | 0.00729 |
|  | (0.00428) | (0.0107) | (0.00657) |
| INFL | -0.0167 | -0.146 | -0.0498** |
|  | (0.0191) | (0.158) | (0.0241) |
| CORR | -0.0865 | 1.819* | -1.193*** |
|  | (0.164) | (0.929) | (0.400) |
| TEL | -0.00171 | 0.00170 | -0.0291* |
|  | (0.00999) | (0.0298) | (0.0175) |
| Constant | 3.950** | -13.59* | 4.316* |
|  | (1.878) | (8.126) | (2.614) |
| Observations | 613 | 613 | 613 |
| Number of panel | 89 | 89 | 89 |

Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

*Note*: Probit random effects panel model. In the first column, the dependent variable is a dummy recording the value of 1 if China has invested in one of the j sectors in the resource intensive industry and 0 otherwise. In the successive columns, the dependent variable is a dummy recording the value of 1 if China has invested in one of the j sectors in the resources *and* in the specified group of countries, and 0 otherwise.

**Table 10 Estimation results for the determinants of Chinese outward FDI in service sectors**

| | (I) | (II) | (III) | (IV) | (V) | (VI) | (VII) |
|---|---|---|---|---|---|---|---|
| | FDI_SER | FDI_SER_HIGH | FDI_SER_OECD | FDI_SER_MIDUP | FDI_SER_LOWER | FDI_trade_services | FDI_other_services |
| GDP | 0.0716 | -0.195** | -0.0234 | 0.0776 | 0.294** | 0.0802 | 0.0751 |
| | (0.0563) | (0.0850) | (0.131) | (0.261) | (0.130) | (0.0490) | (0.0484) |
| IMP | -0.0677*** | -0.0940*** | -0.182*** | -0.0663** | -0.0780*** | -0.0140 | -0.0230* |
| | (0.0103) | (0.0299) | (0.0497) | (0.0260) | (0.0165) | (0.0118) | (0.0118) |
| EXP | -0.0177* | 0.0139 | 0.0936** | -0.0179 | -0.0137 | 0.0228** | -0.0128 |
| | (0.00930) | (0.0280) | (0.0459) | (0.0231) | (0.0130) | (0.0114) | (0.0112) |
| DIST | -0.257* | -0.460** | 0.167 | 1.018 | -0.205 | -0.162 | -0.169 |
| | (0.139) | (0.213) | (0.319) | (0.811) | (0.320) | (0.120) | (0.116) |
| FUELEX | 0.00125 | 0.00612 | -0.000327 | -0.00668 | -0.000504 | 0.00223 | -0.00130 |
| | (0.00353) | (0.00771) | (0.0121) | (0.0156) | (0.00654) | (0.00372) | (0.00370) |
| ORMETEX | -0.00783 | -0.0321 | -0.00110 | -0.0212 | 0.00491 | 0.00732 | -0.0153* |
| | (0.00695) | (0.0257) | (0.0375) | (0.0340) | (0.0114) | (0.00700) | (0.00887) |
| R&D | 0.0295 | 1.017*** | 2.610*** | -1.271 | -7.367 | 0.171 | 0.367* |
| | (0.253) | (0.372) | (0.697) | (1.472) | (599.9) | (0.207) | (0.216) |
| SEC_EDU | 0.000522 | 0.00707 | 0.0234** | 0.0346 | 0.00932 | 0.000913 | -0.00383 |
| | (0.00395) | (0.00633) | (0.00958) | (0.0229) | (0.00931) | (0.00357) | (0.00362) |
| INFL | -0.00801 | -0.160*** | -0.271*** | -0.0207 | 0.00559 | -0.0430* | 0.00237 |
| | (0.0160) | (0.0543) | (0.105) | (0.0463) | (0.0208) | (0.0234) | (0.0159) |
| CORR | 0.237 | 0.144 | -0.567* | -0.0691 | -0.837* | 0.147 | 0.411*** |
| | (0.148) | (0.184) | (0.312) | (0.775) | (0.445) | (0.128) | (0.126) |
| TEL | -0.000792 | 0.0490*** | 0.0683*** | -0.0320 | -0.0451** | 0.00711 | -0.00688 |
| | (0.00823) | (0.0124) | (0.0218) | (0.0410) | (0.0221) | (0.00661) | (0.00701) |
| Costant | 0.719 | 6.091** | -7.311* | -16.01* | -6.783* | -1.922 | -0.702 |
| | (1.682) | (2.408) | (4.076) | (9.681) | (3.937) | (1.505) | (1.404) |
| Observations | 613 | 613 | 613 | 613 | 613 | 613 | 613 |
| Number of panel | 89 | 89 | 89 | 89 | 89 | 89 | 89 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

*Note*: Probit random effects panel model. In the first column, the dependent variable is a dummy recording the value of 1 if China has invested in one of the j sectors in the services and 0 otherwise. In the successive columns, the dependent variable is a dummy recording the value of 1 if China has invested in one of the j sectors in the services *and* in the specified group of countries, and 0 otherwise.

**Table 11 Summary of the main results by sector group**

| MOTIVATION/SECTOR | MANUFACTURING | NATURAL RESOURCES | SERVICES |
|---|---|---|---|
| MARKET SIZE (GDP) | Chinese FDI are attracted by large markets in high income countries | Market size reduces the probability to receive FDI | No clear pattern |
| TRADE (Exports & Imports) | FDI are a support for exports | FDI tends to internalize natural resources otherwise imported. | FDI in services support exports by establishing trade related services |
| NATURAL RESOURCES (Fuels & Metals) | Not a relevant motivation | Fuel endowments have a positive impact on FDI | Not a relevant motivation |
| STRATEGIC ASSETS (R&D; Human Capital) | In OECD FDI are attracted by R&D and human capital level | Not a relevant motivation | In OECD countries FDI are attracted by R&Dand human capital level |
| RISK AVERSION (Corruption; Inflation) | In low income countries FDI are not affected by the level of corruption. Inflation is not significant. | In low income countries FDI are not affected by the level of corruption | In low income countries FDI are not affected by the level of corruption |
| INFRASTRUCTURES (Telephone mainlines) | Endowments of infrastructures increase the probability to receive FDI in high income countries | Not a relevant motivation | Endowments of infrastructures increase the probability to receive FDI In high income countries |