An empirical analysis of Chinese outward foreign direct investment in Africa

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Abstract
Purpose – The purpose of this paper is to identify and analyse determinants of Chinese outward foreign direct investment (OFDI) into a number of African countries for the period 2003-2012.
Design/methodology/approach – A series of panel data models are used to estimate the determinants of Chinese OFDI into eight African countries: Nigeria, South Africa, Zambia, Ghana, Kenya, Algeria, Egypt and the Sudan.
Findings – Results highlighted that Chinese investment in African countries is driven by access to natural resources, and factors related to infrastructure quality and the regulatory environment enforced by host governments.
Originality/value – To the best of the authors’ knowledge, this is one of the first papers to identify empirical determinants of Chinese OFDI in Africa and it contributes from two perspectives. Firstly, it identifies drivers behind Chinese OFDI, but also importantly from the African perspective helps understand the reasons that attract investment from one of the world’s largest investors into one of the world’s poorest regions, given the emphasis that is placed on foreign direct investment today as an instrument of growth and development.

Keywords China, Determinants, Africa, Empirical, Panel data, Outward FDI

Paper type Research paper

1. Introduction
This paper identifies and analyses determinants of Chinese outward foreign direct investment (OFDI) into a number of African countries for the period 2003-2012, with particular emphasis on identifying the reasons behind growing Chinese investment into a continent that in many ways can be regarded as increasingly unstable as a result of new and ongoing conflicts, and both political and economic instability.

Foreign direct investment (FDI) is defined as an investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (UNCTAD, 2014a). Since the early 1970s, largely as a result of globalisation brought about by trade liberalisation, previously independent national economies have become much more closely integrated, which in part has been reflected by the rapid rise in FDI flows during this period. Today, FDI flows have grown from 13.5 billion USD in 1970 to 1.45 trillion USD in 2013 (UNCTAD, 2014a). FDI has become increasingly important because it is seen as a means of financing development. In particular, it has been found to improve the general welfare
of the population by providing employment opportunities, facilitating managerial and technological spillover, trading opportunities and, therefore, ultimately is viewed at a policy level as an instrument of economic growth. In developing countries, it has also helped achieve development goals of reducing absolute poverty and raising incomes (Nunnenkamp, 2004) and, therefore, arguably reduces the existing gap between the rich and the poor.

Not only has the volume of FDI flows increased, but the demographic and direction of FDI has also changed with developing countries now accounting for 54 per cent (778 billion USD) of FDI flows. Nevertheless, overall figures can be misleading, as data show that the distribution of FDI in developing countries is highly skewed with Africa accounting for only 4 per cent, but Asia (54 per cent) and Latin America (37 per cent) accounting for 91 per cent of all FDI flows, respectively, into developing countries (UNCTAD, 2014a). Indeed, we have become familiar with the idea of FDI being attracted into low-cost locations such as China to take advantage of location advantages such as cheap labour, which correlates with the implementation of market reforms in 1979, known as “open door” policies by the Chinese Government. Today, these policies help explain why China is the second most attractive country in the world for FDI inflows, which has of course received deserved attention in the theoretical and empirical literature (Zhang, 1994; Sun et al., 2002).

Yet, while we are relatively clear about inward flows of Chinese FDI, we are much less clear about determinants of outward flows of Chinese FDI, which is somewhat surprising, given that China is now the world’s third largest exporter of FDI (UNCTAD, 2014a). Figure 1 shows that net Chinese OFDI as a percentage of GDP increased significantly from 2001 to date, with minor reductions in outward investment during 2009 and 2011, which is likely to reflect the sluggish growth in the world economy and hangover following the global credit crisis in 2008. The overall trend in Chinese OFDI is likely to correlate with China’s accession to the World Trade Organisation in 2001 and earlier Chinese Government policies in the late 1990s known as “go global”, which actively encouraged certain Chinese firms via export tax rebates, foreign exchange assistance and other forms of direct financial support to invest overseas (Buckley et al., 2007).

While Chinese OFDI has risen to the extent that China is the world’s third most important outward investor, Figure 2 reveals that the vast majority (79.7 per cent) of Chinese OFDI is flowing into developing countries. Indeed, in 2012, the stock of Chinese

![Figure 1. Chinese net OFDI as a percentage of GDP](source: World Bank Development indicators (2014))
OFDI reached 531 billion USD, of which (83 per cent) 445 billion USD was invested in developing countries (UNCTAD, 2014b). For the purposes of this paper, although it only accounts for just over 4 per cent of total Chinese OFDI stock, Chinese OFDI into Africa is increasing. Therefore, while marginal in absolute terms, it has increased over a 10-year period from 491 million USD in 2003 to 21.7 billion USD in 2012, i.e. an increase of over 4,000 per cent. Furthermore, according to the World Investment Report (UNCTAD, 2014a), as China continues to deregulate OFDI, outflows are likely to increase further, with investments by companies such as Sinopec, the second largest Chinese oil company, planning to invest 20 billion USD in Africa over the next five years as just one example.

Zhang and Daly (2011) suggest that Chinese OFDI might be explained by a number of reasons, including gaining access to management skills, advanced technology and access to resources, which may be important for Chinese domestic production. However, empirical studies assessing determinants of Chinese OFDI generally are limited (Kolstad and Wiig, 2012; Buckley et al., 2007; Cheung and Qian, 2009; Duanmu and Gunes, 2009), most likely as a result of the limited and incomplete data that are often available, which is a particularly relevant point when assessing Chinese OFDI into Africa. Yet, it is important to understand and clarify why there have been such large increases in Chinese OFDI in Africa in recent years, which importantly helps identify the drivers behind Chinese OFDI, but also importantly from the African perspective, thus helping to understand the reasons that attract investment from one of the world’s largest investors into one of the world’s poorest regions, given the emphasis that is placed on FDI today as an instrument of growth and development.

The paper is structured as follows. Section 2 outlines a theoretical and empirical overview of FDI. Section 3 outlines the data and method. The empirical results are mentioned in Section 4 and conclusions in Section 5.

2. Literature review and hypothesis development
Theories at both macro and micro levels have been applied to explain flows of FDI (Ricardo, 1817; Smith, 1776; Vernon, 1966, Hymer, 1970, Dunning, 1980, Buckley and

Figure 2.
Chinese OFDI by geographical destination (US$ millions)

Source: UNCTAD (2014a, 2014b)
However, locational determinants of FDI are most commonly linked to the development of Dunning’s (1980) aforementioned work related to internationalisation theory, which suggests that firms undertake three forms of FDI, namely, market-seeking, resource-seeking or efficiency-seeking (Dunning, 1993), and will do so when they are able to obtain certain advantages over rival firms in a given location, namely, ownership advantages, location advantages and the benefits of internalisation (OLI).

Buckley et al. (2007) provide a good overview of the aforementioned forms of FDI suggested by Dunning, stating that market-seeking FDI is undertaken by firms who are particularly keen to open up their goods and services to export markets, but more particularly gain access to markets that are showing signs of strong economic growth. Resource-seeking FDI takes place when firms wish to acquire and/or gain control of resources that are either not available or are in short supply in their domestic markets. Buckley et al. (2007) indicates in terms of Chinese OFDI, this may account for significant investments made in countries with significant energy and raw material reserves. Efficiency-seeking FDI takes places when firms seek to reduce the costs of their operations and is commonly associated with firms from developed countries locating in developing countries to take advantage of low-cost labour. Given that China’s competitive advantage in attracting inward FDI has often been related to efficiency-seeking, it might be considered unlikely that Chinese firms undertake FDI for efficiency reasons.

While Dunning’s categorisation of the different forms of FDI does offer an insight into locational determinants of FDI, the extent to which the triad of possible motives is relevant to Chinese OFDI in Africa is to date not clear. Firstly, Dunning’s framework was designed largely to assess FDI in and between firms in developed countries and not between firms from and into developing countries known as south-south FDI. Secondly, and most significantly in terms of this paper, due to a lack of data, there has generally been a lack of empirical studies assessing determinants of FDI between developing countries. Indeed, it is only relatively recently that empirical studies assessing Chinese OFDI have started to become more prominent, although they remain limited and to date there are few empirical studies assessing Chinese OFDI into Africa most likely as a result of data limitations, which to some degree, as discussed in Section 3, also remains an issue in this paper.

The remainder of this section reviews determinants of FDI and hypothesises on their ability to explain locational determinants of Chinese OFDI in Africa, while conceptually assessing, as Dunning (1993) proposed in his framework, whether Chinese OFDI in Africa is driven by market-seeking, resource-seeking or efficiency-seeking motives.

2.1 Hypothesis development
Theoretically and empirically, there are reasons to believe that firms engage in FDI to access and take advantage of large and/or growing markets. For example, Charkrabarti (2001) suggests that as foreign markets grow, this encourages firms to invest overseas, thus allowing them to exploit economies of scale via specialisation as a result of reduced costs and growth in host markets. Indeed, a number of studies have identified that Chinese firms also engage in OFDI for market-seeking reasons (Buckley et al., 2006, Buckley et al., 2007; Duanmu and Guney, 2009), on the grounds that growing markets signify opportunities for greater economic returns. Therefore, while Africa does have...
limited markets in many regards, such as absolute size, as a result of underdevelopment and poverty leading to relatively low purchasing power; other African countries considered in this paper are considered to be significant emerging markets with significant growth opportunities and, therefore, following previous theoretical and empirical findings at a general level we hypothesise that:

\( H1 \). China’s OFDI in Africa is positively related to host market size.

As China has rapidly industrialised and exhibited growth rates among the highest in the world, this growth has arguably in a large part been dependent and perhaps increasingly dependent upon the ability to provide and secure natural resources such as energy and raw materials. Indeed, a number of studies have reported that the Chinese Government has placed significant emphasis on securing natural resources in strategically important industries via OFDI (Tan, 1999; Ye, 1992; Zhan, 1995; Morck et al., 2008; Cheng and Ma, 2009). Moreover, Renard (2011) reports China’s growing dependence on energy has led to Africa gaining greater prominence on China’s agenda along with Australia and Latin America, as it attempts to secure energy resources for domestic consumption. Furthermore, there is good reason to believe that Chinese trade and development assistance is strongly linked with China’s desire to secure natural resources among many African countries and, therefore, it is hypothesised that:

\( H2 \). Chinese OFDI in Africa is positively associated with natural resource endowments of the host economy.

Studies have suggested that prevailing macroeconomic conditions are also likely to be important determinants of FDI (Demekas et al., 2007; Asiedu, 2006) and give an indication of economic stability in the host country. On the other hand, when economic instability exists, this is likely to be correlated with increased risk and may limit any investment. Buckley et al. (2007) suggested a host country’s inflation rate is a proxy for economic stability, whereby steady and predictable rates of inflation enable long-term planning in relation to price setting and profit expectations. Moreover, high inflation rates also indicate that a currency devaluation may be likely, thus reducing the investor’s real value of earnings. As a result, we hypothesise that:

\( H3 \). Chinese OFDI in Africa is positively associated with host country economic stability.

Efficiency-seeking forms of FDI are likely to be influenced by labour cost and productivity. Indeed, much of the FDI which flows into developing countries from developed countries is often cited both theoretically and empirically on the grounds of efficiency with particular reference to labour costs. China in particular, the second largest recipient of FDI inflows globally, often has low-cost labour cited as its competitive advantage in attracting such significant amounts of FDI historically. This may indicate that because of home market labour conditions, the pursuit of low-cost labour is not a major determinant of Chinese OFDI in Africa.

However, when labour costs are similar from country-to-country, labour market conditions may still lead to efficiency-seeking forms of FDI based not on wages rates, but on labour quality (De Mello, 1997) and, therefore, higher levels of labour productivity internationally can lead to increases in OFDI. Therefore, we hypothesise that:
H4. Chinese OFDI in Africa is positively associated with host country labour market conditions on the grounds of efficiency-seeking.

Productivity is linked not just to labour market conditions, but also to well-developed infrastructure and communication networks, which are critical for coordination and control of FDI projects. Therefore, it is assumed that investing firms give serious consideration to host country infrastructure, as well-developed infrastructure increases the productivity of investment. According to Demirham and Masca (2008), infrastructure covers a range of areas including physical and telecommunications, but also importantly institutional infrastructure regarding aspects around ease of doing business in a given country. Therefore, given the importance of infrastructure to productivity of investment, it can be assumed that countries with weak infrastructure and communication capacity may deter potential investors. This is likely to be an issue in this paper, given that both physical and institutional infrastructure in Africa are generally regarded to be very weak by international standards. Therefore, we test a number of infrastructure variables and thus hypothesise that:

H5. Chinese OFDI in Africa is positively associated with the infrastructure capacity of the host country.

Dunning (1993) latterly added a fourth motive driving FDI, (a sub-set of resource-seeking FDI) known as asset-seeking, which relates specifically to the pursuit of strategic assets, and is largely a response to the increase in global merger and acquisition activity and the search for specific assets and knowledge including research and development capacity, advanced technology and intangible assets such as brands, which enable firms to access information on how to operate in global markets (Ye, 1992; Zhan, 1995; Buckley et al., 2006). Given that it has been suggested that strategic asset-seeking is likely to take place in developed and industrialised economies, it is not clear whether Africa offers these types of opportunities for Chinese firms. Nevertheless, given that this form of FDI has not been assessed before in relation to Chinese OFDI in Africa, we test for its presence, yet do not believe it is a significant factor driving Chinese FDI in Africa, thus we hypothesise that:

H6. Chinese OFDI in Africa is not associated with strategic asset-seeking forms of FDI.

Market openness has been found to have a significant positive effect on FDI flows (Kravis and Lipsey, 1982; Aizenman and Spiegel, 2006). For example, government policies in the form of tariffs, taxes, subsidies and bureaucracy can potentially influence the transaction costs of FDI and, therefore, either encourage or hinder investment flows into a country. However, Charkrabarti (2001) suggests the impact of market openness on FDI flows is more complicated reflected by mixed empirical evidence, while Jordaan (2004) suggests that marketing-seeking FDI when faced by trade restrictions can actually have a positive effect on FDI flows as a means of tariff jumping. However, given that in this paper we are looking at aggregate flows of FDI and not industries, we suggest that, in general, host governments with policies and institutions conducive to overseas investors will lead to higher levels of inward FDI. Therefore, we hypothesise that:

H7. Chinese OFDI in Africa is positively associated with the openness of the host country’s economy.
3. Data, variable measurement and empirical approach

3.1 Dependent variable

A panel data model is used to estimate the determinants of Chinese OFDI in Africa over the period 2003-2012. Flows of Chinese OFDI are estimated for eight countries: Nigeria, South Africa, Zambia, Ghana, Kenya, Algeria, Egypt and Sudan. The relatively small number of recipient countries is a reflection of the limited data available regarding flows of FDI into African counties from China, but more specifically the ability to collate data in relation to forming a sufficient number of independent variables. However, although the relatively small sample of countries for which data are available is disappointing, this is offset somewhat by annual data related to the stock of Chinese FDI in Africa for the year 2012, which highlights that South Africa, Zambia, Nigeria and Algeria were the African continent’s top four recipients in terms of Chinese OFDI stock (24 per cent combined), and when Sudan, Ghana, Kenya and Egypt are included, these eight countries account for the majority (53 per cent) of Chinese OFDI stock in Africa and are, therefore, representative of recipient destinations for Chinese OFDI. The dependent variable COFDI is measured by annual flows of Chinese OFDI (millions USD). The data are transformed via a natural logarithm to generate a normal distribution.

3.2 Independent variables

Table I highlights the ten explanatory variables that are conceptually grouped into four broad categories reflecting marketing-seeking, resource-seeking, efficiency-seeking and strategic-asset seeking forms OFDI, thus allowing us to identify determinants of

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Operational definition</th>
<th>Sign</th>
<th>Theoretical justification</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPGRO</td>
<td>GDP growth annual</td>
<td>+</td>
<td>Market-seeking</td>
<td>World Bank Development Indicators</td>
</tr>
<tr>
<td>GDPPC&lt;sup&gt;a&lt;/sup&gt;</td>
<td>GDP per capita (constant 2005 USD)</td>
<td>+</td>
<td>Market-seeking</td>
<td>World Bank Development Indicators</td>
</tr>
<tr>
<td>LABPRO&lt;sup&gt;a&lt;/sup&gt;</td>
<td>GDP per person employed (constant 1990 PPP $)</td>
<td>+</td>
<td>Efficiency-seeking</td>
<td>World Bank Development Indicators</td>
</tr>
<tr>
<td>RAWMAT</td>
<td>Total natural resources rents (% of GDP)</td>
<td>+</td>
<td>Resource-seeking</td>
<td>World Bank Development Indicators</td>
</tr>
<tr>
<td>HITECEXP</td>
<td>High-technology exports (% of manufactured exports)</td>
<td>+</td>
<td>Resource-seeking</td>
<td>World Bank Development Indicators</td>
</tr>
<tr>
<td>TELCOM&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Mobile cellular subscriptions (per 100 people)</td>
<td>+</td>
<td>Infrastructure</td>
<td>World Bank Development Indicators</td>
</tr>
<tr>
<td>ELPOWER&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Electric power consumption (kWh)</td>
<td>+</td>
<td>Infrastructure</td>
<td>World Bank Development Indicators</td>
</tr>
<tr>
<td>INFLATION</td>
<td>Host country inflation rate</td>
<td>−</td>
<td>Economic stability</td>
<td>IMF</td>
</tr>
<tr>
<td>OPENNESS</td>
<td>Trade (% of GDP)</td>
<td>+</td>
<td>Government policy</td>
<td>World Bank Development Indicators</td>
</tr>
<tr>
<td>EXPTIME</td>
<td>Time to export (days)</td>
<td>−</td>
<td>Regulatory environment</td>
<td>World Bank Development Indicators</td>
</tr>
</tbody>
</table>

**Table I.** Explanatory variables

**Notes:**<sup>a</sup> A natural logarithm of GDPPC, LABPRO, TELCOM, ELPOWER is used to ensure a normal distribution of data.
Chinese OFDI and secondly assess the applicability of Dunning’s (1993, 2006) framework to explain FDI flows between developing countries and in particular between China and Africa.

Market size variables which are a proxy for market-seeking FDI are measured by a number of indicators. Market size allows for the exploitation of economies of scale and represents demand for goods and services, which has been cited as critical for attracting FDI (Asiedu, 2006; Cheung and Qian, 2009; Kolstad and Wiig, 2012). Furthermore, growth prospects of the recipient economy are also likely to be given consideration when potential investors engage in inward investment activities (Bhasin et al., 1994; Morrissey and Rai, 1995) as they represent growing demand for investor’s products. We use both GDP per capita (GDPPC) and GDP growth (GDPGRO) to assess the effects of market size.

Firms pursuing efficiency-seeking FDI have often located in countries where they can access labour at lower costs than in their home country. However, given that labour cost remains low in China by international comparison, it is believed that it is unlikely that Chinese firms pursue efficiency-seeking FDI in Africa based around labour cost. However, labour conditions, such as productivity of workforce, which give an indication of labour quality and productivity of investment may be important. Therefore, we measure the importance of labour market conditions based not on labour cost, but on productivity of labour measured by the ratio of GDP per person employed (LABPRO).

To proxy for the natural resource endowment of a country the total natural resource rents as percentage of host country GDP (RAWMAT) is used. Our hypothesis strongly suggested that Chinese FDI in Africa is likely to be linked to the acquisition of raw materials, thus ensuring energy resources for domestic consumption in China. Related to resource-seeking FDI, we also assess the extent to which Chinese firms engage in strategic asset-seeking FDI in Africa measured by host country high-technology exports as a percentage of manufactured exports (HITECEXP).

Well-developed infrastructure and communication networks are likely to be important determinants of FDI and include aspects such as transportation infrastructure, power supplies and telecommunications. Not only does quality infrastructure reduce transportation cost, but it also increases efficiency of operations, and good infrastructure should encourage FDI. Africa has historically had a reputation for bad infrastructure development, and this is reflected by our inability to acquire data related to transportation variables (roads, rail, sea and air) over the period of investigation in this paper. In this study, we measure host country infrastructure and telecommunications by mobile cellular subscriptions per 100 people (TELCOM) and electric power consumption (ELPOWER).

As previously discussed, economic instability may inhibit flows of FDI into a host country, whereas a more stable macroeconomic environment should encourage inward FDI. We include the host country inflation rate (INFLATION) as a measure of economic stability, whereby the lower the inflation rate the greater the economic stability of a country and, hence, the greater confidence firms have around investment decisions.

Finally, two control variables that account for the institutional environment are included, as government policies in the host country are likely to be important determinants of FDI flows on the grounds that the more open an economy is the more attractive it is likely to be as a location for FDI. China’s market reforms in 1979 (many of which were aimed at attracting inward investment) demonstrate the importance of the
institutional environment regarding flows of FDI in relation to trade barriers and restrictions reflected by the fact that China is now the second largest recipient of FDI flows globally. Openness can also give an indication of how well-integrated a country is in the world economy, which is to a large extent driven by government policy. We measure market openness in terms of total trade as a percentage of GDP (OPENNESS). Lastly, we include the variable export time (EXPTIME) measured as the number of days to export goods and services. This gives an indication related to the ease of doing business and bureaucracy in terms of government regulation in a given country. It is believed that a friendlier business environment and fewer regulations would encourage higher levels of FDI.

3.3 Empirical approach
A panel data set was constructed for the period 2003-2012 to identify determinants of Chinese OFDI in Africa. Panel data estimation differs from regular cross-section, and time-series estimation in that panel data is a combination of both cross-section and time series. To mitigate against the weaknesses of the basic OLS pooled model, a robust individual effects estimator is used. The individual effects model can be written as:

\[ Y_{it} = \alpha_i + X_{it}\beta + \mu_i \]

where \( i \) denotes the individual country and \( t \) denotes time. \( \alpha_i \) is the individual intercept, \( \beta \) is \( k \times 1 \) and \( X_{it} \) the \( it \)th observation on \( K \) explanatory variables. However, major differences exist in the way \( \alpha_i \) is assigned and in the assumptions made between a fixed- and random-effects model. The key differentiating factor between a fixed and random-effects model is the way the individual specific error component is modelled. In the fixed-effects model it is assumed to be part of the intercept, while in the random model it forms part of the error variance.

The fixed-effects model assumes that the individual effect is captured by the intercept term \( \alpha_i \), which means that every individual country has their own intercept and that this individual effect varies across groups. Therefore, the fixed-effects model can be expressed as:

\[ Y_{it} = (\alpha + \mu_i) + X_{it}\beta + v_{it} \]

where in the fixed-effects model, \( \mu_i \) are assumed to be fixed parameters to be estimated, \( v_{it} \) is the remaining stochastic disturbance, which is assumed to be independent and identically distributed IID (\( \theta \sigma_i^2 \)). In the fixed-effects model, the individual effect (\( \alpha + \mu_i \)) is allowed to be correlated with the independent variables \( X_{it} \). However, in the random-effects model, \( \mu_i \) is assumed to be randomly distributed with a constant mean and variance, but crucially that \( \mu_i \) is uncorrelated with the regressors Cov (\( X_{it}, a_i \)) = 0, for all \( t \). Therefore, in the random model, the individual effect is treated as a random component and part of the error structure, not the intercept. The random-effects model can be written as:

\[ Y_{it} = \alpha + X_{it}\beta + (\mu_i + v_{it}) \]

where the only difference \( \mu_i \) is now part of the error term and not the intercept. Therefore, the random-effects model meets all of the same assumptions as the
fixed-effects model plus the additional requirement that the individual effect $\mu_i$ is uncorrelated with the regressors in all time periods (in other words the individual effect is constant). Therefore, $v_{it}$ are independent random variables with $N(0, \sigma^2_v)$ distribution, with $\text{Var}(v_{it}) = \sigma^2_v$. Similarly, $\mu_i$ are independent variables with $N(0, \sigma^2_\mu)$ distribution with $\text{Var}(\mu_i) = \sigma^2_\mu$. Finally, it is assumed that $v_{it}$ and $\mu_i$ are uncorrelated with each other and the regressors. Ultimately, the common way of selecting between the fixed and random-effects model is to conduct a Hausman test. The result is reported in Section 4. On the basis of the Hausman test, a random-effects estimator is used to model determinants of Chinese OFDI in Africa. The empirical results are discussed in the following section.

4. Empirical results and discussion
The results of the regression modelling are presented in Table II with the correlation matrix between variables presented in Appendix. For comparison purposes, Table II displays result for three panel models: the pooled OLS model and both a fixed and random-effects model.

Diagnostic tests of the OLS pooled model revealed that why multicollinearity based on a variance inflation factor test was not a problem, Huber–White robust standard errors were implemented to correct for heteroscedasticity. Furthermore, given that each of the countries investigated are not homogenous, to take account of these differences, an individual-effects model is also used. The choice of whether to estimate coefficients using a fixed- or random-effects model is made using the Hausman test, which tests if the $\mu_i$ are uncorrelated with the independent variables. In this case, the Hausman test produced a $\chi^2$ result of 8.89 indicating we do not reject the null hypothesis, indicating that it is appropriate to use the random-effects model.

Results from Model 3 (the random-effects model) highlight that determinants of Chinese OFDI into Africa can significantly be explained by three factors, namely, access

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>OLS</th>
<th>Fixed effect</th>
<th>Random effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPGRO</td>
<td>−0.022 (0.058)</td>
<td>−0.025 (0.053)</td>
<td>−0.022 (0.052)</td>
</tr>
<tr>
<td>GDPPC</td>
<td>0.490 (0.484)</td>
<td>11.32 (0.225)</td>
<td>0.490 (0.502)</td>
</tr>
<tr>
<td>LABPRO</td>
<td>0.071 (0.425)</td>
<td>−10.39 (10.15)</td>
<td>0.071 (0.497)</td>
</tr>
<tr>
<td>RAWMAT</td>
<td>0.923 (0.187)***</td>
<td>0.836 (0.557)</td>
<td>0.923 (0.179)***</td>
</tr>
<tr>
<td>HITECEXP</td>
<td>0.254 (0.128)***</td>
<td>−0.012 (0.148)</td>
<td>0.254 (0.171)</td>
</tr>
<tr>
<td>TELCOM</td>
<td>1.139 (0.150)***</td>
<td>1.137 (0.275)***</td>
<td>1.139 (0.149)***</td>
</tr>
<tr>
<td>ELPOWER</td>
<td>−0.049 (0.214)</td>
<td>−2.049 (1.045)***</td>
<td>−0.049 (0.198)</td>
</tr>
<tr>
<td>INFLATION</td>
<td>0.454 (0.299)***</td>
<td>0.379 (0.269)</td>
<td>0.454 (0.337)</td>
</tr>
<tr>
<td>OPENNESS</td>
<td>−0.213 (0.769)</td>
<td>2.380 (1.175)***</td>
<td>−0.213 (0.905)</td>
</tr>
<tr>
<td>EXPTIME</td>
<td>−1.422 (0.064)***</td>
<td>−0.736 (0.481)</td>
<td>−1.422 (0.493)***</td>
</tr>
<tr>
<td>Constant</td>
<td>−10.23 (7.115)</td>
<td>48.41 (47.38)</td>
<td>−10.23 (8.579)</td>
</tr>
<tr>
<td>F-value</td>
<td>114.67***</td>
<td>40.09***</td>
<td>127.28***</td>
</tr>
<tr>
<td>Hausman test ($\chi^2$)</td>
<td>8.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.64</td>
<td>0.05</td>
<td>0.64</td>
</tr>
<tr>
<td>$N$</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

**Notes:** Significance at the 0.01, 0.05 and 0.10 level indicated by ***, **, *, respectively; Robust standard errors used to correct for heteroscedasticity.
to raw materials ($H2$), host country infrastructure ($H5$) and country openness ($H7$), which relates to government policy and the regulatory environment. None of the other four hypotheses tested were found to be statistically significant, identifying that based on our conceptual framework Chinese OFDI into Africa is driven largely by resource-seeking forms of FDI and not by either market or efficiency FDI.

In terms of $H1$ measured by $GDPPC$ and $GDPGRO$, we find no evidence to suggest that Chinese OFDI in Africa is driven by marketing-seeking forms of investment. This goes against Buckley et al. (2007), who found that market size is a positive significant factor in terms of absolute world flows of Chinese OFDI. However, although many of the countries modelled in this paper can be considered as emerging markets, as previously discussed in terms of market size, the vast majority of African countries are limited by international comparison and often associated with underdevelopment and poverty, thus limiting market opportunities. Therefore, Chinese market-seeking forms of FDI are likely to take place outside the African continent.

The natural resource endowment of the host economy ($H2$) was found to have a significant positive effect at the 0.01 level on flows of Chinese OFDI. Our findings as hypothesised are consistent with the idea that continued Chinese economic growth and domestic consumption are becoming increasingly reliant upon securing natural resources ($RAWMA T$), including energy and raw materials, both of which are available in significant proportions in many resource-rich African countries. Indeed, China’s continuing need to meet its demand for raw materials and energy resources means that in the future, Africa in general is likely to receive increasing attention from both Chinese companies and the Chinese state, and as discussed in the following section, this creates both opportunities for Africa, yet simultaneously raises some important issues that should not be left unaddressed.

Related to a sub-component of resource-seeking FDI, we find no statistically significant evidence that Chinese OFDI in Africa is driven by strategic asset-seeking ($H6$) measured by host country $HITEC EXP$. Although, we do know that Chinese firms, as a result of the aforementioned “go global” policy, are now more inclined to engage in strategic-asset seeking forms of FDI (Buckley et al., 2007), albeit as hypothesised probably not in Africa at this stage.

$H3$ asserted that host country economic stability is likely to reduce risk and encourage inward flows of FDI from China. Following the common measure of host country inflation as a proxy for economic stability, no statistically significant evidence was found to suggest that Chinese OFDI in Africa is determined by macroeconomic stability ($INFLATION$) in the host country. At one level, this is a little surprising, given that economic stability should signify an environment in which to make investment decisions with a degree of certainty and, therefore, be a preferred environment. On the other hand, Buckley et al. (2007) suggest Chinese firms do not operate in the same way as conventional profit maximising firms from developed countries, as a result of indigenous capital market failure combined with the fact that much of Chinese OFDI is effectively subject to soft budget constraints underwritten by the Chinese state. On that basis, we can make an assertion that Chinese firms may act in ways that private sector firms from developed countries could not justify on the grounds of risk to their own shareholders.

The importance of labour market conditions ($H4$) measured by the ratio of GDP per person employed ($LABPRO$) as a proxy for labour market quality, although showing a
positive coefficient, was not a significant finding and goes against the predicted hypothesis and further tells us that Chinese OFDI is not based on efficiency-seeking, given that labour productivity is indicative of labour quality and, thus, productivity of investment.

The importance of infrastructure proxied by $TELCOM$ was found to be a significant determinant of Chinese OFDI in Africa and confirms our hypothesis ($H_5$), thus reflecting the idea that higher quality infrastructure increases efficiency of operations and the ease of doing business. This finding is consistent with other studies ($Cheng$ and $Kwan$, 2000; $Sun$ et al., 2002) into determinants of FDI generally and signifies from the host country perspective that weak infrastructure will limit the amount of inward FDI and, given Africa’s bad reputation for infrastructure, is one of an important number of reasons reflecting its small share of both global and Chinese levels of inward FDI flows.

Finally, the importance of the institutional and regulatory environment ($H_7$) proxied by the number of days to export goods and services ($EXPTIME$) is confirmed. However, the market openness ($OPENNESS$) coefficient is not as predicted, but nor is it significant. The institutional and regulatory environment signifies how easy it is for foreign companies to conduct business activities in the host country. In the case of this study, given that $H_2$ (resource-seeking forms of FDI in the form of natural resources) was also confirmed, which indicates that Chinese firms increasingly seek natural resources in Africa with the most likely cause being to drive domestic Chinese economic growth, transparent and efficient export procedures for the efficient transfer of those resources are likely to be important and highlight that a bureaucratic business environment for foreign investors limits inward FDI flows in terms of Chinese investment in Africa.

5. Conclusion

This paper investigated determinants of Chinese OFDI in Africa and to the best of the authors knowledge largely as a result of data limitations, is one of the first empirical papers to model Chinese OFDI in Africa. Results highlighted that Chinese investment in African countries is driven by access to natural resources, and factors related to infrastructure quality and the regulatory environment enforced by host governments. The results to a lesser extent were also an assessment of the applicability of Dunning’s theory related to locational determinants of FDI and the ability to explain flows of FDI between two developing countries. The study identified that Chinese OFDI in Africa is driven by resource-seeking rather than market or efficiency-seeking forms of FDI. Significantly, it would appear, however, that in addition to the pursuit of natural resources to sustain domestic Chinese economic growth, levels of Chinese OFDI are also related to the efficiency and ease with which those resources can be expatriated, as highlighted by the importance of proxy variables for infrastructure and regulations related to export time in the host country.

In addition to the empirical findings, a small number of other observations are worth noting. Firstly, economic stability of the host country, which for many private sector firms is an important consideration given that it relates to investment risk, does not appear to be a major determinant of Chinese OFDI in Africa. This correlates with the Buckley et al. (2007) study into Chinese OFDI more generally and signifies that Chinese firms are potentially less risk averse than conventional private sector firms. Indeed, this would correlate with our analysis of flows of Chinese OFDI globally, which demonstrate...
that the majority of Chinese OFDI is bound for developing countries, which in general are often associated with greater political and economic instability compared with developed countries. Of course, as Buckley argues, the destination of Chinese OFDI is likely to be a reflection of capital market imperfections in China, whereby a significant proportion of Chinese OFDI is underwritten by the Chinese state, which, in turn, is not subject to the same constraints that private sector profit seeking firms would be and, therefore, clearly puts Chinese firms at a competitive advantage in relation to conventional firms.

Given that China is one of the largest investors in Africa, and that Chinese FDI in Africa has increased significantly in the past decade and looks set to continue the implications for African countries should also be considered. Firstly, African countries who do not have suitably well-developed infrastructure or a regulatory environment conducive to business will struggle to attract investment from one of the continent’s largest investors signifying they may miss out on the associated advantages of FDI. Secondly, given that Chinese investment in Africa is centred on the acquisition of resource-seeking FDI in the form of natural resources, host countries must ensure that they are not being exploited to the detriment of the country in the long-term, particularly once Chinese investment is no longer taking place. This can be partially achieved through competition via major improvements in the regulatory environment, which enhance the ease of doing business, thus helping expose African countries to the prospects of a wider range of international investors.

In relation to Africa generally, Asiedu (2006) suggests market size and macroeconomic stability are important determinants of overall FDI inflows into Africa. Therefore, in addition to regulatory improvements there should be movements at policy level to create wider and deeper regional African integration facilitating larger and more efficient intra African markets, which will increase Africa’s market size, thus generating greater FDI flows, and simultaneously promoting much needed political and economic stability on the African continent.

As regards future research, further investigation into the China-Africa relationship is required to better understand the associated benefits and costs, and to ascertain whether following the “Beijing Consensus”, as opposed to the “Washington Consensus”, is really in the long-term interests of Africa.

References


**About the author**

Andrew Grant Ross is currently a Lecturer in economics and international business within the School of Management at Edinburgh Napier University. Prior to this appointment, he taught economics at The University of Edinburgh. His research interests relate mainly to regional economics and the business environment for SMEs. He is a published author in the field of corporate governance and regional economics and has presented his work at both national and international conferences. Andrew Grant Ross can be contacted at: a.ross2@napier.ac.uk
Table AI. Pearson’s correlation coefficients

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