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What drives China's outward FDI? A regional analysis

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Abstract

Our study examines home drivers of China's regional outward FDI. We propose a theoretical framework that incorporates an extended Investment Development Path (IDP) theory, home locational constraints, policy incentives and geographic factors. Empirically, we employ the Bayesian Averaging Maximum Likelihood Estimates method to address model uncertainty. All proposed theories (except for geographic aspects) are found to provide important perspectives explaining China's regional outward FDI. Our results highlight the importance of government policies but do not support the original IDP hypothesis that outward investment is automatically generated as income grows. Our findings have implications for both regional and central-government policy.

Key words: China, regional outward FDI, home determinants, extended IDP theory, home locational constraints, government policies, Bayesian.

JEL Classification: F21, R11, C11, C23.

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1 Introduction

Since the implementation of the reform and opening-up policy in 1978, China has been attracting foreign direct investment (FDI) from the rest of the world and has become one of the world's major FDI destinations. In the past two decades, however, a new trend has emerged: a dramatic increase in China's outward FDI (OFDI), especially since the introduction in 1999 of a national policy of encouraging domestic investment to "go out" of China (see Table 1). In 2011, China was the world's 6th largest source of FDI. Along with the impressive growth of overseas investment, a fair amount of literature has emerged explaining the determinants of China's OFDI at country (e.g. Liu et al., 2005; Buckley et al., 2007; Cheng & Ma, 2007; Cheung & Qian, 2009; Wei & Alon, 2010; Tolentino, 2010; Kolstad & Wigg, 2012), industry- (e.g. Amighini et al., 2011) and firm level (e.g. Amighini et al., 2012; Wang et al., 2012). A summary of these studies is presented in Table 2.

Compared with previous analyses, our study attempts to investigate drivers of China's overseas investment from a fresh angle – China's regional OFDI. According to the Ministry of Commerce of China (MoCC), there are two groups of outward investors in China. The first group includes large central firms which are directly supervised and managed by the State Council, while the second group includes regional firms that are owned by regional governments and the private sector. Although started off with little investment, in the past decade, regional OFDI investors have grown into significant players in China's overseas market. For instance, in 2011, about half of the top 100 Chinese firms ranked by OFDI stock were regional firms[1]. More importantly, in terms of size, during 2003–2011, nearly a quarter of China's OFDI has been regional investment, with central investment making up the rest (see Table 1). Given the increasing importance of OFDI at regional level, it is surprising to find that no previous studies have attempted to specifically identify the drivers of China's regional OFDI.

In addition to the growing volume, what makes the issue of China's regional OFDI interesting is the enormous heterogeneity amongst the Chinese regions (see Figure 1 for a

[1] State-owned Assets Supervision and Administration Commission of the State Council of China provides the names of centrally owned firms. The MoCC provides the top 100 Chinese firms ranked by OFDI Stock. By cross checking, we find that in 2011, of the top 100 firms, around 50 were regionally and 50 centrally owned firms. Regional firms include Huawei, Geely, Haier and TCL, which have made the headlines in international media for their overseas expansions.

map of China)[2]. The heterogeneity is not only reflected in the levels of income (measured by gross regional product per capita for instance), but also in many other aspects of the economic development, such as the scale of the international trade, cost of labour, level of educational attainment, etc[3]. Geographic heterogeneity is also noticeable across Chinese regions. For instance, some are located in the eastern coastal area while others are located in the interior. In the past decade, there there have also been significant dynamics related to regional OFDI. Based on data provided by MoCC, over the years, we observe a more balanced distribution of OFDI among regions, although the eastern regions still constitute the leading OFDI source. Such dynamics and heterogeneity across Chinese regions would have been disguised in a country-level analysis.

Furthermore, a regional analysis can provide policy implications at both central and local levels. An important characteristic of regional investors distinguishing them from central investors is that they are affected not only by national policies, but also by regional ones. This is particularly true for China since regional governments need to comply with central policies but also need to adjust to local situations, in order to ensure strong regional economic growth. Hence both regional and central policies should be investigated to understand regional investors' decisions, and doing so should provide valuable information for both central and local governments to design strategies for facilitating China's overall international expansion.

Thus, given its growing importance, the heterogeneity across Chinese regions, and the possibly important policy implications here for both central and local governments, a study dedicated specifically to China's regional OFDI is warranted.

As the first study to examine the determinants of China's OFDI at regional level, our study further contributes to the literature in the following three important ways. First, although many previous analyses investigate China's OFDI from a host-country perspective, only a handful of studies explore the role of home-country factors at national level (e.g. Liu et al., 2005; Wei & Alon, 2010; Tolentino, 2010; Buckley et al., 2007[4]). However, it is the home-country factors that decision makers can directly influence. The first three studies

[2] Figure 1 shows that there are 31 regions in China, which include twenty 2 provinces, 5 Autonomous Regions and 4 Municipalities. For simplicity, we also refer to all of these as Chinese regions in the rest of the paper.
[3] For instance, in 2011, international trade (exports plus imports) of Guangdong province alone reached 1006.8 billion US Dollar (USD), exceeding a quarter of China's total international trade that year, while that of Qinghai province was merely 0.8 billion USD.
[4] At firm level, a recent study Wang et al. (2012) also explores driving factors of Chinese firms' OFDI.

mentioned above focus mainly on macroeconomic factors, but their results may provide limited implications due to the constraint of short time series data (a maximum of 25 observations based on limited data availability). Buckley et al. (2007) include one home-country policy variable (policy liberalisation measured by a dummy variable), and two home country macroeconomic variables (exports and imports). To circumvent the issues of limited number of observations and to offer directly employable information to both regional and central policy makers, our study employs panel regional level data and focuses on home-country factors.

Second, previous studies on China's OFDI are largely focused on a single theoretical perspective (see Table 2). In her extensive review of theoretical FDI models, Faeth (2009) finds that different theories do not necessarily replace each other but may explain different aspects of the same phenomenon; hence she suggests that FDI should not be explained by single theories but more broadly by a combination of them. Buckley et al. (2007) and Wang et al. (2012) have already done so for China (see Table 2). In our study, we propose a comprehensive multi-level theoretical framework to investigate home drivers of China's regional OFDI. It builds on four different, but complementary, theoretical explanations, namely the extended Investment Development Path (IDP) theory, home locational constraints, policy incentives, and geographic factors.

Third, the growth of both theoretical and empirical literature on FDI in recent decades has led to a wide list of variables being proposed as FDI determinants, and often different FDI theories are compatible with one another[5]. Naturally, the issue of model uncertainty arises, as theory may not provide enough guidance to select the proper empirical model. This issue is particularly relevant to our study since we investigate four alternative theoretical explanations of the same OFDI phenomenon. Conventional regression and cointegration techniques employed in previous studies on China (see Table 2) are not able to solve this issue. Our study employs the recently developed panel Bayesian Averaging of Maximum Likelihood Estimates (BAMLE) by Moral-Benito (2012) to deal with model uncertainty. We employ this novel technique not only because it is specifically designed for panel data, but

[5] For instance, Assunção et al. (2011) review recent literature on location determinants of FDI. Following their categorisation, FDI determinates associated with the location, such as infrastructure and human capital, is not logically inconsistent with ones associated with the new theory of trade, such as openness of the economy and factor endowments in natural resources, or ones associated with the institutional approach, such as corruption and or corporate taxation.

also because of the unique nature of its likelihood function. To our knowledge, it is the first time this method has been used in any FDI literature.

2 Theoretical foundations

Studies that empirically examine the determinants of China's OFDI have employed various theoretical models (see Table 2). These models include Dunning's (1981) Investment Development Path (IDP) theory (e.g., Liu et al., 2005; Wei & Alon, 2010), general multinational firm theory, namely market-seeking, resource-seeking and strategic asset- seeking motives (e.g., Amighini et al., 2011, 2012; Buckley et al., 2007; Cheng & Ma, 2007; Cheung & Qian, 2009), and factor analysis where macroeconomic variables are introduced based on reviews of important determinants analysed in the previous literature (e.g., Kolstad & Wigg, 2012; Tolentino, 2010). Two studies have combined several alternative theoretical models. Using firm-level data, Wang et al. (2012) combine institutional theory, industrial organisation economy, and a resource-based view of firms to explain China's OFDI. Using national aggregate data, Buckley et al. (2007) nest three special explanations (capital market imperfections, special ownership advantages and institutional factors) within the general theory of the multinational firm.

After reviewing a range of theoretical FDI models, Faeth (2009) concludes that different theories do not necessarily replace each other but may instead explain different aspects of the same phenomenon, and hence that FDI should not be explained by single theories but more broadly a combination of them. Buckley et al. (2007) and Wang et al. (2012) have done so for China's OFDI at country- and firm-level, respectively. For our regional analysis, we propose a comprehensive theoretical framework that combines four complementary theoretical explanations, namely the extended IDP theory, home locational constraints, policy incentives, and geographic factors.

2.1 Extended investment development path theory

Dunning's (1981) Investment Development Path (IDP) theory has provided a longstanding explanation of the OFDI from many countries. In essence, the IDP theory postulates that a country's investment development cycle is dependent on a country's level of economic development. As one country develops through each stage, OFDI is initially at near zero (first

stage), starts to emerge (second stage), increases (third stage), surpasses inward FDI (fourth stage) and finally is neutralised by inward FDI (fifth stage). The basic hypothesis of IDP theory is that as a country develops, the localisation advantages of the host country and the ownership advantages of home-country multinational firms undergo change as host countries themselves develop so as to provide ownership advantages and thus begin to generate OFDI and in turn seek localisation advantages elsewhere in overseas countries[6]. Therefore, the IDP theory seems to be particularly relevant to China during its fast economic development and its emergence from a FDI destination to one of world's major FDI sources.

However, despite having successfully explained OFDI from many developed countries, the IDP theory has raised questions when it has been applied to developing and transitional economies. For instance, Svetličič (2003) suggest that "leapfrogging globals" in transitional economies may skip some of the stages described in the IDP theory. Kuada and Sorensen (2000) and Erdilek (2003) find that some developing countries are unable to carry out international activities, or they fail to develop localisation advantages despite moving through the economic development stages.

Thus, our study investigates whether for China, the world's largest developing economy, OFDI is consistent with the IDP theory or does it represent a major exception to it, especially given China's unique economic development path and the role played by its governments in the market-oriented economy. In particular, we consider whether China's economic development is captured solely by its GDP per capita, as suggested by the original IDP theory, or by a range of factors that reflect other aspects of the development of the Chinese economy.

2.2 Home locational constraints

Economic reforms and liberalisation – common features of developing and transitional economies – often lead to surges of OFDI as domestic firms, for the first time, are allowed to

[6] The concepts of location and ownership advantage are derived from Dunning's "OLI" (or "eclectic") approach to the study of FDI (See, for example, Dunning (1977)), where multinational firms' decisions on investing abroad are explained by ownership (O) advantage, if these firms possess superior technological knowledge or management skills (developed in home markets), localisation (L) advantage, if the host markets have non-transferable characteristics such as cheaper labour and abundant natural resources, or internalisation (I) advantage, if these firms consider it to be in their interest to exploit imperfections in external markets.

escape rigid home market constraints and to invest abroad. In the presence of this phenomenon, referred to as 'leapfrogging' (Svetličič, 2003), OFDI from developing and transitional economies is not driven by ownership advantages associated with economic development but instead by home localisation disadvantages (Svetličič, 2003).

According to UNCTAD (2006), home locational conditions, which tend to induce companies to move abroad, consist mainly of the following types: market and trade conditions, costs of production, and local business conditions[7]. For developing and transitional economies, these conditions often entail home-localisation disadvantages for domestic firms. For instance, corresponding to the three types of home locational conditions, in developing countries, typically there are limited home markets in terms of scale and opportunities to expand, increasing production costs due to rapid economic expansion, or a scarcity of resources or inputs such as labour, and competition pressure from local or foreign firms within the home market. Empirical studies have also confirmed these three common home locational constraints as pushing factors that lead developing-country firms to go overseas. Some examples include UNCTAD (2003) for the limited size of domestic markets; Brooks & Mirza (2005) for the rising costs of home production; Farrell et al. (2005) for intense competition from both local and foreign firms. However, despite their relevance for developing economies, home locational constraints have not been empirically examined as regards OFDI from China. Therefore, in our study, we include home locational constraints as an important theoretical explanation of China's regional OFDI.

2.3 Policy incentives

In a recent literature review by Faeth (2009), policy incentives were found to form an important category of theoretical models that explain firms' overseas investment decisions[8]. Specifically, governments can influence the firm's choice between domestic production, licensing or FDI, the firm's location choice, the firm's choice to stay or expand, etc. Indeed,

[7] UNCTAD (2006) also includes government policies as part of home country conditions. For China, government polices are not necessary form constraints on OFDI, especially since the "Going Out" policy in 1999. We discuss government policies separately in the following section.

[8] Faeth (2009) provides a broad categorisation of existing FDI models. They include the neoclassical model, which explains international capital trade by differences in returns on capital, Dunning's (1977, 1979) OLI framework, which combines Ownership, Location and Internalisation as determinants of FDI after they were previously discussed in separate theories, new trade theory, which combines ownership and location with technology and country characteristics and explain both horizontal and vertical FDI, risk diversification hypothesis, and policy incentives.

government policies such as tax rates have been examined in a number of studies and are shown to have significant influence on FDI (e.g., Bénassy-Quéré et al., 2001a, b; Hubert & Pain, 2002).

Developing economies often feature significant government involvement in business affairs despite the emergence of a market system. For instance, Le & Zak (2006) find that policy uncertainty is an important driver of capital outflows from developing countries. Correspondingly, home government policy is regarded as an essential part of an action plan for investment in less developed countries proposed by UNCTAD (2011). In terms of China, apart from the dominant central government, regional governments are gaining more autonomy in the process of reform and liberalisation. They need to comply with central guideline policies but are also keen to extend their local influence in order to promote rapid economic growth in their own regions. Therefore, we expect both central and local governments to have a profound impact on Chinese regional OFDI.

It is worth mentioning that many studies have analysed the role of host government policies in the host country in determining the location of FDI (see Assunção et al. (2011) and Faeth (2009) for reviews of recent literature in this strand), yet the impact of home policy factors on OFDI has not been extensively studied[9]. For China, only a few policy variables (e.g., liberalisation policy in 1992 in Buckley et al. (2007), interest rate policy and exchange rate policy in Wei & Alon (2010) and Tolentino (2010), government support in certain industries in Wang et al. (2011)) have been employed in previous analyses as home determinants of China's OFDI. In our study, we not only examine a wide range of central polices, but also introduce important local government policies, to form a third explanation for China's regional OFDI.

2.4 Geographic factors

Gallup et al. (1999) emphasise that geography continues to play an important role in economic development, alongside economic and political institutions. Geographic features of host countries (e.g., landlocked or island economy) have been widely employed to explain locational decisions for FDI. In the case of China, it is widely recognised that there is geographic heterogeneity amongst the regions. For instance, some regions are located in the

[9] E.g., Tallman (1988), Schoppa (2006), Durán & Ubeda (2001), Globerman & Shapiro (2002), Le & Zak (2006), Das (2013). Of these six studies, only the last four analyse developing countries.

coastal areas while others in the inland areas; some regions are richer in natural resources than others; etc. To explicitly account for this regional heterogeneity, we introduce geographic factors to form the final theoretical explanation of China's regional OFDI.

3 Hypotheses development

3.1 An extended investment development path theory for Chinese regions

In the original IDP theory, the level of economic development is explicitly measured by GDP per capita (see for instance Buckley & Castro (1998), Dunning et al. (2001) and Kalotay (2004)). Many researchers have raised the point that GDP per capita alone may not be sufficient capture all aspects of economic development of a country, and many additional economic elements have been proposed (e.g., Dunning, 1986, 1988; Narula, 1996; Dunning & Narula, 1996; Durán & Ubeda, 2001). As summarised by Dunning & Narula (1996), each country is different and hence the way that FDI activity and economic development interact is unique to each individual country.

For China, Liu et al. (2005) also suggest theoretical modification of the original IDP theory by considering other aspects of economic development in addition to the stage of development captured by GDP per capita. Specifically, they extend the IDP model to introduce investment in human capital, exports and inward FDI in addition to GDP per capita as home-country determinants of China's aggregate OFDI. Also based on the IDP model, Wei & Alon (2010) include technology, trade openness (exports and imports) and foreign exchange (FX) reserves in addition to income per capita to reflect the economic development in China[10].

At regional level, following Liu et al. (2005) and Wei & Alon (2010), we employ an extended IDP theory, i.e., incorporating five economic variables (i.e., human capital, trade openness, technology, inward FDI and FX reserves) in addition to Gross Regional Product (GRP) per capita, to reflect the ownership advantage of regional overseas investors.

In addition to the above five economic variables, we incorporate agglomeration economics into the extend IDP theory. Agglomeration effects arise from the presence of

[10] Note that Wei & Alon (2010) also introduce the interest rate and exchange rate as two determinants of China's OFDI. These two variables are regarded as policy variables in our study, as they are set by the Chinese government rather than by the market; they are discussed in detail in Section 3.3.

other firms, other industries, as well as from the availability of skilled labour force (Venables, 1996). Previous OFDI from a home country can create positive externalities, such as factories and production lines that have already been set up, and hence it encourages further OFDI flows. As pointed out by Krugman (1997), FDI tends to follow previous investment. Cheung & Qian (2009) find overwhelming evidence of agglomeration effects for China's national OFDI.

> **Hypothesis 1**: The level of China's regional OFDI is positively related to (a) GRP per capita, (b) human capital, (c) inward FDI, (d) international trade, (e) FX reserves, (f) technology capability, (g) agglomeration effects.

3.2 Regional locational constraints

As mentioned earlier, we examine three types of locational constraints on the home economy: market and trade conditions (e.g., limited home market), costs of production (e.g., rising cost of labour), and local business conditions (e.g., competition from foreign firms). To our knowledge, none of these home locational constraints has been empirically examined as important home determinants of China's OFDI at national or regional level.

In terms of a limited home market, UNCTAD (2003) suggests that insufficient domestic consumption, coupled with excess industrial productive capacity since the late 1990s in certain industries (especially in machinery and electronic appliances), have encouraged Chinese firms to look for overseas markets. Regarding cost of labour, in recent decades, it has been increasing at a fast pace[11] as China has started to "catch up" with developed countries and the Chinese population has begun to age. For home business conditions, competition from foreign firms in the home economy is widely seen as an important driver behind China's rapid increase in OFDI (e.g., Nolan, 2001; Jürgens & Rehbehn, 2006), especially given that many foreign firms in China are export oriented.

In addition to competition from foreign enterprises, inadequate infrastructure is also a form of adverse business conditions at home that may push domestic investment abroad (UNCTAD, 2006). Following a decade of sizeable investment, the level of infrastructure of

[11] According to data from *China Statistical Yearbook 2011*, the average Chinese annual real (consumer price index adjusted) salary per person has increased from 13980 Chinese Yuan in 2003 to 38935 in 2011.

China is above that of most other developing countries but is still well below that of developed economies[12]. Similarly, pollution is another form of adverse business condition for Chinese firms, especially given that it has led to gradually tightening environmental regulations[13]. As suggested by the pollution haven hypothesis (Pethig, 1976; Yohe, 1979), the production of pollution intensive goods will migrate from countries with high environmental standards to ones with low standards.

> **Hypothesis 2**: the level of China's regional OFDI is positively related to (a) cost of labour, (b) foreign ***competition***, (c) pollution; and negatively related to (d) domestic consumption[14], (e) infrastructure.

3.3 Policy incentives of Chinese regions

As mentioned in Section 2, only a few government policies have been analysed by previous studies as home determinants of China's OFDI. Following Wei & Alon (2010) and Tolentino (2010), we include both interest rate and exchange rate as indictors of monetary and foreign exchange policies, respectively. Both rates are tightly administrated by the Chinese central government. The interest rate determines the opportunity cost of capital domestically as well as the profitability of investments (Grubaugh, 1987) and hence has a direct negative impact on OFDI. A stronger home currency encourages OFDI, as it lowers the capital requirements of the investment (Aliber, 1970). Since the most recent foreign exchange reform in 2005, the Chinese Yuan (CNY) has appreciated against the USD by over 24% (from 8.27 to 6.33 CNY/USD in 2011), which has had a positive influence on China's OFDI.

In addition to the above two central polices in monetary and foreign exchange areas, and to better account for the role of both central and local governments, we also include five new central government policies: credit growth, corporate taxation, anti-corruption, work-

[12] For instance, according to The *Global Competitiveness Report 2012–2013* by the World Economic Forum, China's level of infrastructure is better than India's and Brazil's but still ranks only 48 out of around 150 countries.
[13] In 1989, the first Environment Protection Law was put forward in China. At firm level, in 2006, Corporate Social Responsibility has become a law introduced under Company Law in China.
[14] Modigliani & Cao (2004) and You & Sarantis (2012) explain the high savings ratio in China by demographic structure, as they find that a gradual reduction in the relative number of young (under 15), induced by the One-Child policy, has reduced the consumption-to-income ratio. We examined the young dependence ratio instead of consumption, but our empirical results suggest that it was not a robust determinant of regional OFDI.

ers' rights, presence of State Owned Enterprises (SOEs), and two regional government policies (willingness to approve regional OFDI, and investment in research and development (R&D)).

Besides the interest rate, the Chinese central bank also relies heavily on direct administrative limits on loan growth as part of their monetary policy (International Monetary Fund, 2011). The central bank would outline a yearly limit on loans that Chinese banks can extend to their customers. Each region is then unevenly allocated a loan quota and the sum of regional quotas should meet the national limit. Such credit growth has direct implications for the availability of financing for firms that wish to expand internationally.

It is well documented that corporate income taxes have an adverse impact on investment (see Djankov et al. (2010) for a literature review). The corporate tax rate is set by the central government in China. Corporate tax revenue in China has increased from 0.9% of Gross Domestic Product (GDP) in 1999 to 3.6% in 2011. In absolute terms, the corporate income tax increased 20-fold in 1999–2011, much faster than any other category of taxes. Fast rising corporate taxes could have incentivised Chinese firms to invest abroad in search of a more favourable tax rate.

China's transformation to a market oriented economy has unfortunately also led to a proliferation of corruption at all levels. Cole et al. (2009) find that anti-corruption efforts attract inward FDI to Chinese regions. Anti-corruption can have a positive impact on fair competition and efficient allocation of resources. It also helps to form a better institutional environment for where Chinese firms operate in. Therefore, stronger anti-corruption efforts would reduce Chinese firms' incentive to invest abroad.

Legislation on labour protection and consultation with the trade unions has started to be developed in the recent two decades in China (e.g., the *1995 Labour Law*, the 2008 *New Labour Contract Law*). Consequently, the number of trade unions has been increasing across China. Stronger labour protection implies higher production costs for firms. As Zhu and Pickles (2011) have pointed out, many Chinese firms choose to relocate abroad where labour protection is weaker and the associated costs are lower.

Many studies have found that Chinese SOEs are inefficient in terms of profits, productivity, and growth (e.g., Zhang (2004), Dougherty et al. (2007)). However, SOEs are often able to obtain financial resources at low cost from state owned banks and to enjoy

preferential government policies. Given the government support, inefficient SOEs make resources less available or only available at a higher cost to other more productive regional (e.g. collectively or privately owned) firms that wish to expand abroad[15].

Despite the fact that OFDI is widely encouraged in China, one undesired impact of OFDI is that it may cause unemployment at home, as investment abroad may replace home country production and exports (Lipsey, 2004). In recent years, in light of high domestic unemployment, some countries have adopted policies that restrict OFDI and attract investments back home[16]. At the same time, in China, local governments have gained increasing power over approving regional OFDI in the past decade[17] . Given the recent slowing of exports and economic growth in China, unemployment would have become a natural concern of local governments, making them reluctant to approve regional OFDI.

R&D capabilities are crucial for firms to expand abroad, as the ability of a firm to absorb external technology depends on its own prior R&D efforts (Kafouros & Buckley, 2008). In China, regional investment in R&D is largely obtained from local government budgets, making local governments' support of R&D an important policy variable that directly affects how successful local firms' overseas expansion can be.

> **Hypothesis 3:** The level of China's regional OFDI is positively related to governments' favourable policies towards (a) appreciation of the exchange rate of the RMB, (b) high credit growth, (c) high corporate tax rate, (d) rights of workers, (e) willingness to approve OFDI, (f) investment on R&D; and is negatively related to governments' favourable policies towards (g) high interest rate, (h) anti-corruption effort (i) presence of SOEs.

[15] Following Duanmu (2012) and Amighini et al (2012), firms with the central or local governments as controlling stake holders are categorised as SOEs. Some of China's regional OFDI is by regional SOEs controlled by the local governments, and hence a greater presence of SOEs may imply more regional OFDI. However, such regional SOEs only make up about a third of all SOEs (e.g. 37% in 2011 according to China's Ministry of Finance) whereas most SOEs are inefficient users of resources. Therefore, we believe that the negative impact that SOEs have on regional OFDI mentioned above would dominate its positive impact.

[16] UNCTAD (2012) reports that due to the rising home unemployment, in 2011, Argentina required its insurance companies to repatriate all their investments abroad by the end of 2011; India allowed Indian-controlled companies abroad to conditionally disinvest without prior approval from the central bank; The US established the "Select USA" initiative to encourage US investors abroad to relocate their business operations back home.

[17] For instance, OFDI projects for investing in 135 designated countries by Chinese privately owned enterprises only need to get approval by regional Foreign Economic Relation and Trade (FERT) (Luo et al., 2010).

3.4 Regional geographic characteristics

Despite the huge geographic heterogeneity among Chinese regions, to our knowledge, no geographic factors have been empirically examined as important home determinants of China's OFDI. The Chinese territory consists of coastal areas and interior land. The coastal areas cluster in the east and south of China, forming a belt of more developed regions. Porter (1990) argues that advantages gained in clusters can form the foundation for successful internationalisation. These advantages go beyond those due to the co-presence of related firms and institutions (e.g. transportation links and climate) (Swann et al., 1998) to further include labour market pooling, the emergence of specialised input suppliers, and technological and knowledge spillovers (Gupta and Subramanian, 2008). Chinese coastal regions should benefit from being located in a highly clustered environment and hence are more likely to be home to successful international expansion compared with inland regions.

From a home country perspective, there is also huge heterogeneity in the amount of natural resources in each region across China. In resource rich regions, a larger proportion of firms should be serving regional resource industry and be less pressured to expand abroad than those in regions with little national resource endowment.

> **Hypothesis 4:** The level of China's regional OFDI is positively related to (a) geographic location of being coastal regions, but negatively related to (b) natural resource endowment.

4 Bayesian averaging of maximum likelihood estimates (BAMLE) panel method

Various models and theories have proposed a fairly large number of variables as determinants of outward and inward FDI. However, these model and theories do not provide enough guidance regarding the complete specification of which variables are to be kept in the model, and different theories are typically compatible with one another. Thus, even when statistical tests are carried out on the relation between dependent and independent variables in each single models, it remains unclear which specification to favour. This issue is referred to as model uncertainty.

Often, as summarised by Tsangarides (2004), researchers have three options when facing model uncertainty: (i) arbitrarily select one model as the true model generating the data; (ii) present the results based on all plausible models without selecting between the different specifications; and (iii) explicitly account for model uncertainty. Option (i) risks overconfident inferences, while option (ii) is unsystematic and poses substantial logistical challenges[18].

Various methods have been proposed for option (iii) of explicitly accounting for model uncertainty for cross-sectional data, such as the Bayesian Averaging of Classical Estimates (BACE) (Sala-i-Martin et al., 2004), the full Bayesian Model Averaging (BMA) approach (Fernandaz et al., 2001), or the Extreme Bounds Analysis (EBA) (Leamer, 1983; Levin & Renelt, 1992; Sala-i-Martin, 1997). More recently, Moral-Benito (2012) extends the cross-sectional BMA method to panel data with country specific fixed effect in order to simultaneously address model uncertainty and endogeneity issues. A novel maximum likelihood estimator which is able to use the within variation across time and also between variation across countries is employed. Moral-Benito (2012) combines this novel maximum likelihood estimator with the BMA techniques to construct weighted average of maximum likelihood estimates and label the approach as Bayesian Averaging of Maximum Likelihood Estimates (BAMLE).

We adopt the BAMLE method for the following reasons. First, our study considers not one but four theoretical explanations of China's regional OFDI and hence requires the issue of model uncertainty to be addressed. However, conventional regression, cointegration and Generalised Method of Movements (GMM) type analyses that have been employed in previous studies on China (see Table 2), are unable to address this issue, whereas the BAMLE method provides a clear solution. Second, compared with other methods that can deal with model uncertainly, mentioned above (e.g., BACE, BMA, EBA), the BAMLE operates in a panel environment rather than a cross-sectional one, making it ideal for our panel study of China's regional OFDI. Third, as emphasised by Moral-Benito (2012), the novel

[18] It may also be argued that, in principle, as long as the number of observations is large enough, variables which do not belong in the regression will have zero coefficients, and hence one can simply include all of the explanatory variables from alternative theories in one regression and employ classical statistics. However, as pointed out by Sala-i-Martin et al. (2004), in many applications, we do not have the luxury of having a large enough sample size to allow us to draw conclusion on the important of potential regressors based on an all-inclusive regression.

maximum likelihood estimator of the BAMLE method is consistent and asymptotically normal regardless of non-normality, and hence the BAMLE approach to unobserved heterogeneity is as robust as panel GMM estimators in the presence of time series-homoscedasticity.

We now discuss briefly the BAMLE method. Using the Bayesian terminology, a model is formally defined by a likelihood function and a prior density. Supposing that there are K possible explanatory variables, there will be 2^K possible combinations of regressors, or 2^K models. All models, denoted by M_j for $j = 1, \dots, 2^K$, seek to explain y, the data. θ^j is the estimated parameters for each model M_j. The logic of Bayesian inference suggests that Baye's rule is used to derive a probability statement about what we do not know (i.e. whether a model is correct or not) conditional on what we do know (i.e. the data). This implies that the posterior model probability can be used to assess the degree of support for M_j.

The BAMLE approach of Moral-Benito (2012) extends the BMA methodology mentioned above to a panel data framework and employs averaging maximum likelihood estimates in a Bayesian spirit. In other words, the posterior probability in the standard BMA method can be rewritten as:

$$E(\theta|y) = \sum_{j=1}^{2^K} P\left(M_j\middle|y\right) E\left(\theta\middle|y, M_j\right) \quad (1)$$

while the BAMLE approach specifies the posterior probability as:

$$E(\theta|y) = \sum_{j=1}^{2^K} P\left(M_j\middle|y\right) \hat{\theta}_{ML}^{j} \quad (2)$$

where $\hat{\theta}_{ML}^{j}$ is the maximum likelihood estimate for θ in model j.

In a panel data context, for a given model M_j, the estimated econometric model consists of the following equation:

$$y_{it} = \alpha y_{it-\tau} + x_{it}^{'j}\beta^j + z_i^{'j}\gamma^j + \eta_i + \zeta_t + v_{it} \quad (t = 1, \dots T)(i = 1, \dots N) \quad (3)$$

and two assumptions:

$v_{it}|y_{it-1} \dots y_{i0}, x_i^j, z_i^j, \eta_i \sim N(0, \sigma_v^2)$

$\eta_i|y_{i0}, x_i^j, z_i^j \sim N\left(\varphi y_{i0} + \delta^j \bar{x}_i^j, \sigma_\eta^2\right)$

where $y_{it-\tau}$ denotes lags of dependent variable. x_{it}^{j} denotes the $k^{j} \times 1$ vector of explanatory variables in model M_j. η_i is the time-invariant component of the error term capturing the unobserved heterogeneity, i.e. it is the individual specific fixed effect. v_{it} denotes the error tem. ζ_t is time dummies in the model which capture unobserved common factors across countries and therefore cross-sectional dependence is not ruled out. All variables are assumed to be in deviations from their cross-sectional mean. z_i^j denotes a set of regressors which are time-invariant, such as geographic factors without time variation.

As for the assumptions, $\bar{x}_i^j$ is the time-series mean of x^j for individual i ($\bar{x}_i^j = (1/T)\sum_{t=1}^{T} x_{it}^{j}$). The first assumption indicates that the strict assumption of exogeneity of the lagged dependent variable is relaxed (i.e. it is allowed that current shocks affect future values of the dependent variable as implied by the dynamics of the model). This is the key assumption to obtain fixed T, large N consistent estimates of the autoregressive parameter α in Equation (3). The second assumption implies that while the x's can be correlated with the unobserved fixed effect η_i, the z's are independent[19].

Under the above assumptions, Moral-Benito (2012) derives the likelihood function and the posterior model probability for a particular model M_j using the Bayesian Information Criterion (BIC) approximation (see Moral-Benito (2012) for details). The posterior inclusion probability of a particular variable h is calculated as the sum of the posterior model probabilities for all the models including h (i.e., $P(\theta_h \neq 0|y) = \sum_{\theta_h \neq 0} P\left(M_j\middle|y\right)$).

5 Empirical results

Our sample period is 2003–2011. We use annual data for 30 Chinese regions (see Figure 1). Tibet is excluded due to data limitations. Variable measurement and data sources are discussed in Appendix A. Note that our study is at regional level, hence we employ regional data when measuring the central government policies (i.e. we look at regional implications of these central policies).

[19] This is due to the fact that, while η_i captures the transitional unobserved heterogeneity between countries, z_i variables capture a second type of fixed but observable heterogeneity. These two types of heterogeneity must be uncorrelated. For instance, observable geographic factors (such as land area) are assumed independent from unobservable variables such as the ability of its population.

The descriptive statistics and correlation matrix are presented in Table 3. Note that geographic variables are time invariant dummies and hence are not included. All correlation coefficients are below 0.8. Table 3 suggests that there is generally no cause for concern about correlations amongst determinants.

5.1 Single models

Prior to employing the BAMLE method to explicitly address the model uncertainty issue, as a comparison, we first present in Table 4 some single model estimates using the classical panel regressions for (1) the extended IDP theory, (2) home locational constraints, and (3) government incentives. Note that since the geographic variables do not vary over time, they are not included in our experimentations at this stage. As shown in Table 2, regression analysis is the most commonly adopted method in the existing literature on OFDI for China. Hence we also employ panel regression analysis for the above three models. However, in the case of (1) the extended IDP theory, the agglomeration effects is captured by lagged regional OFDI. The presence of a lagged dependent variable would yield seriously biased estimates. Using ordinary least squares (OLS) would bias the coefficient of the lagged term upwards whereas using fixed effects would cause a downward bias in the aforementioned. In addition, the estimates would also be biased because the unobserved country specific effects may be correlated with the regressors. Thus, to overcome the above mentioned problems, for the estimation of model (1) the extended IDP theory, we additionally employ the system GMM (two-step) estimator developed by Arellano and Bover (1995) and Blundell and Bond (1988) and present the results as (1b) alongside the panel regression results (1a) in Table 4.

Looking at Table 4, for (1) the extended IDP theory, (2) home locational constraints, and (3) government incentives, the corresponding significant determinants of China's regional OFDI are (1) agglomeration effects, human capital, and technology capability, (2) cost of labour, pollution, infrastructure, and (3) willingness to approve OFDI, respectively. Note that in the case of (1) the extended IDP theory, we prefer the results based on the system GMM method (Equations (1b)) over that based on the panel regression method (Equation (1a))[20].

[20] The Hansen test and serial correlation tests of the GMM results are reported at the bottom of Table 4. The Hansen test suggests that the null hypothesis of over identification of the instruments is rejected. The serial

Results in Table 4 suggest that all three alternative theories, i.e., (1) the extended IDP theory, (2) home locational constraints, and (3) government incentives, have explanatory power for the phenomenon of China's regional OFDI. Should we choose one of the models, or should we conclude that all determinants from all the models are robust? Since the theories or models do not provide guidance to choose between them and they are often compatible, the typical issue of module uncertainty arises here. If we choose one of the models, it would be an arbitrary choice, ignoring factors from alternative models that may have similar or stronger explanatory power. On the other hand, if we include all significant factors, it is unsystematic and more importantly, it imposes a risky assumption that the same factors would remain robust when competing models are also considered in an all-inclusive equation. Given that China's regional OFDI is a multi-faceted issue, it is essential to investigate alternative theoretical explanations to better understand the drivers behind it. Then the most feasible option is to explicitly address the issue of model uncertainty. Therefore, next, we move on to the prime empirical exercise of our paper, applying the BAMLE method to our data.

5.2 BAMLE results

Recall Equation (3) above:

$$y_{it} = \alpha y_{it-\tau} + x_{it}^{\prime j}\beta^{j} + z_{i}^{\prime j}\gamma^{j} + \eta_i + \zeta_t + v_{it} \quad (t = 1, \dots T)(i = 1, \dots N) \tag{3}$$

To be more specific, y_{it}, the dependent variable, is the regional OFDI to Gross Regional Product (GRP) ratio. Vector x_{it}^{j} includes the extended IDP theory variables, home locational constraints and government incentives, and vector z_i^{j} includes the time-invariant geographic factors. Note that the lagged dependent variable y_{it-1}, i.e. OFDI/GRP(–1), measures one of the extended IDP theory factors, namely the agglomeration effect. Moreover, since the BAMLE can accommodate variables without time variation z_i, we are able to include the

correlation tests suggest that there are first-order serial correlations, which is often expected, but no evidence of second-order serial correlation in the differenced error terms. We also report the difference in the Hansen test to check the exogeneity of each sub-set of instruments, which again does not reject the null of the joint validity of all the instruments.

two geographic factors (location and natural resources endowment) as determinates of China's regional OFDI.

To implement the BAMLE method, only the prior mean model size, m, needs to be specified. It determines the prior inclusion probability (ξ) via the following equation:

$$\xi = m/K \tag{4}$$

Sala-i-Martin et al. (2004) suggest setting $m = 7$ to use the Bayesian Averaging of Classical Estimates method for cross-sectional data. Moral-Benito (2012) proposes setting $m = 5$ instead under the panel framework of the BAMLE method. In our study, we experiment with both prior mean model sizes, i.e. $m = 5$ and $m = 7$, to evaluate whether our results are sensitive to the choice of m. It is important to point out that the Bayesian robustness check adopted in the BAMLE approach is the posterior inclusion probabilities (PIPs) (h) being higher than the prior inclusion probabilities (ξ), i.e., $h > \xi$. Based on Equation (4), ξ in our study is 0.217 when $m = 5$ and 0.304 when $m = 7$ ($K = 23$).

The BAMLE test results are presented in Table 5. Comparing the two sets of results ($m = 5$ and $m = 7$), all variables have the same signs. More importantly, based on the Bayesian robustness check used in the BAMLE approach (i.e., $h > \xi$), the same variables are robust irrespective of the choice of m. This confirms that our results are not sensitive to the choice of m. Specifically, robust home determinants of China's regional OFDI include three government policy variables (presence of SOEs, willingness to approve OFDI and investment in R&D), two extended IDP theory variables (trade openness and agglomeration effect[21]) and one home locational constraint (pollution)[22].

[21] In BAMLE method, the lagged dependent variable (in our case the agglomerate effect) is incorporated in all models, i.e., its posterior inclusion probability is one. We adopt this setting given the overwhelming evidence for the agglomeration effect for OFDI from China (e.g., Cheung & Qian, 2009) and from other countries (see Faeth (2009) for a review). The posterior mean for the agglomerate effect has the expected positive sign. The posterior standard deviation is much smaller than the mean (the latter divided by the former is 4.148 when m=5 and 4.087 when m=7). These confirm that it is a robust determinant.

[22] When interpreting the PIPs in Table 5, an alternative rule of thumb proposed by Jeffreys (1961) and refined by Kass & Raftery (1995) to judge the effectiveness of a regressor in explaining OFDI is that, the effect of a regressor is weak, positive, strong, or decisive if the PIPs lie between 50-75%, 75%-95%, 95%-99% or are greater than 99%, respectively. We thus set the prior inclusion probability to random and re-run the BAMLE tests using one million loops. Robust variables based on this alternative rule include two government policy variables (presence of SOEs (positive), willingness to approve OFDI (decisive)) and two extended IDP theory variables (trade openness (positive), agglomeration effect (decisive)). In our study, we follow the Bayesian robust check rule of the BAMLE method in Moral-Benito (2012), i.e., the PIPs (h) being higher than the prior inclusion probabilities (ξ) ($h > \xi$), especially since the alternative rule does not generate results that are very different from the general conclusions of our paper.

A comparison between Table 5 and Table 4 highlights the following issues. First, results in Table 4 suggest a total of seven significant home determinants of China's regional OFDI based on the three alternative models, while the BAMLE method suggests one fewer, i.e., a total of six variables. Second and more importantly, while the GMM and regression methods suggest three significant variables each for the extended IDP and home locational constraint models and only one for the government incentives model, the BAMLE results in Table 5 highlight the importance of government incentives (three robust variables) in explaining China's regional OFDI compared with the former two models (two and one significant variables respectively). In addition, overall, the robust variables in Table 5 are rather different from those suggested by Table 4. The above comparison first confirms that, given that significant variables are found in all models, irrespective of whether the model uncertainty issue is addressed (in Table 5) or not (in Table 4), it is indeed necessary to employ alternative models to explain the multi-faceted issue of China's regional OFDI. Another interesting finding is that the single model estimates indicate different and more significant variables compared with the BAMLE results, where alternative models are considered simultaneously and model uncertainty issue is addressed. More specifically, employing the single model estimates would exaggerate the importance of the extended IDP and home locational constraints theories and underestimate the significance of government policy factors. Thus, the comparison shows that the impact of model uncertainty on China's regional OFDI estimates is substantial and that employing the BAMLE method is necessary.

We now explain in detail our results in Table 5. Looking at Table 5, we first notice that GRP per capita does not appear to be a robust determinant of China's regional OFDI. This is in contrast to the prediction of the original IDP hypothesis, which is widely observed in previous studies. It is also in contrast to Liu et al. (2005) and Wei & Alon (2010), who extend the original IDP theory to China incorporating additional economic variables. There could be two explanations. First, previous studies, such as Liu et al. (2005) and Wei & Alon (2010), did not distinguish between central and regional OFDI from China. Hence their conclusions may be biased towards central OFDI given its dominant share. Second, although we also employ an extended IDP theory, we compete it with other alternative theories, including the government incentives theory. That GRP per capita is of little importance suggests that other characteristics of the Chinese economy (e.g. government policies) may have much more important effects on China's regional OFDI. As suggested by Durán & Ubeda (2001), OFDI from developing countries may depend less on economic development and

more on the activity carried out by governments. Our results suggest this is the case for China's regional OFDI[23].

We now investigate our prime interest, the government policy variables. All three robust policy variables have the expected signs, confirming our predictions set out in Section 3. It is interesting to notice that both regional government policies, namely willingness to approve OFDI and investment in R&D, are robust. In contrast, only one central government policy, namely presence of SOEs, turns out to be a robust determinant. Our results suggest that both central and local governments have a strong influence on China's regional OFDI. More importantly, our results especially highlight the irreplaceable role of local governments.

On the other hand, six other policy variables, all of which are set by the central government, turn out to have little influence on China's regional OFDI. It is interesting to observe that monetary policy, measured by the real base annual lending rate and credit growth set by the Chinese central bank, does not affect regional firms' decisions on whether to invest abroad. In China's bank-based financial system, in parallel with formal banking institutions, there is a flourishing informal financial market. The increasing demand for credit among China's private enterprises seems to be neglected by the former and hence the latter contributes to closing the gap (Tanaka & Molnar, 2008). A thriving informal banking sector has notably weakened the link between monetary policy and the cost and availability of regional firms' financing.

In terms of home locational constraints, we find that pollution is a robust determinant of China OFDI, but with a positive sign. As pointed out by Chow (2008), although the central government recognises the use of penalties, specific laws are yet to be passed in areas such as listing detailed polluting activities, estimating the negative externalities, and specifying suitable penalties for violations. Another major hindrance to environmental law enforcement is the lack of cooperation from regional governments, which are more interested in increasing regional output than in controlling pollution. Both imply that local firms could be paying much lower penalties than the environmental damage they cause. Assuming that environmental costs must reach a threshold level before they trigger an outflow of FDI (Manderson & Kneller, 2012), before the threshold is reached, firms may be inclined to stay in China rather than to expand abroad. We find domestic consumption and labour cost are not

[23] Note that even when we employ single model estimates for the extended IDP theory for China's OFDI at regional level (Equations (1a) and (1b) in Table 4), GRP per capita turns out to be an insignificant determinant.

robust determinants. This implies that Chinese firms are not taking investment abroad as an exit strategy based on insufficient domestic demand. Despite rapidly increasing labour costs, the relative cost of labour may still be low enough to attract firms to stay in China. Our results also indicate that Chinese regional investors do not invest abroad in order to escape foreign competition or poor infrastructure in China.

Turning to the extended IDP theory, only two economic variables, namely trade openness and the agglomeration effect, are found to be robust. It seems that the other four factors have little influence on OFDI at regional level. For instance, while inward FDI concentrates on manufacturing industry in China, regional OFDI flows to other industries. Also, despite greater availability of FX reserves at local level, financial institutions that channel reserves to international firms may remain underdeveloped. Technological capability and human capital stock not being robust may suggest that regional overseas investors do not tend to invest in high technology sectors. Note that GRP per capital not being a robust determinant has been discussed above.

Both geographic factors have high PIPs, but their posterior standard deviations are higher than the posterior means. It implies these two variables are associated with OFDI, but we are not able to confirm in which direction. The same conclusion is reached when $m = 5$ and $m = 7$. We originally expect geographic location to be an important determinant. However, our empirical results suggest otherwise. Given the shifting of OFDI sources from eastern to inner and western regions, such results may reflect an overall more balanced distribution of OFDI across the regions of China in recent decade.

To sum up, the BAMLE results first confirm the explanatory power of all the proposed theories (except the geographic factors) in our study. The importance of government policy variables, namely presence of SOEs, willingness to approve local OFDI and investment in R&D, are particularly highlighted. The fact that two of the three polices variables are at local level shows that local governments significantly influence regional OFDI. Our study does not support the original IDP theory. In other words, China's OFDI, at least at regional level, is not the result of economic development as measured solely by GRP per capita. Our results are not sensitive to the choice of prior mean model size.

6 Conclusions and policy implications

Our study investigates the home determinants of China's regional OFDI. We provide a first analysis that focuses on China's OFDI at regional level, using a theoretical framework that integrates four different but complementary explanations: the extended IDP theory, home locational constraints, government incentives and geographic factors. Many variables examined in our study have never been introduced previously to analyse China's OFDI. At the empirical level, we employ the BAMLE method to deal with the issue of model uncertainty. This is the first time this method has been used in the FDI literature. A comparison between the BAMLE method and traditional panel regression and GMM methods confirms the necessity of employing the former.

Overall, our results first confirm the importance of the extended IDP theory, home locational constraints and government policies in determining China's regional OFDI. At the same time, it also shows that none of these aspects alone has full explanatory power. Thus, our results demonstrate the necessity of employing a framework that combines several theories to better understand the drivers of China's regional OFDI. Second, our findings highlight the importance of government policy variables, namely the presence of SOEs, willingness to approve local OFDI, and investment in R&D. More importantly, we find local government policies (such as the latter two policies above) have notable influence on regional OFDI. This suggests that the rising importance of the local governments should not be overlooked, especially on issues of regional dimension. Third, although previous studies may suggest that OFDI will be automatically promoted by economic development in transitional or developing economies (e.g. Liu et al. (2005)), our study clearly indicates that, at least at regional level, China's overseas investment is not due solely to economic as development measured by GRP per capita. Rather, our study emphasises the vital role of government policies, both at regional and central levels, in determining China's regional OFDI. Fourth, robust variables based on the extended IDP theory include trade openness and agglomeration effect, but pollution is the only home locational constraint that is robust. Fifth, geographic factors have little impact on regional OFDI. Our results are not sensitive to the choice of prior mean model size.

Our study provides important implications for policy makers at both the central and local levels. OFDI promoting policies have largely been designed at the central level. Central

policy makers need to recognise the heterogeneity of regional economies and that local investment may respond to a different set of factors compared with central investment abroad. It is important to take these differences into account when setting OFDI policies, especially given that about a quarter of China's OFDI originates at local level. For instance, while granting lower interest rates on loans to facilitate OFDI may boost overseas investment from centrally-owned enterprises, it may have little impact on investment decisions of local firms as their financing mainly depends on informal financial markets. In order to effectively encourage foreign investment at local level, policy makers need to employ measures that can lower the interest rates in the informal financial markets rather than at the large state owned banks.

As for the regional level, our study provides direct reference on the tools that local government can employ to support firms' overseas investment, such as more investment in R&D, approving OFDI projects based on their merits rather than local economic growth and unemployment rates, and directing a certain amount of resources away from SOEs. In addition, local authorities can also help encourage foreign trade, price pollution properly, and actively penalise polluters. It is equally important that both levels of governments cooperate. For example, pollution law implemented by central government may have minimal local effect if local authorities are only interested in increasing their output rather than enforcing penalties.

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Figure and tables

Figure 1 Map of China

Source: The Huntington Archive http://huntingtonarchive.osu.edu/resources/locatorMaps.html#!pretty-Photo/52/

Note: There are thirty one regions in China, which include twenty two provinces (Anhui, Fujian, Gansu, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang), five Autonomous Regions (Guangxi , Inner Mongolia, Ningxia, Tibet, Xinjiang) and four Municipalities (Beijing, Chongqing, Shanghai, Tianjin). In our study we include all these regions except Tibet due to data limitations.

Table 1 China's OFDI at central and regional levels (million USD)

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total OFDI	2855	5498	12261	17634	26506	41859	47795	60182	68584
Central OFDI	2098	4525	10204	15237	21253	35983	38193	42437	45023
Regional OFDI	757	973	2058	2397	5253	5876	9603	17745	23560
Regional / Total OFDI (%)	26.5	17.7	16.8	13.6	19.8	14.0	20.1	29.5	34.4

Table 2 Review on recent empirical analysis on determinants of China's OFDI

Authors	Level	Home/Host	Theoretical Framework	Methodology
Liu et al. (2005)	Country	Home	Investment Development Path (IDP) theory	Cointegration and GMM
Wei & Alon (2010)	Country	Home	Extended IDP theory	Partial least square regression)
Tolentino (2010)	Country	Home	Home country-specific macroeconomic factors of China and India (it is argued that ownership advantages reflect national economic characteristics)	Vector Autoregression (VAR) model
Buckley et al. (2007)	Country	Host	Three special explanations (capital market imperfections, special ownership advantages and institutional factors) are nested within the general theory of the multinational firm (Market-seeking motive, resources seeking motive, strategic asset seeking motive)	Regression analysis (pooled OLS and random effect Generalised Least Squares(GLS))
Cheng & Ma (2008)	Country	Host	A set of macroeconomic variables are identified based on literature review and data availability	Regression analysis (on a gravity model)
Cheung & Qian (2009)	Country	Host	Market-seeking motive, resources seeking motive	Regression analysis
Kolstad & Wigg (2012)	Country	Host	Determinants are identified based on conclusions derived from review of literature and the characteristics of the Chinese economy	Regression analysis
Amighini et al. (2011)	Industry	Host	Market-seeking motive, resources seeking motive, strategic asset seeking	Random effect probit model
Wang et al. (2012)	Firm	Home	A combination of three theoretical frameworks: resource based view of firms, industrial organisation economy, and institutional theory (to capture firm, industry, and country level variables respectively)	Regression analysis
Amighini et al. (2012)	Ownership (SOEs and private firms)	Host	Market-seeking motive, resources seeking motive, strategic asset seeking motive	Random effect panel Poisson model

Table 3 Descriptive statistics and correlation coefficients

Variables	Mean	S.d.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1) GRP per capita	9.79	0.62	1																				
(2) human capital	2.36	0.08	0.69	1																			
(3) inward FDI	0.55	1.14	0.50	0.49	1																		
(4) international trade	2.97	1.02	0.69	0.54	0.53	1																	
(5) FX reserves	4.68	0.35	–0.26	–0.39	–0.08	–0.24	1																
(6) technology capability	0.22	1.19	0.68	0.63	0.51	0.74	–0.23	1															
(7) agglomeration effects	2.31	0.01	0.47	0.30	0.12	0.34	–0.17	0.49	1														
(8) cost of labour	11.01	3.60	–0.10	0.10	0.15	–0.04	–0.09	–0.16	–0.17	1													
(9) foreign competition	3.10	0.93	0.51	0.45	0.77	0.58	–0.08	0.54	0.14	0.09	1												
(10) pollution	–2.30	0.29	–0.08	–0.08	–0.23	–0.07	–0.11	0.00	–0.11	0.03	–0.22	1											
(11) domestic consumption	3.56	0.18	–0.65	–0.44	–0.24	–0.36	0.09	–0.41	–0.10	–0.04	–0.23	–0.13	1										
(12) infrastructure	3.12	0.62	–0.20	–0.37	–0.50	–0.55	0.18	–0.33	–0.11	–0.07	–0.62	–0.05	–0.07	1									
(13) RMB exchange rate	4.72	0.12	0.44	0.20	–0.11	–0.12	–0.03	0.37	0.40	–0.30	–0.08	–0.22	–0.24	0.45	1								
(14) credit growth	3.18	0.38	0.27	0.14	0.06	0.17	–0.19	0.34	0.28	–0.09	0.08	–0.06	–0.07	0.01	0.31	1							
(15) corporate tax rate	–0.42	0.62	0.68	0.47	0.33	0.57	–0.34	0.69	0.41	–0.02	0.38	–0.14	–0.23	–0.24	0.27	0.49	1						
(16) rights of the workers	2.40	0.42	0.79	0.42	0.35	0.37	0.03	0.68	0.38	–0.17	0.40	–0.22	–0.48	0.06	0.59	0.28	0.53	1					
(17) willingness to approve OFDI	1.31	0.21	–0.37	–0.40	–0.11	–0.42	0.60	–0.37	–0.30	0.03	–0.18	–0.03	0.27	0.13	–0.13	–0.25	–0.43	–0.13	1				
(18) investment on R&D	5.17	0.87	0.62	0.37	0.29	0.32	–0.06	0.68	0.40	–0.16	0.37	–0.01	–0.25	–0.08	0.55	0.12	0.47	0.49	–0.27	1			
(19) interest rate	2.79	2.08	–0.00	0.04	0.14	0.12	–0.01	0.04	–0.09	0.25	0.12	0.04	0.04	–0.21	–0.38	0.25	0.24	–0.12	–0.03	–0.10	1		
(20) anti–corruption effort	3.39	0.35	0.11	0.18	0.01	–0.11	0.12	–0.01	0.00	0.06	–0.08	0.01	–0.28	0.15	0.15	0.01	–0.03	0.16	0.06	–0.05	–0.03	1	
(21) presence of SOEs	3.80	0.39	–0.07	0.03	–0.40	–0.21	–0.09	–0.16	0.00	0.08	–0.39	0.46	–0.03	0.21	0.07	–0.09	–0.05	–0.09	0.18	–0.19	–0.07	0.21	1

Note: geographic variables are not included in this table as they are dummy variables (see Appendix A)

Table 4 Single model results

Dependent variable: China's regional OFDI to GRP ratio								
(1) The extended IDP theory				(2) Home locational constraints		(3) Government incentives	
(1a) Panel regression (fixed effect)		(1b) GMM		(2) Panel regression (fixed effect)		(3) Panel regression (fixed effect)	
GRP per capita	0.0215 (0.0147)	GRP per capita	–0.0435 (0.0381)	Cost of labour	–0.0005** (0.0002)	RMB exchange rate	0.0165 (0.0315)
Human capital	–0.1296 (0.1069)	Human capital	–0.2765* (0.1450)	Foreign competition	–0.0013 (0.0045)	Credit growth	–0.0023 (0.0035)
Inward FDI	–0.0023 (0.0028)	Inward FDI	–0.0029 (0.0106)	Pollution	–0.0243* (0.0139)	Corporate tax rate	0.0076 (0.0053)
International trade	0.0180 (0.0142)	International trade	0.0313 (0.0226)	Domestic consumption	–0.0201 (0.0252)	Right of the workers	–0.0126 (0.0115)
FX reserves	–0.0094* (0.0050)	FX reserves	0.0221 (0.0329)	Infrastructure	0.0074** (0.0032)	Willingness to approve OFDI	–0.1113* (0.0564)
Technology capability	0.0035 (0.0045)	Technology capability	0.0405* (0.0236)	Constant	2.3179*** (0.1079)	Investment on R&D	0.0083 (0.0075)
Agglomeration effects	0.6086 (0.4328)	Agglomeration effects	1.3647*** (0.2083)			Interest rate	–0.0006 (0.0008)
Constant	0.9949 (0.9037)					Anti-corruption effort	–0.0011 (0.0051)
						Presence of SOEs	–0.0303 (0.02559)
						Constant	2.5011 (0.2622)
No. of observations	240	No. of observations	240	No. of observations	240	No. of observations	240
No. of groups	30	No. of groups	30	No. of groups	30	No. of groups	30
ρ	0.6642	AR1 (p-value)	0.016	ρ	0.2780	ρ	0.7776
R^2	0.4732	AR2 (p-value)	0.916	R^2	0.2814	R^2	0.5714
Adjusted R^2	0.3798	Hansen (p-value)	0.763	Adjusted R^2	0.1774	Adjusted R^2	0.5009
F-value	33.43***	Difference in Hansen test (p-value)	0.937	F-value	6.95***	F-value	6.30***

Note: Panel regression is employed for estimations (1a), (2) and (3). In all three cases fixed effect model is chosen over random effect model based on Hausman test results. System-GMM (two step) is employed for the estimation (1b). The t-stats are in brackets. *, ** and *** indicate 10%, 5% and 1% significance level, respectively. AR1 and AR2 are tests for 1st order serial 2nd order serial correlation, respectively. All variables are defined in Appendix A

Table 5 BAMLE approach results

Variables	m=5			m=7		
	Posterior Inclusion Probability (PIPs) (h)	Posterior Mean	Posterior Standard Deviation	Posterior Inclusion Probability (PIPs) (h)	Posterior Mean	Posterior Standard Deviation
Extended IDP theory						
(1) GRP per capita	0.022	–0.001	0.002	0.037	–0.001	0.002
(2) human capital	0.044	–0.061	0.061	0.063	–0.060	0.062
(3) inward FDI	0.025	0.000	0.002	0.036	0.000	0.003
(4) international trade	0.735	0.017	0.006	0.855	0.018	0.006
(5) FX reserves	0.095	–0.006	0.006	0.130	–0.006	0.006
(6) technology capability	0.053	0.002	0.005	0.071	0.003	0.005
(7) agglomeration effects	1.000	0.477	0.115	1.000	0.470	0.115
Home locational constraints						
(8) cost of labour	0.024	0.000	0.000	0.038	0.000	0.000
(9) foreign competition	0.031	0.001	0.006	0.053	0.000	0.007
(10) pollution	0.352	–0.019	0.012	0.454	–0.020	0.012
(11) domestic consumption	0.050	0.007	0.014	0.069	0.007	0.014
(12) infrastructure	0.051	–0.008	0.007	0.074	–0.008	0.007
Government incentives						
(13) RMB exchange rate	0.055	0.109	0.082	0.098	0.123	0.083
(14) credit growth	0.025	0.002	0.006	0.042	0.001	0.006
(15) corporate tax rate	0.186	0.014	0.007	0.199	0.013	0.007
(16) rights of the workers	0.118	–0.021	0.012	0.197	–0.023	0.013
(17) willingness to approve OFDI	1.000	–0.100	0.016	1.000	–0.098	0.016
(18) investment on R&D	0.309	0.030	0.016	0.401	0.030	0.016
(19) interest rate	0.052	–0.002	0.001	0.080	–0.002	0.001
(20) anti-corruption effort	0.044	–0.004	0.004	0.065	–0.004	0.004
(21) presence of SOEs	0.781	–0.044	0.013	0.866	–0.044	0.013
Geographic factors						
(22) Geographic location	0.478	0.002	0.004	0.432	0.001	0.004
(23) Natural resources endowment	0.535	–0.003	0.003	0.587	–0.003	0.003

Note: GAUSS algorithm for the BAMLE method is provided by Dr. Moral-Benito. There are as many as 2^K models given K explanatory variables. Moreal-Benito (2012) employs Markov Chain Monte Carlo Model Composition (MC^3) algorithm to reduce the number of model under consideration. The number of iterations of the algorithm is set at one million. Following Moral-Benito (2012), the Bayesian robustness check adopted in the BAMLE approach is the PIPs (h) being higher than the prior inclusion probabilities (ξ), i.e., $h > \xi$. Based on Equation (4), ξ in our study is 0.217 when $m = 5$ and 0.304 when $m = 7$ ($K = 23$).

Appendix A. Regional variable measurement and data source

Variables	Measurement	Data source
outward FDI	outward FDI divided by gross regional product (GRP)	*SBCOFDI,*
(1) GRP per capita	Real GRP per capita (nominal GRP adjusted by consumer price index (CPI)) divided by regional population)	*CSY*
(2) human capital	average schooling years of working population (see Wang and Yao (2003) for a similar measurement)	*CSY*
(3) inward FDI	inward FDI divided by GRP	*CCSY, CSY*
(4) international trade	sum of export and import divided by GRP	*CCSY, CSY*
(5) FX reserves	export minus import divided by GRP	*CCSY, CSY*
(6) technology capability	patent applications divided by population	*CSY*
(7) agglomeration effects	outward FDI of the previous year	*SBCOFDI,*
(8) cost of labour	growth rate of real average salary (nominal salary adjusted by CPI) per person.	*CSY*
(9) foreign competition	exports from foreign invested enterprises divided by total exports	*CSY*
(10) pollution	the amount of CO_2 emission (standard cubic meter) divided by population	*CSY*
(11) domestic consumption	household consumption divided by GRP	*CSY*
(12) infrastructure	number of landlines per person	*CSY*
(13) RMB exchange rate	real CNY/USD exchange rate (nominal rate adjusted by relative CPI of the US to each Chinese region)	*IFS, CSY*
(14) credit growth	loan growth divided by GRP	*ACFB, CSY*
(15) corporate tax rate	corporate tax divided by GRP	*CCSY, CSY*
(16) rights of the workers	number of trade unions divided by population	*CLSY, CSY*
(17) willingness to approve OFDI	unemployment rate	*CSY*
(18) investment on R&D	ratio of regional governments' investment on science and research to total governments' expenditure	*CSY*
(19) interest rate	annual national base interest rate set by the central bank adjusted by regional CPI to obtain the real regional rates	*PBC, CSY*
(20) anti-corruption effort	number of registered cases under the direct investigation of the people's procuratorates divided by population	*PYC, CSY*
(21) presence of SOEs	SOEs' output to GRP (SOEs defined following Duanmu (2012) and Amighini et al. (2012))	*CSY*
(22) Geographic location	one for coastal (non-landlocked) regions (Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan) and zero for interior regions	Figure 1
(23) Natural resources endowment	one for natural resources rich regions (regions with stock in coal higher than regional average) (Shanxi, Inner Mongolia, Anhui, Shandong, Henan, Shaanxi and Xinjiang) and zero for other regions	*CSY*

Note: SBCOFDI: Statistical Bulletin of China's Outward Foreign Direct Investment; CSY: China Statistical Yearbook; IFS: International Financial Statistics; CCSY: China City Statistical Yearbook; ACFB: Almanac of China's Finance and Banking; PYC: Procuratorial Yearbook of China; CLSY: China Labour Statistical Yearbook, PBC: People's Bank of China (http://www.pbc.gov.cn/). Sample period is 2003-2011. All price indices have 2005 as the base year (2005=100). All data are at regional level (note that the annual base interest rate set by the central bank and the nominal exchange of CNY/USD are national level data before they were adjusted by regional CPI to obtain the regional real terms). All variables are in natural logarithm except the cost of labour and interest rate.

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