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Economic complexity and the global asset-seeking strategies of Chinese multinationals

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ABSTRACT

This article investigates the role of economic complexity in capturing asset-seeking motives and strategies of global knowledge accumulation by analysing the location decisions of Chinese multinationals. Using data on 14,873 Chinese subsidiaries in 78 countries for 2007–2015, we find that investment is associated with locations with lower economic complexity. This applies especially for destination countries within the OECD and MNCs in knowledge-intensive industries, whereas firms with a strong knowledge base may instead seek out locations with high economic complexity. Results are consistent with a strategy of accessing relatively low-complexity capabilities that can be accumulated to build and reinforce the international advantage and competitiveness of the multinational.

1. Introduction

The location decisions of multinational corporations (MNCs) are fundamentally guided by their global search for competitive advantage, which depends on corporate objectives, locations' characteristics and the complementarity between the two (Cantwell and Narula 2001; Iammarino and McCann 2013). As such, MNCs may select locations based on a range of different rationales. Of these, *strategic asset-seeking*, i.e. foreign direct investment (FDI) to access new knowledge or capabilities, emerges as particularly important, especially for MNCs from emerging economies (e.g. Makino, Lau, and Yeh 2002; Matthews 2006; Luo and Tung 2007; Athreye and Kapur 2009). A central component of these strategies pertains to the content as well as the sophistication of available knowledge pools. This article views asset-seeking through the lens of *economic complexity*, which offers a novel framework of conceptualising the non-tradable capabilities of locations. The notion of economic complexity relies on the idea that a country's knowledge or capabilities can be derived from characteristics of its exports, where more diverse and less ubiquitous export goods imply a more sophisticated knowledge base (Hidalgo and Hausmann 2009). In this sense, economic complexity offers an avenue for extending the study of location decisions by using a richer

conceptualisation of local capabilities. Hence, the aim of this article is to join the study of the determinants of location decisions with the perspective of economic complexity in order to investigate whether companies' locational choices target host markets with higher complexity in their knowledge bases.

We pursue this objective by investigating the global strategies of Chinese MNCs and evaluating why, whether and to what extent the location of their international subsidiaries responds to the complexity of host economies. The case of Chinese multinationals represents an interesting application for this topic for a variety of reasons. First, due to the external nature of their engagement in a country, MNCs represent actors whose investment strategies are taken into account in most scholarly analyses of firm location strategies (e.g. Head and Mayer 2004; Defever 2006; Crescenzi, Pietrobelli, and Rabellotti 2014). Second, Chinese companies play a prominent and increasing role on global markets: their outward FDI more than doubled from \$88 billion in 2012 to \$196 billion in 2016, ranking China second only after the US in terms of its MNCs' global activities (UNCTAD 2018). Third, the asset-seeking rationale for outward investment is particularly emphasised for corporations from emerging markets (Dunning and Narula 1996; Child and Rodrigues 2005; Gaur and Kumar 2010). Indeed, Chinese MNCs are often described to survey the global economy for capabilities to be tapped on the basis of their complementarity, imitability and transferability (Yiu, Bruton, and Lu 2005; Matthews 2006) and some suggest that the *raison d'être* of some newcomer MNCs may even stand in the global search for complementary capabilities that are not available in their home market (Luo and Tung 2007; Cuervo-Cazurra 2012).

By investigating the relationship between location decisions and economic complexity on a global scale, this article combines the economic complexity perspective with both the economic geography literature on firms' location decisions and the growing literature on the behaviour of emerging markets' MNCs, thus bridging various and complementary academic communities. Indeed, location decisions represent a natural field of application for the information provided by economic complexity. Moreover, and in consideration of the tight inter-country connections generated by global markets, the analysis of the relationship between economic complexity and MNCs' location strategies can also be considered as a step towards a better understanding of the processes of capability accumulation in the case of emerging economies, such as China, and how the access to foreign pools of sophisticated competences can contribute to the upgrading of production structures over time.

Analysing restricted-access data on 14,873 subsidiaries of Chinese MNCs located in 78 countries over the period 2007–2015 (from the Bureau van Dijk Historical Ownership Database) and the economic complexity index (ECI), we find that Chinese MNCs privilege destinations characterised by lower economic complexity, especially within the OECD and in knowledge-intensive industries, while firms with strong knowledge bases may instead prioritise host countries with high economic complexity. Not only is this in line with the view that emerging markets' MNCs invest in advanced economies to learn and capture novel capabilities, but it also suggests that, at their relatively early stage of internationalisation, MNCs from emerging markets may only be able to successfully mobilise foreign knowledge resources within their limited reach in terms of complementarity and transferability.

The article is organised as follows. The next section provides the conceptual background of our study by discussing the locational determinants of emerging markets', and Chinese, MNCs as well as motivating the relevance of economic complexity as a driver of asset-seeking foreign investment before developing empirical hypotheses. Next, we describe the data and our methodological approach. Then, we present and discuss the results. Finally, we draw conclusions and offer relevant managerial and policy implications for stakeholders in both origin economies of MNCs and recipient countries.

2. Conceptual background

2.1. The internationalisation of MNCs from emerging economies

A broad consensus exists among scholars from different fields, including international business studies, economic geography and economics, regarding the competitive sources of companies' 'multinationality'. Across these disciplines, a long-standing tradition of academic work sustains the idea that a firm's higher productivity or the possession of firm-specific advantages generates a push towards the internationalisation of operations (Hymer 1960/1976; Dunning 1981; Barba Navaretti and Venables 2001; Helpman, Melitz, and Yeaple 2004; Iammarino and McCann 2013). These advantages can be exploited in foreign markets as a strategy to overcome the local obstacles to business activity (Dunning 1993), such as higher costs of running operations in unfamiliar contexts (Zaheer 1995).

However, since MNCs from emerging economies may lack the initial resources for the exploitation of foreign markets, their internationalisation tends to be driven by the need to construct and consolidate firm-specific advantages via foreign investment (Child and Rodrigues 2005; Yiu, Lau, and Bruton 2007). This quest for valuable resources conceptually motivates most theoretical views regarding outward investment projects of MNCs from emerging economies in industrialised (Deng 2007) as well as developing countries (Kang and Jiang 2012). Furthermore, and in contrast to MNCs from developed economies, latecomer MNCs from emerging markets can develop their international strategies within a world system at an advanced stage of globalisation, thus having the opportunity to tap into foreign resources more easily and at lower cost than their counterparts in the past (Matthews 2006; Williamson and Zeng 2009). Taken together, these aspects motivate the rapid pace of foreign engagement of emerging countries' MNCs in recent years and their tendency to leapfrog some stages of the internationalisation process (Luo and Tung 2007; Ramamurti 2012; Ramamurti and Hilleman 2018).

It should be noted that the construction of a competitive position on the international stage is often channelled through specific organisational forms, such as state-owned enterprises (SOEs) and business groups (Aminghini, Rabellotti, and Sanfilippo 2013). Not only do these provide affiliated companies with the necessary competitive attributes to pursue global business strategies of resource search, access and exploitation (Li et al. 2013), but they can also produce real business partnerships between the home government and national MNCs (Luo, Xue, and Han 2010). Especially, the Chinese government is believed to shape the internationalisation strategies of national companies over the years, facilitating their global deals and their access to foreign markets (Cuervo-Cazurra et al. 2014).

Having discussed the internationalisation of emerging countries MNC, we now turn to the specific locational determinants of Chinese global investments. This is a recent and growing literature, which mirrors the increasing and paramount international presence of Chinese MNCs and the 'going global' attitude of China after the WTO accession in 2001. The seminal contribution by Buckley et al. (2007) represents a fundamental theoretical and empirical perspective on the host country factors attracting Chinese outward investment. By combining internalisation and institutional theory with the ownership advantages of Chinese companies (Buckley et al. 2018), they empirically test for the relevance of several host country characteristics in attracting Chinese outward investment. Their results mainly highlight the relevance of a *market-seeking* rationale for outward direct investment directed towards OECD countries, thus suggesting that Chinese MNCs (in line with most studies on developed countries MNCs (see Head and Mayer 2004)) go abroad to explore and access new market opportunities. On the contrary, the *strategic asset- seeking* motive remains unsupported in their findings, while they report a clear preference of Chinese MNCs for risky institutional contexts (Buckley et al. 2018), suggesting a relatively risk prone attitude of Chinese investors compared to international companies from developed economies.

Most subsequent studies extend the analysis of Chinese outward investment determinants along the lines suggested by Buckley et al. (2007). This stream of works offers both consistent and conflicting results on various host country factors attracting Chinese MNCs, probably due to the wide diversity in data, variables, methodological approaches and time periods analysed (Duanmu 2012; Ramasamy, Yeung, and Laforet 2012; Han, Chi, and Li 2014; Li et al. 2018). Most works build on the investigation of *market-seeking, natural resource-seeking* and *asset-seeking* motives for Chinese firms' internationalisation, as well as the incidence of recipients' institutions in terms of political risk and rule of law. Overall, market access considerations emerge as the clearest and most robust locational determinant of Chinese MNCs' engagement abroad, especially as far as investment in developed countries is concerned (Cheung and Qian 2009; Kolstad and Wiig 2012), but not in other types of destinations, such as non-OECD economies (Kang and Jiang 2012). Gaining access to natural resources is also regarded as a crucial element in Chinese MNCs' strategies, but extant evidence remains mixed on this aspect, with studies offering only partial evidence (Zhang and Daly 2011; Ramasamy, Yeung, and Laforet 2012; Li et al. 2018). Realistically, this type of investment motive is more relevant for Chinese investors targeting developing economies (Cheung and Qian 2009; Kang and Jiang 2012; Li et al. 2013), for SOEs more than private companies (Ramasamy, Yeung, and Laforet 2012), and for Chinese firms operating in specific resource-related sectors (Quer et al. 2012). Nevertheless, the most ambiguous evidence pertains to asset-seeking motives of Chinese MNCs' outward investment, which conceptually motivates Chinese outward expansion as a strategy to gain access to superior knowledge pools (Cozza, Rabellotti, and Sanfilippo 2015; Huang and Zhang 2017). In fact, existing studies on the location determinants of Chinese foreign investment surprisingly reach very opposite results, by detecting both a negative or a positive relationship between Chinese investment and host country patents (Ramasamy, Yeung, and Laforet 2012; Han, Chi, and Li 2014; Li et al. 2018). In other instances, the role of technological capabilities in host locations, instead, is relevant for Chinese foreign investment depending on the specific industrial advantage of the host economy (Li et al. 2012)

In general, the recent literature on the determinants of Chinese FDI tends to be characterised by mixed results, probably as a consequence of the many different empirical settings of each single study (for a review see Paul and Benito 2017). In fact, in comparing and summarising the main FDI motives of Chinese FDI, Table 1 shows how selected extant studies are heterogeneous in terms of the methodologies applied, the samples considered, the time periods covered, the variables employed and, ultimately, the results obtained.

2.2. The case for economic complexity for the asset-seeking strategies of Chinese MNCs

As it emerges from the discussion above, a gap exists between the theoretical expectations and the empirical findings of the existing literature when it comes to certain drivers of Chinese outward foreign direct investment, in particular asset-seeking motives. Conceptually, a consensus exists on the idea that the internationalisation process of emerging markets' MNCs is characterised by the global search for strategic assets, as a key condition to overcome their latecomer disadvantage in global markets (e.g. Makino, Lau, and Yeh 2002; Matthews 2006; Luo and Tung 2007). Nevertheless, as shown in Table 1, the literature that explicitly addresses the location drivers of Chinese outward investment remains characterised by strikingly ambiguous results on the role of foreign assets as a key element motivating Chinese investors.

Empirically, most studies have operationalised the strategic asset-seeking motive by means of patent counts in destination countries and this could be one reason for the mixed results in existing works. In fact, the well-known limitations of patent statistics (see for instance Griliches 1990) may be particularly severe when the purpose is capturing asset-seeking motives of foreign investment from emerging countries' MNCs and when the analysis also encompasses countries from the Global South as potential destinations of investment. As a measure of invention rather than innovation, patents capture a rather high-end outcome of the whole process of new knowledge creation, which affects the strategic asset-seeking motive both in terms of the type of capabilities sought out by MNCs and offered by host countries. Patents could be particularly misleading in the case of MNCs from emerging markets, as these companies aim at learning core competences and capabilities within their reach, rather than accumulating frontier knowledge that they may be unable to exploit at home (Dunning and Narula 1996). In fact, these more basic competences and capabilities, rather than high-end innovations, are positively evaluated by emerging markets' MNCs for their complementarity with the MNC's existing knowledge base, for their imitability and transferability (Matthews 2006). As a consequence, and in consideration of the relatively early stage of the internationalisation process of most Chinese MNCs, host countries' endowment of less complex assets could be particularly relevant for Chinese foreign investment choices. However, these tend to be entirely missed by patent statistics, thus producing a clear divide between theoretical predictions and empirical outcomes regarding Chinese MNCs asset-seeking motivations for outward investment. Thus, on the one hand, while Chinese MNCs may be pursuing strategic asset-seeking motives, they may be looking for assets not described by high patent counts. On the other hand, when considering destination countries in the Global

Table 1. Comparison and summary of the existing studies on the locational determinants of Chinese outward FDI.

Authors	Time period	Countries	Method	Dependent Variable	Main FDI motives	Main findings	Notes
Buckley et al. (2007)	1984–2001	49	Pooled OLS and Random Effects	Total amount of foreign exchange	Market seeking: Resource seeking: Asset seeking: Political Risk:	+** +** with OLS only Not sig. +**	Split between two different time periods and between OECD and non-OECD economies
Duanmu and Guney (2009)	1999–2002	33	Fixed Effects	Annual FDI flow	Market seeking: Resource seeking: Political Risk:	+** Not sig. +**	
Cheung and Qian (2009)	1991–2005	50	Fixed Effects	FDI stock on recipients' population	Market seeking: Resource seeking: Efficiency-seeking:	+** for developed countries. +*** for developing countries. +*** for developed countries. -*** for developing countries.	Split between developed and developing countries.
Zhang and Daly (2011)	2003–2009	23	Pooled OLS	Annual outward FDI flow	Political Risk: Market seeking: Resource seeking:	Not sig. +** Not sig.	
Duanmu (2012)	1998–2008	32	Conditional and Nested Logit	Dummy for chosen location	Market seeking: Resource seeking: Efficiency-seeking: Political Risk:	+*** Not sig. -** +***	Analysis of 189 MNEs from Jiangsu province; Split between SOE and non-SOE, and manufacturing vs. non-manufacturing.
Kang and Jiang (2012)	1995–2007	8	Random Effects	FDI stock	Market seeking: Resource seeking: Efficiency seeking:	Not sig. +*** for developing countries. -***	
Quer et al. (2012)	2002–2009	52	Conditional Logit	Dummy for chosen location	Market seeking: Resource seeking: Political Risk:	Not sig. +** Not sig.	Analysis of 139 FDI by 29 Chinese firms from the Fortune Global 500 list.
Ramasamy, Yeung, and Laforet (2012)	2006–2008	78	Poisson and Negative Binomial	Frequency count of Chinese FDI projects	Market seeking: Resource seeking: Asset seeking: Political Risk:	+** for private firms. +*** -** -*	Analysis of 1350 FDI by 63 companies listed on the Shanghai and Shenzhen Stock Exchange.
Kolstad and Wiig (2012)	2003–2006	104	OLS	Annual inflow of Chinese FDI	Market seeking: Resource seeking: Rule of Law:	+*** for non-OECD countries. Not sig. Not sig.	Split between OECD and non-OECD economies.
Han, Chi, and Li (2014)	2003–2010	48	OLS	FDI stock	Market seeking: Resource seeking: Asset seeking: Political Risk:	+*** +*** +*** +***	

(Continued)

Table 1. (Continued).

Authors	Time period	Countries	Method	Dependent Variable	Main FDI motives	Main findings	Notes
Quer et al. (2018)	2005–2013	93	Conditional Logit	Dummy for chosen location	Market seeking: Resource seeking: Political Risk:	+*** +*** -*** for all firms; +*** for SOEs.	Analysis of 489 FDI by 186 Chinese firms, differentiating between SOEs and non-SOEs.
Li et al. (2018)	2003–2014	56	Conditional Logit	Dummy for chosen location	Asset seeking: Resource seeking: Law and Order: Diplomatic relations:	+*** Not sig. +*** +*** for SOEs.	Analysis of 1432 subsidiaries of 516 Chinese companies listed on the Shanghai and Shenzhen Stock Exchange; Split between SOEs and non-SOEs and other organisational forms.

Notes: In the column 'Main findings', the sign + indicates a positive coefficient, while the sign – stands for a negative coefficient; *, ** and *** indicate 10%, 5% and 1% significance levels, respectively; Not sig. denotes instead insignificant coefficients.

South, structural weaknesses in terms of patenting capacity may incorrectly be interpreted as a lack of strategic assets rather than an endowment of a different kind of local capacity.

Furthermore, by definition, patent statistics miss non-patented innovations, which can also be relevant as a location determinant for Chinese MNCs: industrial secrecy and the fact that most incremental innovation may not qualify for patenting represent two possible reasons for this weakness of patent statistics. Moreover, the propensity to patent differs across manufacturing sectors, with R&D-intensive industries characterised by a larger number of patents due to the very nature of their innovation process. Other sectors can be equally innovative, but their process of new knowledge creation mostly refers to activities that are not taken into account by the majority of innovation indicators (e.g. Von Tunzelmann and Acha 2005; Hirsch-Kreinsen and Jacobson 2008). More generally, patent statistics may capture both economically valuable innovations and outcomes of core research with limited economic significance (Griliches 1990). Nonetheless, the corporate strategies of latecomer MNCs tend to more extensively target foreign assets with a clear commercial potential (Ramasamy, Yeung, and Laforet 2012), and patent statistics can hardly offer a clean indication of this type of assets, especially within very developed innovation systems where the share of patents with a purely technical relevance is larger.

For these reasons, and with specific reference to the context of this article, we propose economic complexity as an alternative conceptualisation of locations' strategic assets, overcoming some of the empirical limitations of patent data but also opening up the discussion to a broader idea of local *capabilities*. The notion of economic complexity, as described by Hidalgo and Hausmann (2009) suggests that a countries' capabilities can be inferred from the goods this country already produces. In particular, if the production of a certain good requires a certain set of capabilities, then information on the variety of goods exported is an indicator for the presence of these capabilities. Moreover, taking into account which other countries export this specific good allows a further judgement on the sophistication of production. Therefore, using the concepts of *diversity* and *ubiquity* of exports, the notion of economic complexity becomes a measure of local skills and knowledge embedded in the production process.

Since more developed economies export a broader and more sophisticated basket of goods (e.g. Hidalgo et al. 2007; Felipe et al. 2012) it has been shown that the economic complexity index (ECI) correlates highly and consistently with measures of development. As such, economic complexity is positively correlated with GDP per capita and GDP growth in global cross-country comparisons (Hidalgo and Hausmann 2009; Zhu and Li 2017) but also with economic disparities at a regional scale for instance for Australia (Reynolds et al. 2018), Mexico (Chávez, Mosqueda, and Gómez-Zaldívar 2017), and China (Gao and Zhou 2018). Moreover, work by Hartmann and colleagues (2017) illustrates that economic complexity captures more than just income levels, as it is also significantly negatively related to income inequality even when controlling for other country characteristics.

A closely related strand of literature focuses more directly on the capability interpretation of complexity by considering the relationship between a countries' product space and processes of diversification or technological progress. For instance, Petralia, Balland, and Morrison (2017) use the complexity of technologies to show that countries

are more likely to diversify into activities that are related to current competences and that the specialisation into more complex technologies tends to co-occur with economic development. Bahar, Hausmann, and Hidalgo (2014) find that countries are more likely to diversify into a given product if a neighbouring country is an established exporter of this product, suggesting that trade data cannot only help to describe local capabilities but also to illustrate processes of knowledge diffusion. Complexity has also been applied to knowledge more generally, for instance by Balland and Rigby (2017) who find that spatial diffusion of low complexity knowledge may be easier than for high complexity knowledge.

The connection between economic complexity and development, as well as technological sophistication, is thus well-established. These findings lend support to the interpretation of economic complexity as a measure of local capabilities or knowledge – a factor that should also be decisive in the strategic asset-seeking location strategies of MNCs, especially from emerging markets. Bahar and colleagues (2014) make reference to the relevance of FDI in potentially driving their result as it represents a channel of knowledge transmission between a successful and a prospective exporter of a given good. This notion is further supported by Javorcik, Lo Turco, and Maggioni (2018) who show that presence of FDI in Turkish regions is significantly positively related to the sophistication of new products in these regions. This result is relevant for our study because it not only emphasises the relevance of FDI as a knowledge transmission channel but also relates this directly to the product sophistication as measured by the ECI.

2.3. Hypotheses development

The literature on economic complexity thus posits economic complexity as a valuable measure of local capabilities. Therefore, if MNCs pursue asset-seeking strategies that are focused on obtaining access to local capabilities through the localisation of subsidiaries, we would expect them to take the sophistication of host countries' production structures into account. However, the direction of the effect is not theoretically clear. Our analysis thus aims to shed light on these considerations, which have so far been neglected in the literature on location strategies of MNCs from emerging markets, by investigating the relationship between host countries' economic complexity and the intensity of FDI from Chinese MNCs. On the one hand, MNCs may use their subsidiaries to gain access to the most sophisticated capabilities. In this perspective, these firms are motivated to expand globally with the primary aim of accessing novel and relevant technical, managerial and organisational assets and capabilities that are scarcely available in their origin markets (Kogut and Chang 1991; Almeida 1996). Hence, faced with large knowledge gaps to compete in international markets, MNCs from emerging economies can compensate their disadvantages by leveraging more sophisticated resources during their process of internationalisation (Matthews 2006; Kedia, Gaffney, and Clampit 2012). Based on these considerations, our baseline hypothesis is that:

H1a: There is a positive relationship between the number of Chinese MNCs' subsidiaries and the economic complexity of the host country.

On the other hand, and in contrast to patent statistics, the ECI is not a linear depiction of the presence versus absence of knowledge, but it is an indicator of qualitative differences in capabilities. In this sense, MNCs' location choices with respect to the ECI may reflect preferences for a specific type of asset-seeking behaviour that does not necessarily rely on gaining the most sophisticated type of knowledge. In this sense, in the process of internationalisation through asset-seeking strategies, MNCs from emerging markets face substantial cognitive gaps that may orient their investment choices towards locations where the available pool of knowledge and capabilities is relatively less sophisticated and thus easy to absorb and re-use in an economically valuable manner (Amendolagine et al. 2018). In fact, the latecomer status of these type of MNCs imply that they do not possess ex-ante the necessary cognitive assets to access frontier knowledge (Cuervo-Cazurra and Genc 2008; Deng 2007). Therefore, their international location strategies may be oriented towards markets that are less complex. Based on this argument, we formulate a second baseline hypothesis, as follows:

H1b: There is a negative relationship between the number of Chinese MNCs' subsidiaries and the economic complexity of the host country.

These baseline hypotheses offer an initial conceptual guidance to the analysis of the link between economic complexity and the locational configuration of emerging markets' MNCs, potentially also explaining the ambiguity of the results in the extant literature. Nonetheless, this relationship can also be subject to contingent factors at the level of both host markets and MNCs. Exploring these sources of heterogeneity may provide the lenses to reconcile the opposing views of the hypotheses above. In this sense, recent studies suggest that the asset-seeking strategies of MNCs from emerging economies evolve based on the strength of both the home- and host-country innovation system, in a way that while MNCs from weaker home systems would target complementary host locations to limit the cognitive gaps, MNCs from stronger technological backgrounds self-select into host economies with more sophisticated knowledge environments (Elia and Santangelo 2017; Amendolagine et al. 2018). Therefore, the asset-seeking strategies of MNCs from emerging economies may be contingent on both the type of technological environment present in recipient countries and on their individual endowment in terms of knowledge assets. These factors can in turn influence the type of knowledge assets sought by emerging markets' MNCs (Kedia, Gaffney, and Clampit 2012).

With respect to the features of host markets, in an economic complexity perspective, knowledge capabilities are not uniformly distributed across space, but they follow specific trajectories connected to countries' product space and processes of technological diversification (Hidalgo and Hausmann 2009). In this sense, we can expect that technologically-advanced countries hold the most complex assets and capabilities that may be the objective of the asset-seeking strategies of MNCs from emerging economies. At the same time, considering the latecomer status of these firms and their need to cement their competitive advantage with foreign knowledge resources (Child and Rodrigues 2005), these MNCs may access relatively less sophisticated assets in industrialised countries, precisely because they lack the absorptive capacity to intercept frontier knowledge assets,

i.e. the most complex capabilities. This is in line with a strategy of accumulation of competences that can realistically sustain and reinforce the existing asset portfolio of MNCs from emerging markets (Niosi and Tschang 2009). Based on these considerations, we formulate the following hypothesis:

H2: Among the sub-group of industrialised countries, there is a negative relationship between host countries' economic complexity and Chinese MNCs' subsidiaries.

With respect to the features of MNCs, the literature highlights that firms operate within technological sectors with varying degrees of reliance on novel assets and capabilities that are needed to maintain a global competitive edge (Chung and Alcácer 2002; Ang 2008; Ascani and Gagliardi 2020). This implies that economic activities characterised by fast-changing technological environments, where acquiring new knowledge provides key advantages on international markets, may be the sectors in which MNCs from emerging economies develop more systematic asset-seeking strategies. Combining this argument with the insights regarding the latecomer status of MNCs from emerging markets entails that these firms may seek relatively less complex knowledge assets within sectors where new knowledge is relevant for economic performance. Based on this, we formulate the following hypothesis:

H3: A negative relationship between host countries' economic complexity and Chinese MNCs' investment characterises knowledge intensive sectors.

While the contingencies operating at the sector level may be informative of technological environments that produce diverse incentives to engage in asset-seeking strategies, a long-standing literature also suggests that firms within industries are highly heterogeneous (Yeaple 2005; Greenaway and Kneller 2007; Hottman, Redding, and Weinstein 2016). In the context of this article, this means that the location strategies of MNCs from emerging countries can also vary according to their individual diversity. Therefore, while seeking assets abroad can be a common strategy for these MNCs, some of them may have already accumulated firm-specific advantages that allow them to seek more complex capabilities in foreign markets (e.g. Elia and Santangelo 2017), while others rely on a weak knowledge base that still need to be reinforced though accessing less complex foreign assets. In this sense, it is plausible to expect that different MNCs follow different trajectories in terms of international location strategies and asset seeking investment based on their individual endowment of capabilities. Based on these considerations, we formulate our last set of hypotheses:

H4a: A positive relationship between host countries' economic complexity and Chinese MNCs' investment characterises MNCs with strong knowledge bases.

H4b: A negative relationship between host countries' economic complexity and Chinese MNCs' investment characterises MNCs with weak knowledge bases.

3. Data description

3.1. Dependent variable

We assemble our dataset for the empirical analysis from several complementary sources. In order to construct our dependent variable, we consider the number of subsidiaries owned by Chinese and Hong Kong shareholders by destination country yearly over the period 2007–2015. We include shareholders in Hong Kong, in addition to those located in mainland China, as Hong Kong frequently serves as base for Chinese firms' internationalisation (Deng 2004). Data come from the Bureau van Dijk Historical Ownership Database, a restricted-access source of information on the ownership links between shareholders and their subsidiaries. We define Chinese subsidiaries as all companies abroad with a 50% ownership stake possessed by a Chinese Global Ultimate Owner. As such, we are able to capture the distribution of Chinese companies across countries by analysing subsidiaries as a count variable.

As shown in Table 2, we identify 14,873 Chinese subsidiaries in 78 countries, of which about 84% are located in 33 OECD economies and nearly 16% in 45 non-OECD countries. Figure 1 plots the number of Chinese subsidiaries in our sample: Europe, North America and Australia are the most important destinations for Chinese outward investment, although some Asian countries also host a large number of Chinese subsidiaries. Hence, not only do we cover a largely heterogeneous group of countries in our analysis, which allows us to reliably test the variety of rationales for Chinese foreign activities, but we also consider a much larger sample of Chinese subsidiaries than any other previous study on the locational determinants of Chinese outward investment.[1] Table 2 provides a breakdown of Chinese subsidiaries by their location and industry.

Table 2. Chinese subsidiaries and their location, industry and knowledge base.

	Subsidiaries	% of total	Countries	% of Countries
Total	14873	100	78	100
OECD	12530	84.2	33	42.3
Non-OECD	2343	15.8	45	57.7
Europe	9212	61.9	32	41.0
Asia	2936	19.7	21	26.9
Rest of the World	2725	18.3	25	32.1
High-tech & medium high-tech	4419	29.7	69	88.5
Medium low-tech & low-tech	1990	13.4	53	67.9
Knowledge-intensive services	4702	31.6	63	80.8
Non-knowledge-intensive services	3762	25.3	61	78.2
High labour productivity	7445	50.1	67	85.9
Low labour productivity	7428	49.9	78	100
High intangibles	7261	48.8	65	83.3
Low intangibles	7608	51.1	78	100

Notes: the sector of activity is based on the codes for parent companies.

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[1]For instance, Duanmu (2012) covers 189 Chinese MNCs from the Jianmu province; Quer et al. (2012) analyse 139 foreign direct investments of 29 Chinese companies from the Fortune Global 500 list; Ramasamy, Yeung, and Laforet (2012) study 1350 foreign investments undertaken by 63 companies listed on Shanghai and Shenzhen Stock Exchange, Quer et al. (2018) cover 489 foreign investments from 186 Chinese MNCs; Li et al. (2018) employ data on 1432 subsidiaries of 516 Chinese companies listed on Shanghai and Shenzhen Stock Exchange.
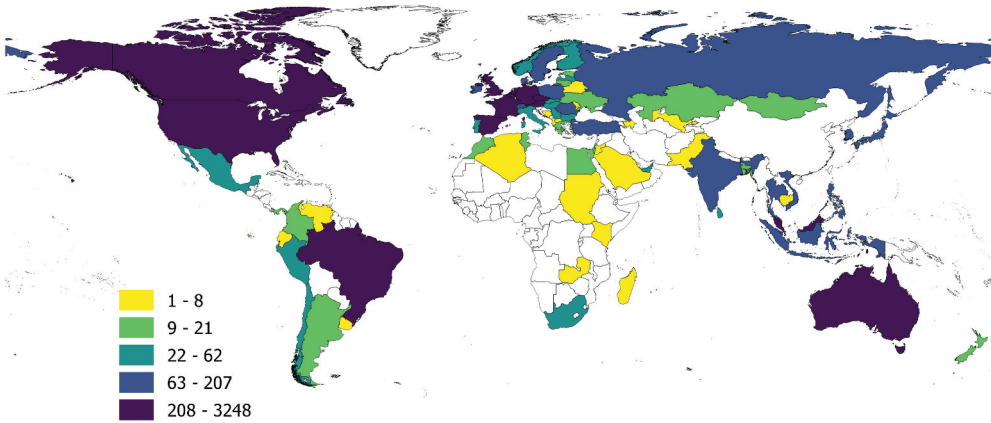
Figure 1. Number of subsidiary firms of Chinese companies (2007–2015) by host country (by quantile).

3.2. Independent variables

With respect to our variable of interest, the *Economic Complexity Index* (ECI) is meant to capture the location-bound capabilities motivating the strategic-asset seeking rationale of Chinese MNCs. The ECI was obtained for all years in the sample from the Observatory of Economic Complexity (Simoes and Hidalgo 2011) and is based on export data by product and country. The index uses *Revealed Comparative Advantage* (RCA) to identify countries that are important exporters of a specific good (Hidalgo et al. 2007):

$$RCA_{c,i} = \frac{\frac{x(c,i)}{\sum_i x(c,i)}}{\frac{\sum_c x(c,i)}{\sum_{c,i} x(c,i)}}$$

The RCA describes the share of good i in all the exports from country c relative to the share of exports i in the global average. Using the cut-off value of RCA = 1, countries are considered as exporters of good i if the relevance of this good in their export basket is higher than average. The RCA for all countries and products allows construction of a matrix M_{cp} of countries and products that is 1 for all countries considered significant exporters of a given product p and 0 otherwise. M_{cp} allows calculation of measures of the degree of diversification ($k_{c,0}$) of a country as well as the ubiquity ($k_{p,0}$) of a product:

$$Diversity = k_{c,0} = \sum_p M_{cp}$$

$$Ubiquity = k_{p,0} = \sum_c M_{cp}$$

As described in Hartmann et al. (2017), defining a matrix that connects countries that export a similar basket of goods, weighting it by the inverse of a product's ubiquity, and normalising it by diversity of a country yields:
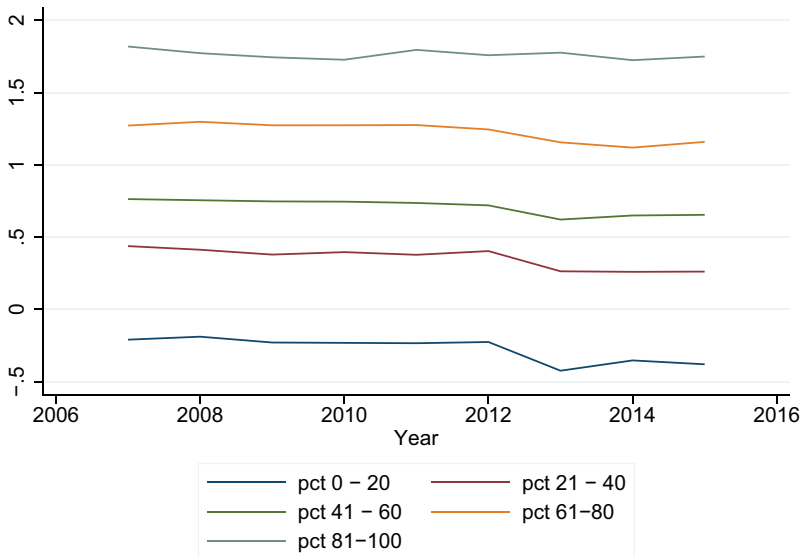
Figure 2. Time trends of ECI for quantiles of the distribution for a balanced panel.

$$\tilde{M}_{cc'} = \frac{1}{k_{c,0}} \sum_p \frac{M_{cp} M_{c'p}}{k_{p,0}}$$

The eigenvector of $\tilde{M}_{cc'}$ with the largest eigenvalue is a vector of ones, but the eigenvector associated with the second largest eigenvalue (K_c) is the measure of economic complexity (Simoes and Hidalgo 2011). The ECI as obtained from the Observatory of Economic Complexity is thus defined as:

$$ECI_c = \frac{K_c - \langle K \rangle}{std(K)}$$

Figure 2 shows the time evolution of the ECI over the sample period. The graph indicates limited time variation in ECI values on average and for all quantiles of the distribution. Similarly, in our full unbalanced sample, the standard deviation of the ECI within country is much smaller than between countries (0.115 and 0.464 respectively) illustrating further the relative stability of the ECI over the eight years of our sample period. This is in line with the idea that changes in the basket of capabilities of countries happen slowly over time. Figure 3 presents the geographical variation in the ECI across the sample. In line with existing evidence on the positive correlation between economic complexity and GDP (Hidalgo and Hausmann 2009; Zhu and Li 2017), industrialised countries generally score high on the ECI (with some exceptions, e.g. Australia), whereas especially countries in Africa and South America exhibit lower levels of economic complexity.

In addition to the ECI as a measure of countries' strategic assets, we also include the more customary proxy of patent applications in each destination country of Chinese MNCs, using patent statistics from the WIPO. The simultaneous inclusion of both variables allows testing whether the ECI explains variation beyond the high-end outcome
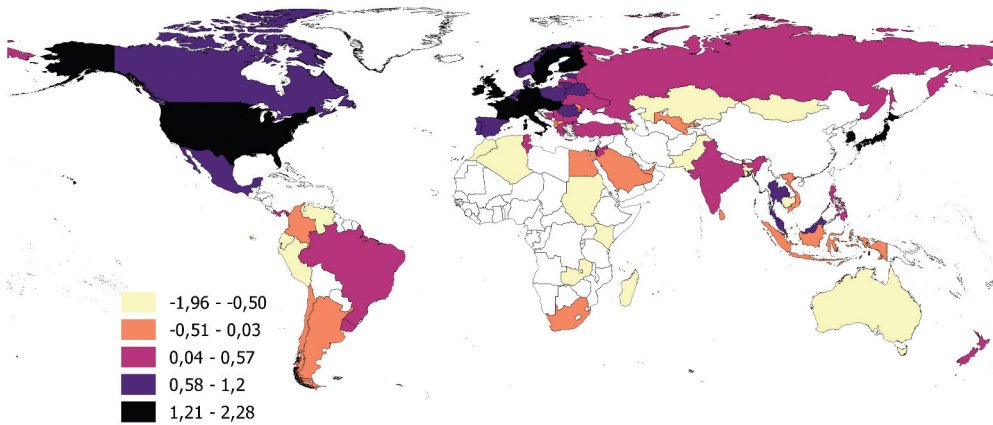
Figure 3. Economic complexity index by country (mean for 2007–2015, by quantile).

of the innovation process that is captured by patent statistics and thus produces a more encompassing indication of the strategic-asset intent of Chinese MNCs' subsidiaries in the heterogeneous group of host countries under analysis.

Although the asset-seeking motive for outward investment is the focus of our paper, we consider and control for other motives in line with the literature surveyed in Table 1. The data for all these variables were obtained from the World Development Indicators (World Bank 2021). We control for size differences between countries generally by including population size. Market-seeking drivers of foreign investment are captured by the size of recipient economies' internal market, proxied by national GDP, as well as the growth rate of GDP, which provides a measure of the dynamisms and speed of a country's economic system. While market size could be an important determinant of Chinese investments aimed at exploiting mature economies' large internal demand, the growth rate of GDP should capture the potential relevance of fast-growing emerging markets for Chinese MNCs (Duanmu and Guney 2009; Zhang and Daly 2011). In line with recent works (Li et al. 2018), we consider resource-seeking drivers of outward investment by including countries' total natural resource rents, i.e. the sum of rents from oil, natural gas, coal (hard and soft), minerals, and forest, as a share of national gross domestic product. As a broad measure of human capital availability, we control for mean years of schooling. Furthermore, in consideration of the relationship evidenced in existing studies between Chinese outward investment and host economies' institutional environment (Buckley et al. 2018), we use the Rule of Law index[2] from the World Governance Indicators (WGI) of the World Bank, similar to Kolstad and Wiig (2012).

Finally, we account for a specific feature of the context of our study to control for relevant time effects. During our sample period, the Chinese government concluded the 11th Five Year Plan in 2010 and inaugurated the 12th Five Year Plan in 2011. The latter

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[2]Rule of Law refers to perceptions of confidence in the rules of society such as property rights, contract enforcement, the police and court system as well as the likelihood of crime and violence. The index is included as percentile rank with the highest rank (country with highest degree of Rule of Law) denoted by 100 and the lowest as 0.

provides a boost in the 'go global' strategy of China by actively encouraging Chinese enterprises to operate internationally through a plethora of dedicated support policies (Davies 2013). Based on this, we consider that the number of Chinese subsidiaries abroad can be realistically connected to time effects that coincides with these national strategies. Therefore, we consider two main periods in our sample and, thus, to include time dummies based on these time windows (2007–2010 and 2011–2015). Table A1 and A2 in the Appendix show descriptive statistics and the correlation matrix between the variables employed in the empirical analysis.

4. Methodology

Our methodological approach is based on the implementation of a Poisson model for count data with panel fixed effects for an unbalanced panel of our 78 countries and years from 2007 to 2015. Specifying a count model allows understanding the number of subsidiaries in its nature as a count variable, i.e. as discrete and non-negative but with a natural interpretation for zero. Furthermore, within a panel data context, this method is regarded as a reliable and robust econometric approach (Wooldridge 1999). Hence, estimating a panel fixed-effects model allows us to control for all time-invariant unobserved characteristics of destination countries, thus alleviating concern of omitted variable bias in our estimates. Considering the various empirical approaches employed in the existing literature on the location determinants of Chinese outward FDI, reviewed in Table 1 above, we are confident that the proposed estimation approach can produce more reliable estimates than those offered in most previous studies, where the omitted variable bias is likely to be large. In order to explicitly show the importance of considering destination-country fixed-effects, we also run a pooled OLS estimation, similar to some past studies, where we allow these time-invariant unobservables to be correlated with our regressors.

Given the count nature of our dependent variable, we consider a Poisson distribution with density:

$$f(Y_{it} = y_{it}|x_{it}) = \frac{e^{-\mu_{it}}\mu_{it}^{y_{it}}}{y_{it}!} \tag{1}$$

where Y_{it} represents a random variable and its realisation y_{it} is the frequency of Chinese affiliates in each destination country i and year t; x_{it} is a vector of explanatory variables and μ_{it} is the conditional mean of the Poisson distribution. Given the panel nature of our dataset, we estimate the following Poisson model with exponential mean function and a multiplicative individual term:

$$y_{it} \sim P[\mu_{it} = \theta_i \varphi_{it}] \tag{2}$$

where θ_i capture country-specific fixed effects and φ_{it} represents the exponential mean that depends on the set of independent variables x'_{it} and parameters β, as follows:

$$\varphi_{it} = \exp\left(x'_{it}\beta\right) \tag{3}$$

We estimate the Poisson fixed effects model given by Equations (2) and (3) by means of Maximum Likelihood. For the sake of completeness, we re-write (3) by explicitly reporting all the covariates included in the empirical model, as defined in the data section above:

$$\varphi_{it} = \exp(\beta_1 ECI_{it} + \beta_2 lnPopulation_{it} + \beta_3 lnGDP_{it} + \beta_4 GDPgrowth_{it} + \beta_5 Nat.res_{it} + \\ + \beta_6 lnPatents_{it} + \beta_7 yrs.schooling_{it} + \beta_8 Ruleoflaw_{it} + \beta_9 before2011_t + \varepsilon_{it})$$

(4)

After producing a set of baseline estimates, we run variations of the regression model by splitting our sample according to several relevant dimensions. In order to test hypothesis 2, we consider the economic development level of destination countries by analysing the location determinants of Chinese MNCs outward investment in OECD and non-OECD economies. Subsequently, we regroup destination countries of Chinese MNCs into geographic macro-regions: namely, Europe, Asia and the rest of the world (RoW),[3] by considering differences in investment drivers in the light of the regional nature of Chinese foreign engagement, as of most emerging markets' MNCs (Gaur and Kumar 2010; Kang and Jiang 2012). Next, we analyse the location of Chinese subsidiaries for different categories of economic activities, including manufacturing and services as well as their knowledge-intensity. Hence, we explore whether the rationale for Chinese MNCs external engagement changes with different industries characterised by varying degrees of technical competence. Finally, to consider whether location decisions of Chinese MNCs may depend on firm-specific (rather than industry-specific) capabilities, we split our sample into groups of firms characterised by relatively strong and relatively weak knowledge bases as measured by firm-level labour productivity and endowment of intangible assets.

5. Results and discussion

5.1. Baseline results

Table 3 reports the baseline estimates of the relationship between the presence of Chinese MNCs' subsidiaries and destination countries' economic complexity. In the first two columns as well as the fourth and fifth, we only include the ECI as explanatory factor for the number of Chinese subsidiaries and evaluate the importance of controlling for time-invariant unobserved characteristics of host economies for a OLS and a Poisson specification, respectively. Column 1 performs a simple OLS regression pooling cross-sections across time, while in Columns 2 and 3 we exploit the longitudinal dimension of the data with a fixed effects estimator. Similarly, column 4 represents a pooled Poisson regression, whereas Columns 5 and 6 add the country fixed-effects. The results with and without these effects are of opposing signs: the naïve estimation approach of Columns 1 and 4 suggests that, on average, Chinese MNCs would invest in countries with more complex capabilities in the sample, but Column 2 and 5 indicate a clear negative relationship between the time variation in both the number of Chinese subsidiaries and the ECI within each recipient country. Hence, by accounting for unobserved country-level effects

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[3]Due to small sample sizes for some geographic regions, more detailed splits of the sample were not possible.

Table 3. Economic complexity and the location of Chinese subsidiaries.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.: Chinese subsidiaries	OLS	Panel FE	Panel FE	Poisson	Poisson FE	Poisson FE
ECI	19.331***	−39.517*	−41.680*	0.870***	−2.000***	−1.605***
	(3.7924)	(20.4023)	(21.1001)	(0.1451)	(0.4275)	(0.4260)
ln GDP			9.883			4.334***
			(27.8522)			(1.2774)
GDP growth			0.626			−0.016
			(0.4371)			(0.0127)
ln population			48.521			1.012
			(97.7918)			(2.4484)
natural resource rents			0.098			−0.028
			(0.4864)			(0.0260)
ln patent applications			−0.724			−0.349
			(2.8433)			(0.2436)
rule of law			−0.557			−0.089**
			(0.4879)			(0.0393)
mean years of schooling			−10.592			0.319
			(15.2844)			(0.2942)
Constant	28.470***	53.414***	−878.503	2.932***		
	(4.2557)	(11.0886)	(1,289.6219)	(0.1927)		
Observations	603	603	603	603	603	603
Number of groups		78	78		78	78
R-squared	0.090	0.090	0.097			
FEs	No	Yes	Yes	No	Yes	Yes
Period dummies	Yes	Yes	Yes	Yes	Yes	Yes

Notes: robust standard errors in parentheses. Significance levels: *** p< 0.01, ** p< 0.05, * p< 0.1

that do not vary over the sample period, including their geographical features, some of their institutional and cultural traits, or their membership in relevant trade agreements or political and monetary unions, such as NAFTA and the EU, we suggest that Chinese MNCs systematically invest in economies characterised by capabilities and competences of a less complex nature as captured by the ECI. These general patterns hold irrespective of whether we adopt a linear or a count data model.

In Columns 3 and 6 we add a number of covariates aimed at capturing the other relevant rationales of foreign direct investment, as discussed in the conceptual background section. We account for the market access considerations of Chinese MNCs in terms of both countries' economic size and their speed of economic growth. Whereas GDP growth is insignificant, the size of the host market, proxied by national GDP, emerges as significantly positively associated with the presence of Chinese subsidiaries in Column 6. We also enter the natural resource motive for Chinese operations abroad as well as the destination countries' measure of patents, as an indication of asset-seeking FDI. Finally, we consider hosts' rule of law. None of these variables are significantly associated with the presence of Chinese subsidiaries, except for a negative statistical association in the case of host countries' rule of law in the Poisson estimation (Column 6). This is consistent with similar recent evidence on the link between Chinese outward investment and the poor quality of institutions in recipient countries (Ramasamy, Yeung, and Laforet 2012).

Overall, Table 3 suggests that Chinese companies' engagement abroad tends to be mainly motivated by market access and by asset-seeking drivers, whereby the strategies of Chinese MNCs aim at tapping into competences and capabilities with lower complexity. Conceptually, this provides support in favour of H1b rather than H1a, that is,

a view of the process of internationalisation through asset-seeking strategies whereby MNCs from emerging markets orient their investment towards locations where the available pool of knowledge and capabilities is less sophisticated and thus easy to absorb and re-use in an economically valuable manner (Amendolagine et al. 2018). This may be due to the substantial cognitive gaps suffered by many MNCs' from emerging economies, as they hardly possess ex-ante the necessary knowledge assets to access complex capabilities (Cuervo-Cazurra and Genc 2008; Deng 2007). Furthermore, these results corroborate the idea that economic complexity may be both a better concept and a better empirical proxy to capture this sort of corporate strategic behaviour as compared to patents. In fact, the significance of the coefficient associated with the traditional patent indicator remains statistically equal to zero across regressions whereas controlling for patents does not affect significance of the ECI. At the same time, the fact that a negative relationship emerges even in this aggregate analysis points towards a systematic pattern in the global location strategy of Chinese MNCs.

5.2. Asset-seeking investment and the geography of economic complexity

It is possible that Chinese MNCs' consider different groups of countries for different motives and that not all types of locations are targeted based on asset-seeking rationales. Indeed, literature suggests that MNCs' global search of valuable knowledge assets may be directed towards technologically-advanced countries, where the potential to capitalise on diversified activities and capabilities is larger (Dunning and Lundan 2008; Iammarino and McCann 2013). Therefore, and also considering the geographic heterogeneity in the ECI presented in Figure 3, we extend our analysis by allowing Chinese MNCs' location strategies to differ among groups of heterogeneous destination countries. We present our results in Table 4, where Column 1 repeats the baseline results for comparison. First, we consider the case of OECD vs. non-OECD members, where the former category gathers relatively technologically advanced countries, while the latter mostly include emerging and developing economies with a limited scope for the asset-seeking investment of foreign MNCs. Consistently, the effect of the economic complexity concentrates in the OECD area (Column 2), whilst non-OECD economies exhibit a non-significant effect (Column 3). This geographic polarisation of the complexity effect across heterogeneous groups of countries suggests that the location behaviour of Chinese MNCs, all else equal, is related to accessing capabilities of a less complex nature within advanced technological contexts. When we split countries in our sample for specific macro-regions, according to their relative vicinity to China (Columns 4 to 6), we find evidence of similar strategic asset-seeking behaviour in the case of Chinese subsidiaries located in European countries and for Asia and the Pacific. For countries beyond these two macro-regions (Rest of the world) the ECI is insignificant. Once again, this effect points in the direction of an international sourcing strategy of Chinese MNCs aimed at gaining access to developed

Table 4. Geographic differences in the effect of economic complexity.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var.: Chinese subsidiaries	All	OECD	non-OECD	Europe	Asia, Pacific	RoW	RoW no USA, CAN
ECI	−1.605***	−1.049**	−0.722	−1.321**	−1.202***	0.114	−0.077
	(0.4260)	(0.5049)	(0.4629)	(0.5904)	(0.4236)	(0.9843)	(0.7518)
ln GDP	4.334***	6.506***	2.059	4.328***	3.920*	8.869*	−9.090**
	(1.2774)	(1.6750)	(1.8400)	(1.5558)	(2.0074)	(5.1573)	(3.7989)
GDP growth	−0.016	−0.022	−0.058***	−0.012	−0.049***	−0.114**	−0.034
	(0.0127)	(0.0182)	(0.0201)	(0.0160)	(0.0095)	(0.0503)	(0.0333)
ln population	1.012	3.138	−2.959	3.337	0.123	26.465***	27.125***
	(2.4484)	(2.3227)	(4.3395)	(4.5711)	(5.1292)	(8.7774)	(6.2699)
natural resource rents	−0.089**	−0.096*	−0.076**	−0.185	−0.109***	0.002	−0.059***
	(0.0393)	(0.0533)	(0.0327)	(0.1584)	(0.0348)	(0.0348)	(0.0179)
ln patent applications	−0.349	−0.009	−0.237	−0.347	−0.610**	0.645	−0.035
	(0.2436)	(0.3794)	(0.2293)	(0.3925)	(0.2593)	(0.5841)	(0.3343)
rule of law	−0.028	−0.007	−0.015	0.040	−0.060***	−0.106***	−0.009
	(0.0260)	(0.0424)	(0.0180)	(0.0330)	(0.0188)	(0.0409)	(0.0326)
mean yrs. of schooling	0.319	0.413	0.964**	0.615	0.902***	−1.239*	1.486**
	(0.2942)	(0.3142)	(0.4009)	(0.4032)	(0.3095)	(0.7486)	(0.5935)
Observations	603	293	310	266	159	178	160
Number of groups	78	33	45	32	21	25	23
FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: robust standard errors in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

economic systems characterised by less complex capabilities and competences. Interestingly, excluding the US and Canada from the macro-region 'Rest of the world' does not affect significance of the ECI but yields a significantly negative coefficient for GDP, consistent with China accessing lower income markets in the Global South. Therefore, the results in Table 4 illustrate that the location strategy of Chinese MNCs is not to target countries with limited knowledge capabilities as a whole, but that within relatively advanced economies they are attracted to those with relatively lower economic complexity.

This recurrent result in our analysis is consistent with H2 and therefore with the idea that emerging markets' companies need to gradually build their knowledge base before they are able to capture and exploit the advantages bound to the most technologically-advanced locations and sectors (Elia and Santangelo 2017; Amendolagine et al. 2018). In other words, our results suggest that the asset-seeking behaviour of Chinese outward investment in advanced countries may be aimed at augmenting the MNCs' global portfolio of knowledge assets, by accumulating competences and capabilities that can more adequately sustain and reinforce their existing operational capacities (Niosi and Tschang 2009). Hence, these capabilities may well be characterised by lower complexity. In fact, considering the latecomer nature of emerging markets' MNCs and the fact that their outward engagement is perceived as a necessary step to construct their own competitiveness, their initial endowment of knowledge assets is believed to be limited (Wells 1983; Young, Huang, and McDermott 1996; Gaur and Kumar 2010). Therefore, the generalised weakness of the resource positions of Chinese MNCs motivates a typology of global strategic asset-seeking behaviour that privileges low-complexity capabilities that can in turn be used as a complementary resource to expand the corporate advantage and international competitiveness of the MNC.

5.3. Industry differences in knowledge intensity

Next, we analyse the location determinants of Chinese subsidiaries for different categories of economic activities, including manufacturing and services as well as their knowledge-intensity. In this sense, we explore whether the role of the non-tradable capabilities underpinning the economic complexity of recipient countries changes the behaviour of Chinese MNCs across industries and across activities characterised by varying degrees of technical competence. Column 2 of Table 5 reports the regression results for Chinese shareholders operating in high-tech and medium-high tech manufacturing industries, while Column 3 pertains to medium-low and low-tech manufacturing sectors. This categorisation is based on the Eurostat NACE 3-digit classification of economic sectors by technological intensity, which provides a key indication of the technological environment of each individual industry in terms of the speed of technical change and sophistication of its knowl-edge content. Our results suggest that the global search of Chinese MNCs for low-complexity knowledge resources is associated with technology-intensive industries, while the coefficient for medium-low and low-tech manufacturing is not statistically different from zero. This result further qualifies the previous discussion, as the asset-seeking nature of Chinese investment aimed at strengthening the MNC knowledge-base by targeting low-complexity locations is directed towards manufacturing indus-tries with key technological assets to sustain the growth and international competi-tiveness of Chinese investors. Put differently, the asset-seeking orientation in outward investment strategies emerges as an integral part of the behaviour of Chinese MNCs operating in technology-intensive manufacturing activities, in line with H3, whereby these companies systematically target low-complexity locations to reinforce their existing competences by acquiring and accumulating imitable and transferable resources (Yiu, Bruton, and Lu 2005). On the one hand, this result may

Table 5. Industry differences.

Dep. Var.: Chinese subsidiaries	(1)	(2)	(3)	(4)	(5)
	All	HMM	MLM	KIS	LIS
ECI	−1.605***	−2.191***	−0.876	−1.404*	−1.575***
	(0.4260)	(0.6335)	(0.6317)	(0.7648)	(0.4728)
ln GDP	4.334***	3.849*	3.958**	6.512***	2.701**
	(1.2774)	(2.3054)	(1.8334)	(1.4038)	(1.0839)
GDP growth	−0.016	0.014	−0.024	−0.045	0.007
	(0.0127)	(0.0123)	(0.0167)	(0.0279)	(0.0163)
ln population	1.012	1.787	7.656*	0.268	−1.739
	(2.4484)	(3.4964)	(4.2350)	(4.5703)	(3.0801)
natural resource rents	−0.089**	−0.062	−0.025	−0.115**	−0.139
	(0.0393)	(0.0507)	(0.0367)	(0.0470)	(0.0988)
ln patent applications	−0.349	−0.390	−1.063**	−0.315	−0.008
	(0.2436)	(0.3039)	(0.4875)	(0.4289)	(0.4208)
rule of law	−0.028	−0.017	−0.049*	−0.087**	0.022
	(0.0260)	(0.0321)	(0.0269)	(0.0416)	(0.0323)
mean years of schooling	0.319	0.532**	0.791*	0.049	0.046
	(0.2942)	(0.2428)	(0.4106)	(0.3041)	(0.3510)
Observations	603	481	385	454	452
Num. of groups	78	69	53	63	61
FEs	Yes	Yes	Yes	Yes	Yes
Period dummies	Yes	Yes	Yes	Yes	Yes

Notes: robust standard errors in parentheses. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1

be surprising because high-technology sectors would be the prime candidate to seek highly complex knowledge from abroad. On the other hand, however, it is precisely this sector that may be unable to identify technological opportunities at home thus encouraging the global pursuit of capabilities in general. Regarding tertiary activities (Columns 4 and 5), the split between knowledge-intensive and less-knowledge-intensive services reveals that Chinese asset-seeking strategies substantially cover both categories by targeting again low-complexity capabilities. In these terms, therefore, our results do not completely conform to H3. This result suggests that the search for external knowledge assets in the service sector is not dependent on the knowledge intensity of the activity, but it is a more generalised search oriented towards relatively less sophisticated destinations.

5.4. The role of the MNC knowledge base

Finally, we consider the sources of MNC heterogeneity as a contingent factor that may influence the asset-seeking location strategies of Chinese investors. As explained in the conceptual section, while seeking assets abroad can be a common strategy for MNCs from emerging markets, some of them may have already accumulated firm-specific capabilities that allow them to seek more complex assets in foreign markets (e.g. Elia and Santangelo 2017). At the same time, MNCs relying on a weaker knowledge base may aim at accessing less complex foreign assets as a strategy to cement their existing internal competences. Hence, it is plausible to expect that different MNCs follow different trajectories in terms of international location strategies and asset seeking investment based on their individual endowment of capabilities. We consider MNC heterogeneity by capturing their knowledge base with two alternative measures that are used in the literature. First, we consider MNC labour productivity, calculated as value added over employment by linking the Historical Ownership database with ORBIS data. This is a standard measure of firm-level capabilities and competences widely used in the literature on foreign investment (e.g. Guadalupe, Kuzmina, and Thomas 2012). Second, we adopt an alternative measure of a firm's knowledge base by considering the endowment of intangible assets of MNCs, taken again from ORBIS. Intangible assets also represent a widely used proxy for firm competences that focus more specifically on the immaterial set of skills and capabilities embedded within companies' human and structural resources (Kogut and Zander 1996; Kramer et al. 2011; Bournakis, Papanastassiou, and Pitelis 2019).

We empirically explore the role of MNC heterogeneity in Table 6 by considering as our dependent variable the subsidiaries of MNCs with high vs. low productivity (columns 1 and 2) and high vs. low intangible assets (columns 3 and 4). The definition of high and low is based on the median value of the distribution of productivity and intangible assets in our sample of MNCs. Our results suggest that MNCs may adopt different asset-seeking strategies based on their different knowledge bases. The location of the subsidiaries of MNCs with high productivity and high intangible assets, in fact, is positively associated with host markets' ECI, in line with H4a. This suggests that MNCs with pre-existing competences and skills are attracted to locations with more sophisticated assets. Interestingly, the coefficient on high productivity remains only weakly significant (column 1), while the role of high MNC intangible assets emerges as very

Table 6. MNC heterogeneity.

Dep. Var.: Chinese subsidiaries	(1)	(2)	(3)	(4)
	MNC productivity		MNC intangibles	
	High	Low	High	Low
ECI	0.862*	−4.521***	2.050***	−5.774***
	(0.5040)	(0.8258)	(0.4917)	(1.0270)
ln GDP	3.970***	3.671*	2.709**	1.421
	(1.4339)	(2.1464)	(1.3572)	(2.8351)
GDP growth	−0.015	−0.009	0.003	0.001
	(0.0218)	(0.0134)	(0.0146)	(0.0239)
ln population	7.725**	−6.899	3.651	4.904
	(3.9087)	(5.0261)	(4.3263)	(6.1539)
natural resource rents	−0.097*	−0.098	−0.025	−0.155*
	(0.0544)	(0.0603)	(0.0446)	(0.0826)
ln patent applications	−0.649*	−0.175	−0.293	−0.327
	(0.3925)	(0.2764)	(0.3327)	(0.2988)
rule of law	−0.027	−0.034	0.002	−0.038
	(0.0306)	(0.0356)	(0.0279)	(0.0489)
mean years of schooling	0.317	0.272	0.205	0.250
	(0.5046)	(0.2725)	(0.3844)	(0.4193)
Observations	544	603	536	603
Num. of groups	67	78	65	78
FEs	Yes	Yes	Yes	Yes
Period dummies	Yes	Yes	Yes	Yes

Notes: robust standard errors in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

significant (column 3). This may indicate that MNCs' knowledge base is better captured by intangibles and that productivity may not completely represent the endowment of firm internal assets and competences. At the same time, the location of subsidiaries of MNCs with low productivity and low intangibles relates to destinations with lower ECI values, in line with H4b. This finding is consistent with the conventional wisdom that MNCs from emerging markets may prefer locations with less complex knowledge as their knowledge bases are not adequate to intercept more sophisticated capabilities.

6. Concluding remarks

This article brought together the economic complexity perspective, the study of the determinants of firm location decisions and the theory on emerging markets' MNCs, by asking the question whether economic complexity can be an important factor in Chinese MNCs' locational choices. In this sense, the notion of economic complexity provides a novel and solid framework to the analysis of the location determinants of economic activity in space, by emphasising the geographically-bound nature of the non-tradable capabilities that are ultimately responsible for the heterogeneity in economic activities across countries. We investigated this by analysing the global strategies of Chinese MNCs, a category of emerging economy firms for which the global access to complementary capabilities and competences is key to sustain their international competitiveness. Therefore, this article contributes to the literature by combining the economic complexity perspective with both the economic geography tradition on firms' location decisions and the literature on the behaviour and strategies of emerging markets' MNCs.

Employing restricted access data on 14,873 subsidiaries of Chinese MNCs located in 78 countries over the period 2007–2015, our main result is that recipient countries' economic complexity provides a sound explanation for the locational configuration of Chinese subsidiaries across the globe, with specific reference to the strategic asset-seeking rationale for outward investment. More in detail, we find that Chinese MNCs are associated with locations in advanced economies characterised by lower economic complexity. This denotes that emerging market's MNCs invest in advanced countries to learn and capitalise on novel capabilities and that they systematically target locations endowed with relatively less complex knowledge resources. However, our results also highlight the role of firm-level heterogeneity in asset-seeking strategies. Chinese MNCs in services and high-tech manufacturing are likely to pursue lower-complexity locations but firms with an existing strong knowledge base may seek out locations with high economic complexity instead.

These findings are particularly relevant for several reasons. First, they show that the notion of economic complexity allows to capture the full range of asset-seeking behaviour of firm location decisions, as opposed to other measures customarily employed in existing studies, such as patent statistics. Second, the importance of capturing the range of capabilities available in a location by means of the framework of economic complexity becomes even more meaningful in the case of emerging markets' MNCs, as the international business theory on this typology of organisations suggests that their asset-seeking behaviour is primarily directed towards complementary foreign knowledge in terms of transferability and imitability, in order to complement their limited knowledge base (Matthews 2006). Consistently, we highlight how Chinese MNCs privilege locations with relatively low economic complexity, and we interpret this relationship as evidence of their need to gradually build their base of internal capabilities before they can capture and exploit the most technologically advanced competences abroad (Amendolagine et al. 2018). However, while this applies on average, individual firms that have already built the necessary capability to access more complex knowledge seem to be attracted by locations with high economic complexity, which may allow them to further capitalise on their advantage. Overall, the initial weakness of the resource positions of emerging economies' MNCs motivates the global asset-seeking strategies oriented to low-complexity capabilities that can be accumulated to expand the international advantage and competitiveness of the MNC.

Some limitations of our study, especially in terms of data structure, should be noted. First, the geographic dimension in this paper is limited to country-level comparisons, whereas both the availability of local capabilities and firms' location decisions exhibit subnational geographic heterogeneity. While a regional analysis of this phenomenon would be valuable, this would require limiting the study focus to a specific country or groups of countries, due to data availability. Instead, this study aimed at taking into account the full and global scale of Chinese foreign direct investment and leaves subnational perspectives for future research. A second limitation regards the lack of information on the specific structure of the business group of MNCs. There may be MNCs with only one subsidiary and others with many more. Looking into the characteristics of these groups can be insightful to understand how the evolution of these structures shape the asset-seeking strategies of MNCs. Finally, while the ECI is based on export data, economic complexity could be derived from other data sources. In fact, capabilities may not

be readily visible in trade data that is limited to gross exports, for these data cannot identify critical imports that often underpin exports of specific goods from specific countries and value-added trade data could circumvent this issue (e.g. Koch 2021).

Despite these caveats, our findings and considerations deliver important implications for policy and managerial practice in both emerging and advanced economies. In a technological catch-up perspective, the processes of knowledge accumulation are a crucial step for emerging economies (Fu, Pietrobelli, and Soete 2011; Buckley and Nashai 2014), such as China, and the access to foreign pools of diverse and complementary capabilities can be considered as functional to the internal upgrade of their production structure over time. Managers should consider that the corporate international search for novel and diverse capabilities should be not only strategically tailored to the specific industrial needs of the MNC, but also complemented by measures facilitating the successful transfer and absorption of foreign competences by means of R&D investment at home. Policy-makers in emerging markets can facilitate this process through specific measures of support to private R&D in sectors that are strategic to climb up the ladder of economic complexity. For developed countries, although Chinese subsidiaries are currently located in relatively less complex technological domains, future technological catch-up could gradually re-orient their focus towards accessing more and more complex knowledge, which could raise challenges for advanced economies. For policy makers, any strategy to secure international competitiveness should therefore consider tools aimed at (i) further specialisation in technology-intensive activities and (ii) favouring a larger product differentiation. These two aspects fundamentally pertain to the central tenets of a country's economic complexity, in terms of specialisation in less ubiquitous products and diversification in a larger set of activities.

Acknowledgement

Disclosure statement

No potential conflict of interest was reported by the authors.

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