Leveraging the benefits of location decisions into performance: A global view from matched MNEs

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Abstract

We examine how firms leverage their resources, through FDI decisions into profits growth. Drawing on over 19,000 multinational firms, we employ a matching process and find that while investment in developed countries leads to productivity improvement, profits growth is not automatic, but requires continued productivity growth.

Contrasting the emphasis placed on different firm-level resources by the resource-based view and the knowledge-based view, we show that a firm's capability to invest in firm-specific assets accelerates the speed of reaping the rents from knowledge seeking FDI in developed countries.

In addition, profits growth as a result from investing in developing countries is greater for firms who appoint foreign directors from the same global or regional cluster as their foreign subsidiaries. Moreover, developing country MNEs, if properly deploying their firm resources, can leverage the benefits of FDI location into performance better than developed country MNEs.

1. Introduction

Multinational enterprises (MNEs) face a dilemma when balancing their location decisions in the context of whether to invest in developed or developing countries (Pantzalis 2001, Mudambi & Navarra 2004; Berry 2017), and this quandary is exacerbated by the question of how to strategically deploy firm resources to maximize foreign direct investment (FDI) returns. Some MNEs may gravitate toward advanced countries as their investment location which provides them with superior technological capabilities and know-how, while other MNEs may gravitate toward developing country location which offers them with a strong market growth prospect and lower production costs. The FDI return literature suggests that the two contrasting investment location presents different benefits, with the former leading to productivity enhancement and the latter yielding profit growths (Driffield, Love & Yang 2014).

As the call for this special issue notes, the ability of firms to allocate input resources is crucial when they operate in foreign markets, whether this concerns their abilities to absorb superior knowledge of developed countries, or to maximize the benefit of developing country markets. We contrast insights from the knowledge based view and the resource based view, arguing that in terms of understanding the variation in returns to internationalisation, the former offers greater insight in terms of capturing the benefits of international knowledge transfer, while the latter offers greater insight in terms of resource deployment, and the speed with which firms lever new knowledge into profits growth. As earlier work (cf Mudambi & Navarra 2004, Driffield, Love & Yang 2016) has illustrated, there is a key distinction however between the strategy of engaging in international knowledge transfer, and its effectiveness. The extent to which firms are able to lever this into increased firm performance, and more importantly what the drivers are of this, remains a matter of some empirical conjecture. The resource-based view of the firm hitherto has far-reaching influences on a MNE's diversification strategy. Building upon the seminal contributions of Penrose (1959), and subsequent developments pioneered by Wernerfelt (1984), Barney (1986) and Mohoney and Pandian (1992), the resource-based theory (RBT) of the firm has long recognised that MNEs diversify their businesses in order to benefit from exploiting their valuable, unique resources and capabilities. RBV theory and its core concepts have been often applied to explain the returns from multinationality or geographical diversifications. Drawing on this Hitt et al (1996),

Tallman and Li (1996) and Wan et al (2011) and others articulate the benefits of using a firm's internal resources to exploit imperfect markets. Despite the importance of resources, there has been a growing awareness that resources alone are insufficient enough to generate financial performance. For example. a theoretical extension on resource-based view places an emphasis on the importance of manager's ability to structure, bundle and deploy resources (see for example, Helfat et al 2007; Sirmon et al., 2011, Ndofor et al 2015, Hitt et al., 2016). We extend this line of resource-based view by analysing how a firm's resource management capabilities can link to, and more importantly can potentially accelerate the speed for a firm to reap the returns from FDI.

In contrast, the knowledge based view of the firm (Kogut and Zander 1992), its various critiques and extensions (Håkanson 2010), Szulanski 1996; Driffield et al., 2014 2016) has at its heart the premise that one of the inherent advantages that the multinational firm has is to transfer technology within the firm, but across national boundaries. As such, analysis of the returns to FDI is couched in terms of how effectively this is done, and what this means for the overall performance of the parent company. This has led to a series of considerations, including for example the location of R&D, and the contrasting implications of transferring knowledge from affiliate to parent, compared with for example locating R&D within the affiliate, and therefore nearer the customer. However, as Driffield et al (2016) point out, much of the literature on international technology transfer essentially takes what may considered to be a "revealed preference" approach to analysing technology transfer, which is to focus on the processes, or the mechanisms by which this occurs, rather than the magnitudes of the benefits to the firm. Thus, our focus here is essentially on two related literatures, extending the technology transfer literature to consider the gains in both the host and home country to international technology transfer, and therefore nuancing the multinationality-performance literature by considering the nature of these returns building for example on Mudambi and Navarra (2004) addressing foreign subsidiaries as sources of knowledge that impact MNEs.

The purpose of this paper therefore is to address the issue of the returns to FDI in the context of different location decisions, contrasting the resource-based view and knowledge-based view. In seeking to understand this, one first needs to consider the nature of firms' investment decisions, and

their importance in this process. Firms with apparently similar characteristics, in terms for example of history, technological base and ownership can make very different decisions regarding international location (Bhaumik & Driffield 2011; Contractor, Yang & Gaur 2016). To illustrate this, China Hisense and China Meilin are of similar size (assets 2-3 billion USD), but the former has subsidiaries only in developed countries, while the latter only in developing countries. Both were established in 1992, and both are in the home electronic appliances sector. Meanwhile, Swisscom (Switzerland) and Telenor (Norway) are in the telecommunication industry and have similar assets (around 25 US billion) and were both established in the 19th century. Swisscom has its most foreign subsidiaries in developed country, while Telenor has far more foreign presence in developing country. Examples like these indicate that MNEs, despite similar, can have different FDI location preferences. These firm level comparisons highlight the need for a more detailed level of multivariate analysis when seeking to understand variance in the returns to internationalization, and particularly a better understanding of the nature of the counterfactual position. That is, rather than simply assigning an apparent profits differential to a given location decision, the focus needs to be on what would have occurred had the firm adopted a different location strategy.

This paper therefore explores the ability of firms to deploy resources to maximise returns to FDI, within this overall setting. A debate has recently surfaced in the international business and strategic management literatures, concerning the need to address the issue of endogeneity, particularly in the context of the impact of firm level decisions on performance. This is discussed in detail in Certo, Busenbark, Woo & Semadeni (2016), as well as in editorials or commentaries (Meyer, Witteloostuijn & Beugelsdijk 2017; Wolfolds & Siegel 2019). Developing this further, this literature has also sought to move the state of the art from Heckman's classic treatment or sample selection model, to approaches that more precisely address the endogeneity problem. Our analysis outlined below therefore employs matched samples (Heckman, Ichimura & Todd 1997, 1998).The use of matched samples to address the possible endogeneity issue has become a solution to dealing with the endogeneity (Chang, Chung & Moon 2013, Blevins & Ragozzino 2018). Using the propensity score matching methodology (Rosenbaum & Rubin 1983), we address the possible endogeneity issue by using a rigorous matching

exercise on many observable characteristics of a large sample to provide a global view of FDI returns (Cumming & Zhang 2019).

The remainder of our paper is organized as follows. We start in section two with a brief review of the related literature, and we build our hypotheses. Section three elaborates on this to develop an analytical framework. Section four describes the data sources and presents descriptive statistics. Section five discusses the matching process. The results and discussion follow in section six, and section seven concludes.

2. Theory and hypotheses development

2.1 Different FDI returns from developed and developing countries

The FDI location decision has always been a core question in both the strategic management and international business literatures (Dunning 1998; Cantwell 2009; Berry 2017), and the literature highlights *inter alia* the attractiveness of host countries and firm resources in determining the firm's location decision (Berry 2006; Driffield, Love & Yang 2016).

A comparison between developed and developing countries as locations for FDI has remained as an important research topic, and received wisdom suggests that investing in developing countries leads to faster profits growth, while investing in developed countries leads to productivity growth (Pantzalis 2001; Berry 2006; Demirbag & Glaister 2010; Yang, Martins & Driffield 2013; Berry 2017). The simplest characterisation is that firms are attracted to rich countries by large markets agglomeration economies through knowledge sourcing. There is a well-established literature, see for example Wheeler and Mody (1992), Shaver & Flyer (2000) or Head, Ries & Swenson (1995), which illustrates the importance of location for knowledge sourcing (Cantwell 2009). Chung & Yeaple (2008) for example illustrate how this can be a source of technology and knowledge, in particular when foreign firms agglomerate with domestic MNE headquarters or other foreign firms (Mariotti, Piscitello & Elia 2010)

In contrast firms locate in developing countries for reasons related to efficiency. In reality, firms may have to choose between these alternatives due to resource constraints, such as available capital or managerial resources. In effect therefore firms must trade off the potential gains from these different

strategies. The benefits of these alternatives are well documented in the literature, as to a lesser extent are the reasons why the gains may not be as great as expected. For example, Mudambi & Navara (2004) and Driffield, Love & Yang (2016) discuss the limits in terms of the gains from technology sourcing FDI, while (Berry 2006, 2017) explores the limits to gains from investing in emerging or developing countries due to factors such as institutional distance. Equally, the concept of liability of foreignness, both in terms of access to consumers, and to factor markets is well understood (Zaheer 1995).

2.2. Hypotheses

We hypothesize how firm should strategically lever location choices, coupled with firm resources, into profits growth. In hypotheses one and two, we propose strategies to transfer productivity growth as a result from knowledge sourcing in developed countries into profitability, and in hypothesis three we propose how to deal with complexity to yield a higher return from FDI in developing countries.

2.2.1 The importance of continued productivity improvement

Driffield, Love & Yang (2014, 2016) suggest that one reason for this is that technology assimilation, and the associated knowledge transfer process which is a necessary condition for effective technology sourcing is a complex process, requiring key firm level strategic investments. From the perspective of knowledge based view, MNEs are regarded as the repository for sourcing, collecting and assimilating knowledge across different countries (Kogut and Zander 1992), while the benefit from using these knowledge may not be realised immediately and can require arduous efforts (Szulanski 1996; Szulanski, Ringov, & Jensen 2016) As Song (2014) outlines, much of the focus in the knowledge sourcing literature, is on the mechanisms by which firms seek to internationalise in order to engage in knowledge sourcing. However, building on Berry (2017) or Monteiro (2015), such gains are not automatic, but rather require a number of strategic decisions by the firm. Song (2014) argues for example that in order to understand knowledge transfer between different elements of an MNC, one needs to consider a multi-layered model, incorporating knowledge, motive, and absorptive capacity. Knowledge flows involve the transfer of often tacit information, which in turn becomes path-dependent and complex. The technological capabilities and knowledge of foreign subsidiaries in developed countries, once improved, must be transferred to parent companies or sibling subsidiaries, leading to MNE productivity

improvement subsequently (Mudambi & Navara 2004; Driffield, Love & Yang 2016). This however, as the wider literature based on the knowledge-based view of the firm argues, is not automatic, but dependent on effective knowledge management and transfer by its affiliate.

This builds on the extensive literature on technological development in subsidiaries following Bouquet and Birkinshaw (2008) and Rabbiosi and Santangelo (2013), developing the arguments of Rugman and Verbeke (2001) and Mudambi and Navara (2004). This wider literature on subsidiary development, linked to the literatures on spillovers and international technology transfer, argues that such development manifests itself in productivity growth driven by technological development. It is not inconceivable that the parent company may find it is difficult to perfectly understand the best practices transferred from its overseas affiliates in developed countries due to idiosyncratic characteristics of the knowledge (Szulanski, 1996; Simonin 1999, Song, Almeida & Wu 2003, Szulanski, Ringov & Jensen 2016), so as such firms are likely to take a long time to materialize this knowledge. We therefore propose that Hypothesis 1: In order to achieve greater financial returns from investing in developed countries, firms require continued productivity growth.

2.2.2 The importance of continued investment in firm-specific assets

From the perspective of resource-based view, the firm has a bundle of resources (Wernerfelt 1984; Barney 1986) which have far-reaching influences in the firm's diversification and its subsequent performance. Firms are heterogeneous in terms of their resources and capabilities including, for example, firm-specific assets and managerial capabilities, which have been underpinned in the multinational enterprise literature (Chang, Chung & Moon 2013 and Miletkov, Poulsen, Wintoki 2017). Hereafter, we explore to what extent the capability of firms to deploy resources affects FDI returns.

As Li, Qian and Yao (2015) demonstrate, firms vary greatly in their capacity for learning, and the ability to assimilate knowledge. Equally, it has long been suggested that the importance of managers' capabilities in deploying resources for firm performance is contingent on environmental conditions. This is essentially a nuancing of the well established literature on firm specific advantage. This asserts that in order to be overcome for example liability of foreignness, firms must possess some form advantage to facilitate the investment. The knowledge sourcing literature (building for example of

Fosfuri and Motta (1999) however has argued that such advantages are not required in order to undertake technology sourcing FDI, and indeed Hashai and Buckley (2014) have extended this to argue that firm specific advantage may not be a necessary condition for multinationality. However, we seek however to extend this, focussing not on the assets required to facilitate knowledge sourcing, but on the nature of the assets required to lever knowledge sourcing into firm level profitability. As such, we seek to develop the arguments in Driffield, Love & Yang (2016), who assert that while the motivation for, and process of knowledge sourcing is well understood, its efficacy is less well understood.

In seeking to explore how a firm translates the productivity growth resulting from investing in developed country into profitability, one needs to focus specifically on the role of firm specific assets, and on R&D particularly. We seek effectively to combine the insights from the knowledge sourcing literature with the wider literature that focusses on investment in R&D. The absorptive capability of the firm underpins the ability of MNEs to recognise the value of new knowledge and apply it for commercial ends, and investment in R&D has been the main contributor for building up the firm's absorptive capability (Cohen and Levinthal 1990).The wider international business literature for example focuses on the extent to which R&D expenditure can also influence, for example, mode of entry decisions, see for example Brouthers and Hennart (2007). We continue to develop this argument that continued investment in R&D is required to make technology sourcing FDI a success. The economic literature (see for example the survey paper by Wagner (2007) treats this essentially as simply a feature of absorptive capacity, while we argue that the IB literature needs to view this as part of a more substantive issue, of how not merely to create FSA, but how to lever this into profits growth. Sirmon and Hitt (2009), for example, argue that a "fit" between resource investments such as capital investments, and deployment decisions (the "how much" and "when" of investment) have a complementary effect on performance outcomes. A similar finding of the environmental contingencies of firm resources and capabilities is also evidenced in Kor and Leblebici (2005). We seek to link this literature to that on FDI decisions and knowledge transfer.

Deploying resources in R&D enables an upgrade of absorptive capability, and allocating more resources to marketing channels generates better access to customer needs and market trends. Sirmon,

Gove & Hitt (2008) articulate that the extent of managers' skills in effectively deploying resources augments the positive outcome of the capabilities-performance relationship; in other words, the availability of a bundle of resources (e.g. skills), coupled with managers' capability to effectively deploy these resources, allows firms to gain maximum opportunity to sustain competitiveness and reap high financial returns. Hypothesis 2a: High investments in R&D assets accelerate a firm's speed of converting productivity improvement to financial returns. One can however broaden this out, to consider other forms of firm specific assets. Translating productivity growth into profits growth in this setting therefore requires a combination of absorptive capacity, further investment firm-specific assets, and location. On one level, one may consider this to be a problem of (spatial) resource allocation (Dellestrand & Kappen, 2012), with the first order problem for the firm being how to combine its ownership advantages and subsequent development of them in a spatial setting. The firm has to take into account both its ability to generate productivity growth and its ability, through continued investment in ownership advantages, to amplify this into profitability. The timing and integration of these investments drive productivity, which in turn accelerates the speed with which financial returns from these new technological capabilities are realised. We therefore argue, in contrast to the well-established literature that emphasises absorptive capacity as the game maker in the field of knowledge transfer, that one needs to take a wider perspective. For example, Driffield et al (2016), building in part on Michailova and Mustaffa (2012), explore the magnitude of these effects, but only speculate on the process. This highlights the need for research on flows both to and from subsidiaries, and the need for better theoretical underpinnings linked to, for example, an explanation of how individual variables or constructs are linked to knowledge flows, and here we specifically look at intangible assets of the firm (Chang, Chung & Moon 2013). This argument relates however to more than R&D, and focusses on firm specific assets or knowledge and competence advantages more generally (Filatotchev & Piesse 2009; Contractor, Yang & Gaur 2016). We propose that firms with a high-level of investment in intangible assets help them to successfully leverage and assimilate crucial knowledge, leading to greater financial returns. We therefore propose that: Hypothesis 2b: High investments in intangible assets accelerate a firm's speed of converting productivity improvement to financial returns.

2.2.3. The importance of firm experience:

Technological knowledge and experience of MNEs and the managerial capabilities of boundedly rational managers are vital firm resources in determining FDI location decision (Alcácer 2006; Buckley, Devinney & Louviere 2007). It has been addressed that the firm's prior experience in a host country will lower the searching costs and mitigate the possible coordination issue, thereby increasing the likelihood of the firm choosing the host country (Demirbag & Glaister 2010), or the host country's region (Arregle, Miller, Hitt & Beamish 2013). As a firm gains foreign experience, and therefore being involved in the learning process to internationalisation, there is an increased tendency in investing in a less politically unstable countries to minimize or avoid losses, i.e. being more risk-averse (García-Canal & Guillén 2008) and being a rational calculative approach to their location choices (Buckley, Devinney & Louviere 2007). The ethnic tie as social capital is vital for the firm to gain access to critical resources and information, and therefore to lower the liability of foreignness (Filatotchev, Strange, Piesse & Lien 2007; Zaheer, Lamin & Subramani 2009) and to facilitate the market entry (Jean, Tan & Sinkovics 2011). Internationally experienced management team will help to perceive foreign market regulatory information and subsequently make a faster entry (Coeurderoy & Murray 2008).

The internationalisation of board members has garnered attention in the MNE literature (e.g., Masulis, Wang & Xie 2012; Miletkov, Poulsen, Wintoki 2017), since when and where to invest is largely decided by board. We contribute to this literature by exploring to what extent board members' international experience determines FDI returns. The international experience of board members matters for MNEs to manage complexities when they invest in developing country location. Some domestic directors, who have overseas experience from their previous working or studying, can bring an important insight about the foreign market institution context (Giannetti, Liao & Yu 2015).

Management teams who have international experience and therefore are aware of complexities of a foreign market's regulative framework will make a firm being more reluctant in investing in countries with regulative hazards (Coeurderoy & Murray 2008). Equally, firm resources play an important role for the firm to achieve returns from investing abroad (Gonzalez-Mulé & Aguinis 2018). Alcácer (2006), for example, proposed and evidenced that the benefit of host country agglomeration

economies is not independent on firm capabilities, and more-capable firms benefit less from, and therefore rely less on, agglomeration economies relative to less-capable firms.

Standard analysis within international business highlights the cultural and institutional distances than engender liability of foreignness in firms from developed countries (Johanson and Vahlne 1977). In addition to a need to overcome risks due to, for example, developing country political instability the cultural unfamiliarity increases transactions costs and potentially increases the moral hazard problem between parent and affiliate (Bouquet and Birkinsahaw 2008). Ronen and Shenkar (1985, 2013) characterize the problem in terms of psychic zones, with which psychic and cultural distances are limited, and a certain commonality of cultural and social norms prevail. To reduce cultural distance, a firm therefore can hire directors who are in the same psychic zone as the host countries where the firm operate. Foreign directors, who come from the same global or regional cluster as their foreign subsidiaries will be better placed to overcome liability of foreignness, and, particularly in the context of developing countries, navigate institutional voids. The standard CAGE framework of Ghemawat (2001) points strongly to the importance of such knowledge, and as a result such experience will facilitate such firms becoming more embedded, and better placed to lever such investments into firm profitability. In addition, such directors will be more au fait with local practices, but also better able to identify problems in the affiliate first hand (Schotte & Beamish 2013). They are also better able to participate directly in the decision-making process. Appointing these foreign directors will enhance overall competence and knowledge of boardroom to deal with the complexity of investing in developing country location. Taken all these together, we therefore propose that H3: profits growth as a result from investing in developing countries increases with the number of foreign directors from the same cluster as the firm's foreign subsidiaries.

3. Analytical framework

The premise of this paper is to explore the returns from FDI decisions. In order to do this, it is necessary to remove the inherent bias resulting from the potential endogeneity of location choice or FDI motives. The Heckman two-step approach (Heckman 1976, 1979) is used to address selection bias arising from

regressions using non-random samples (Certo, Busenbark, Woo & Semadeni 2016). This approach is now relatively common in the modelling of the FDI decision (see Belderbos & Zou (2007), Paul & Wooster (2008), or Tong & Reuer (2007) for examples). However, while the two-step Heckman approach provides a method that eliminates or alleviates the specification error in the case of censored samples, it relies on a strong distributional assumption to the effect that error terms in the FDI decision (treatment) and outcome specifications are jointly normally distributed, with zero means and constant variances (Greene, 2000).

An alternative approach is to use a more standard instrumental variable estimator (e.g., Driffield, love &Yang 2014; Berry & Kaul 2016), though this has well known drawbacks, most notably that in practice either the potential instruments are not significantly correlated with the endogenous variable, or they are correlated with unobservable effects and are consequently invalid, thus generating biased estimates (Carneiro & Heckman, 2002; Heckman & Li, 2004).

In order to address these, we engage in a matching process that allows for observable differences in firm characteristics, allowing an adequate `like-for-like' comparison. Propensity score matching (PSM), unlike the well-known two-step Heckman and instrumental variable (IV) estimations does not have the constraint of the normal distributional assumption of errors inherent in the two-step Heckman estimator (Greene 2000), nor the reliance on potentially poor instruments in instrumental variable approach (Carneiro & Heckman 20002; Heckman & Li 2004).

An important assumption of the PSM estimator (Rosenbaum & Rubin 1983, Heckman, Ichimura & Todd 1997, Chang, Chung & Moon 2013, Wolfolds & Siegel 2019) is that variables observable within the data set can explain both the incidence of treatment and the outcome – in this case FDI location and potential performance. Our dataset has two sample groups - MNEs who invest more in developed countries and MNEs who invest more in developing countries. The principle of the counterfactual framework is to determine the outcome of treatment (investing more in developed countries) on an MNE compared with if it had not been treated. In order to do so, we carry out the matching exercise (Heckman et al 1997) to find an untreated MNE for each treated MNE, and the MNEs in each matched pair have fairly similar values in a range of firm characteristics but are different in

terms of their FDI location choices. The analysis based on the matched samples allows us reaching more precise estimates of the benefits of technology access and learning on firm performance when MNEs invest in developed countries, as compared to them investing in developing countries. Our baseline assumption – investing in developed countries improves productivity and investing in developing countries generates greater profitability – will be tested by propensity score matching PSM estimation (Chang, Chung & Moon 2013). Matched samples will be generated by PSM approach, and then we use the matched samples to test our three hypotheses. Specifically, building on the knowledge-based view, we test to what extent the continued knowledge enhancement is crucial for the profit growth of MNEs who are inclined in investing in developed countries. Then building on the resource-based view, we aim to demonstrate the importance of firm resources in maximizing FDI financial returns, from investing in developed country location (in hypotheses 2a and 2b), and from investing in developing country location (in hypothesis 3).

4. Data

Our analysis draws on Orbis, a data set that includes detailed accounting and financial information for the largest firms across the world. The data are collected and made available by Bureau van Dijk[1]. The records of each company include information on whether the company has ownership stakes in its subsidiaries (defined as a minimum 25.01% shares control over its overseas subsidiary) and the subsidiary location. Therefore, we are able to calculate the ratio of subsidiaries in foreign countries in relation to a firm's total number of subsidiaries - the proxy for the level of multinationality of a firm that we consider in this paper. We are also able to calculate the ratio of overseas subsidiaries in developed/developing countries in relation to the total number of subsidiaries. The financial and operational information of the firms in our data is generally available for the period 2008-2016. (see summary statistics Table 1 of 19,096 MNEs from 90 countries.). We consider firms that have

1. See Ribeiro, Menghinello & Backer (2010) for more information on the Orbis data set and Bhaumik, Driffield & Pal (2010) and Contractor, Yang and Gaur (2016) for other papers that use this data set.

information available on sales, employees, capital, intermediate inputs, total assets, intangible assets, debt to equity ratio, firm age, return on sales, number of subsidiaries (including overseas subsidiaries) and industry classifications. Each MNE appears 4.3 years with a standard deviation of 2.6, which allows the longitudinal analysis. Firms without at least one of these variables are excluded from our sample, as these variables are used in our matching process. Appendix A gives a list of countries in which our samples are concentrated, and presents the characteristics of some key variables used in our analysis.

4.1. Key variables

The main variables considered in this study are the following:

Measurement of firm performance: We use (consolidated) return on sales (ROS) and total factor productivity. We employ the measure of total factor productivity developed by Levinsohn & Petrin (2003). Return on sales (ROS) is an accounting-based variable defined as after-tax profits divided by total sales. The justification for this can be seen in Grifel-Tatje and Lovell (1999). In addition to highlighting the key differences between measures of productivity and measures of profitability, they also link measures of profitability to firm strategy. Here, the key distinction is between return on assets, typically used in the finance literature, and return on sales. We employ return on sales, following the arguments of Hitt and Brynjolfsson (1996) and Foster, Haltiwanger and Syverson (2008). Return on sales, being the ability of a firm to generate a profit, is linked by these authors to the strategy that a firm employs across its various markets. We do not use return on employed capital because this figure may include assets that are included in the accounts for purely historical reasons.

Multinationality: Although a considerable number of studies have tested the MP relationship, almost all of them have used aggregate measures to calculate a firm's multinationality level (Yang & Driffield 2012). Our paper uses one common multinationality measurement: the ratio of the number of overseas subsidiaries in relation to all subsidiaries (OSTS)[2]. We exploit the availability in our data set of information on whether the company has an ownership stake in its subsidiaries. Moreover, we draw on

2 The list of multinationality measures in previous literature is listed in a few surveys (Sullivan 1994, Annavarjula & Beldona 2000, Li 2007, and Yang & Driffield 2012)

information about the subsidiary location to separate domestic from overseas subsidiaries.

Location choices: Our paper takes different location choices of overseas investment into consideration (Pantzalis, 2001; Berry, 2006; Qian, Li, Li & Qian 2008). Specifically, we divide the locations of investment in terms of developed and developing countries (Berry 2007; Pantzalis 2001; Berry 2006; Demirbag & Glaister 2010; Yang, Martins & Driffield 2013; Berry 2017), with reference to the latest World Bank definition. We then measure the level of multinationality of each firm in three ways: the ratio of the number of overseas subsidiaries in relation to the firm's total subsidiaries (OSTS); the ratio of the number of subsidiaries in developed countries in relation to the firm's total subsidiaries ($OSTS^{D'ed}$); and the ratio of the number of subsidiaries in developing countries in relation to the firm's total subsidiaries ($OSTS^{D'ing}$). Firms with more overseas investment in developed countries ($OSTS^{D'ed}$>$OSTS^{D'ing}$) in all time periods are grouped as treated firms, and we create a control group for those firms with more overseas investment in developing countries ($OSTS^{D'ing}$>$OSTS^{D'ed}$) across all years.

Firm-specific assets: we use two indicators to measure firm-specific assets. Investments in research and development enables the firm to develop superior technological capabilities which are firm-specific, thus differentiating them from competitors (Dierickx & Cool 1989; Delios & Beamish 2001). In addition, intangible assets have been widely used to measure the firm's specific knowledge (Filatotchev & Piesse 2009; Contractor, Yang & Gaur 2016), and we calculate the growth of intangible assets as the measure of increments in firm-specific knowledge. Orbis dataset reports companies' intangible assets based on the International Accounting Standard IAS 38. Intangible assets include, for example, patented technology, computer software, trademarks, licensing, royalty and standstill agreements (IAS 38), and this measure of intangible assets has been used in a number of studies such as Denicolai, Zucchella, & Strange (2014) and Contractor, Yang & Gaur (2016).

Board internationalisation: This captures the international experience, and location specific experience of the board of directors. Following the standard practice we generate this the board cluster measure based on the clustering maps of Ronen and Shenkar (2013). First, for each firm we calculate the

percentage of its foreign subsidiaries which locate in the same "global" cluster as one of its board member's home country, in relation its total number of foreign subsidiaries. We then use the same approach to calculate board experience in "regional" or "local" clusters.

Other controls:

Firm size: We include firm size, representing the physical and financial resources of a firm, and this is frequently used as the ability of the firm to deal with complexity (Qian, 2002; Nachum, Zaheer & Gross 2008; Li, Zhang & Shi 2020).

Firm age is measured as the actual duration of existence of a firm since the starting year of its operations (Qian, Li, Li & Qian 2008).

We regard country and industry effects as needing to be controlled in our matching process. However instead of controlling for country effect, we control for the effect of economic income group, which creates more pairs of matched MNEs.

4.2 Descriptive statistics

Once the data sources are described and the set of variables to be considered is defined, our next step is to present descriptive statistics: Table 1 presents key summary statistics regarding 19,096 MNEs corresponding to 82,226 observations in our data set. On average, the MNE's productivity is around 5.67 and their profitability is around 0.06. MNEs have on average $701 million turnover, $262 million capital and over 2000 employees. The treatment group consists of MNEs with more overseas subsidiaries in developed than developing countries ($OS^{D'ed}$>$OS^{D'ing}$); The control group contains MNEs with more overseas subsidiaries in developing than developed countries ($OS^{D'ing}$>$OS^{D'ed}$).

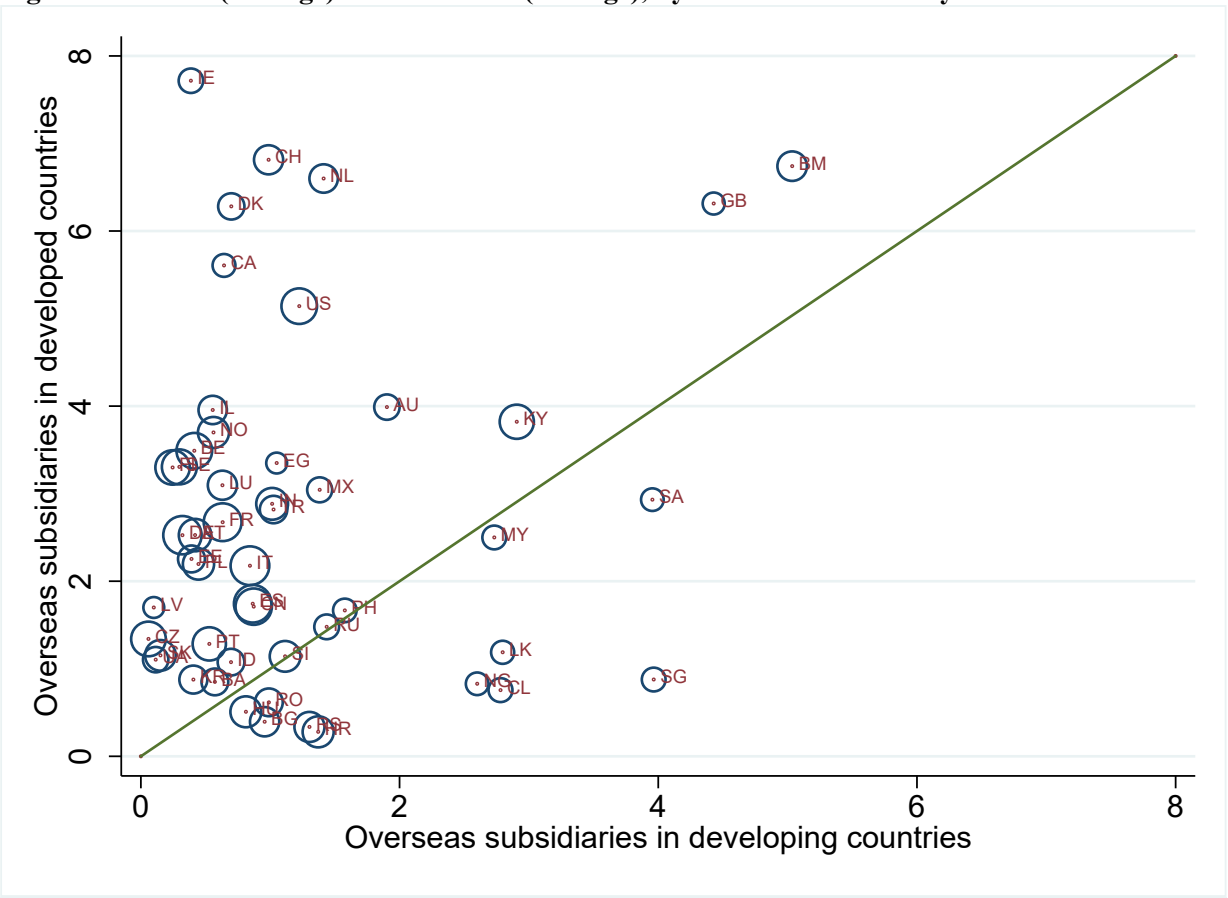
Table 1: Variables and Summary statistics

Variables	Variable descriptions	Mean	Std. Dev.	Obs
Performance measurements				
TFP	Total Factor Productivity using Levinsohn & Petrin (2003) measurement	5.67	0.78	82,226
†Turnover	Turnover (000,000)	700.95	5,155.41	82,226
†Capital	Capital (000,000)	261.92	2,274.63	82,226
†Employee number	Employee number	2,176	10,983	82,226
†Materials	Raw materials (000,000)	180.55	1,284.85	82,226
Profitability	Return on sales (%)	6.04	7.72	82,226
Overseas investments				
OS	The number of overseas subsidiaries	3.28	3.83	82,226
OS_D'ed	The number of overseas subsidiaries in developed countries	2.54	3.15	82,226
OS_D'ing	The number of overseas subsidiaries in developing countries	0.75	1.67	82,226
OS_D'ed>OS_D'ing	A dummy equal to one (zero) for MNEs investing *more* in developed (developing) countries	0.8	0.4	82,226
OS_D'ed only	A dummy equal to one (zero) for MNEs investing *only* in developed (developing) countries	0.61	0.49	82,226
OS_D'ing only	A dummy equal to one (zero) for MNEs investing *only* in developing (developed) countries	0.15	0.36	82,226
Other variables				
Capital per worker	Capital per worker (000)	98.61	328.75	82,226
Intangibles	Intangible assets (000,000)	98.06	826.17	82,226
Gearing	Debt to equity ratio (%)	99.76	120.66	82,226
Age	Firm age	33.29	27.26	82,226
R&D	Research and development expenditure (000,000)	51.61	239.88	11,001
Assets	Total assets (000,000)	796.69	4,600.83	82,226
Board global cluster	The ratio of foreign subsidiaries in the same "global" cluster as MNE board members' home countries, in the total number of foreign subsidiaries.	0.38	0.39	41,860
Board regional cluster	The ratio of foreign subsidiaries in the same "regional" cluster as MNE board members' home countries, in the total number of foreign subsidiaries.	0.35	0.38	41,860
Board local cluster	The ratio of foreign subsidiaries in the same "local" cluster as MNE board members' home countries, in the total number of foreign subsidiaries.	0.24	0.34	41,860
Developed	A dummy equal to one (zero) for MNEs from developed (developing) countries	0.9	0.3	82,226
High-tech sectors	A dummy equal to one (zero) for MNEs in high (low) technology sectors	0.45	0.5	82,226
Year	Survey year	2013	2.45	82,226

Notes: Variables with † are used to calculate total factor productivity.

Each MNE has on average 3 subsidiaries in foreign markets, and most (2.54) of these subsidiaries are in advanced economies. Table 1 also reports other characteristics of these MNEs. These MNEs have on average $ 52 million R&D investment and $ 98 million intangible assets. These firms are on average 33 years old. Most of these MNEs come from developed economies. On average, 38% of foreign subsidiaries locate in the same global cluster as their MNE board members' home countries. 35% of foreign subsidiaries are in the same reginal cluster and 24% of them are in the same local cluster. These are based on the 70 country clustering map in Ronen and Shenkar (2013). We have also considered the use of 94 country clustering map of Ronen and Shenkar (2013) in the data analysis as a robustness exercise. To offer a better feel for the data, we present a distribution of average of $OSTS^{D'ed}$ and $OSTS^{D'ing}$ by the multinational parent's home country (Figure 1), and the size of circle is proportional to the number of MNEs in each country. There seems to be a pattern that most of the countries included in our paper are located above the 45° line, and some countries are below the line, suggesting that there is a trade-off between developed and developing country locations. This is partly because investing in developing countries accrue high sunk costs and take greater risks when accessing developed countries.

Figure 1: $OS^{D'ed}$ (average) and $OST^{D'ing}$ (average), by MNEs home country



Note: The above figure is the relationship between the number of overseas subsidiaries in developed countries and the number of overseas subsidiaries in developing countries, by multinational parents' home country. Size of circle is proportional to the number of MNEs in each country. The label in the circle is the country ISO two-digit code.

5. Matching process

5.1 Propensity score process exercises

Rather than regressing firm performance on FDI location for the whole sample, we calculate the average effects of FDI decisions on firm performance in the matched samples; this is also known as the 'average treatment on treated effect' (ATT). It is argued by Heckman and Robb (1985) and Heckman, Ichimura and Todd (1997) that PSM is a more appropriate approach in the presence of such sample selection effects. However, to be effective, a large population is required from which to extract the matched and non-matched samples. Hence it is important to make firms as analogous as possible prior to uncovering the average estimate.

We carry out the standard matching exercise to identify MNEs who are similar in a range of firm characteristics but different in their preferences of location choices using Eq. 1.

$$\rho = \Pr(D = 1|X)$$

(1), where D is a dummy taking value one for the MNEs whose overseas subsidiaries are largely in developed countries and taking value zero for the MNEs that locate most overseas subsidiaries in developing countries across all years. ρ is the probability of being the former type (*i.e.* a MNE whose overseas subsidiaries are largely in developed countries), based on the given firm characteristics X. The number of samples included in the matching process is 19,096, which is certainly comparable to other papers using matching techniques in this area – see for example Girma & Gorg (2007), Chang, Chung & Moon (2013), Driffield, Love & Yang (2016) and Contractor, Yang and Gaur (2016). The idea of the matching is that, for each MNE that largely invests in developed countries, we find a fairly similar MNE that invests mostly in developing countries[3]. In terms of the matching quality, we find that all (19 out of 19) variables included in the matching process are balanced between the matched MNEs after matching exercises, indicating a very good matching quality (please see Table 2 for the matching quality). In addition, we require that MNEs in each matched pair share the same two-digit industry code and are from the same economic income group.

[3] Common support is included in the matching process to avoid the matching bias and improve the matching quality, which drops some observations where the treatment observations' propensity scores are higher than the maximum, or lower than the minimum, propensity score of the untreated group.

Table 2: Matching quality

Variables	Group A	Group B	T-tests	P-value
*Matched MNEs investing **more** in D'ed countries (Group A) and MNEs investing **more** in D'ing countries*				
Propensity score	0.79	0.79	0.07	**0.95**
Capital	16.15	16.13	0.66	**0.51**
Capital per worker	10.36	10.35	0.71	**0.48**
Intangible	13.88	13.93	-1.38	**0.17**
Gearing	115.03	112.34	1.51	**0.13**
Age	27.28	26.99	1.06	**0.29**
Employees	5.79	5.78	0.29	**0.77**
Intangible*Gearing	1620.60	1579.30	1.60	**0.11**
Intangible*age	372.64	368.54	1.07	**0.29**
Intangible*Employees	82.94	83.16	-0.47	**0.64**
Capital squared	265.36	264.78	0.64	**0.53**
Capital per worker squared	109.30	109.11	0.52	**0.60**
Intangible squared	201.01	202.16	-1.10	**0.27**
Gearing squared	32732.00	31216.00	1.46	**0.14**
Age squared	1187.80	1169.80	0.60	**0.55**
Capital per worker cubic	1171.80	1169.70	0.35	**0.73**
Intangible cubic	3023.30	3039.80	-0.71	**0.48**
Gearing cubic	14000000	13000000	1.15	**0.25**
Age cubic	75218	75514	-0.07	**0.95**
Same sectors (2-digit)			0.00	**1.00**
Same Income group			0.00	**1.00**
*Matched MNEs investing **only** in D'ed countries (Group A) and MNEs investing **only** in D'ing countries*				
Propensity score	0.80	0.80	0.10	**0.92**
Capital	16.04	16.01	1.17	**0.24**
Capital per worker	10.35	10.34	0.34	**0.74**
Intangible	13.71	13.75	-1.09	**0.28**
Gearing	114.56	120.13	-2.98	**0.00**
Age	27.24	27.22	0.05	**0.96**
Employees	5.69	5.67	1.42	**0.16**
Intangible*Gearing	1596.80	1655.40	-2.18	**0.03**
Intangible*age	368.14	367.68	0.12	**0.91**
Intangible*Employees	80.49	80.22	0.59	**0.55**
Capital squared	261.83	260.67	1.27	**0.21**
Capital per worker squared	109.04	109.02	0.04	**0.97**
Intangible squared	196.21	197.00	-0.76	**0.45**
Gearing squared	32544.00	35383.00	-2.56	**0.01**
Age squared	1205.80	1194.90	0.32	**0.75**
Capital per worker cubic	1169.00	1170.00	-0.16	**0.87**
Intangible cubic	2918.50	2924.80	-0.27	**0.78**
Gearing cubic	14000000	16000000	-2.63	**0.01**
Age cubic	81236	80982	0.05	**0.96**
Same sectors (2-digit)			0.00	**1.00**
Same Income group			0.00	**1.00**

Notes: P-value >0.1 shows that the two matched MNE groups are not similar in a given characteristics. All firm characteristics are measured in logarithms during the matching process. Matched samples are required to be in the same two-digit industry and from the same economic income group. Also see propensity score histogram in Appendix C showing good quality of matching.

Three different matching methods are used in our paper, including kernel matching, radius and caliper matching, and nearest neighbours matching. Our benchmark results are based on kernel matching[4]. This approach attaches greater weight to control observations that are closer in terms of the propensity score of a treated individual, and less weight to more distant observations Caliendo & Kopeinig (2008)[5].

5.2. Average treatment effect on the treated ATT - baseline tests

After the matching process, we conduct "like-for-like" comparisons to estimate the magnitude of performance differences (*i.e.* productivity and profitability) between the matched MNEs using the following equation:

$$\triangle Y_{it} = \mathrm{E}\,[\,Y_{it} \mid \rho\,,\ \mathrm{D} = 1] - \mathrm{E}\,[\,Y_{it} \mid \rho\,,\ \mathrm{D} = 0] \qquad (2)$$

$\triangle Y_{it}$ refers to the average difference in performance (Y_{it}) between the matched MNEs. We observe a significant difference in returns from different FDI location choices as shown in Table 3. More specifically, in the first half of Table 3 we find that while firms investing more in developed countries tend to have 7% higher productivity than the firms investing largely in developing countries, we find that the latter firm type has on average 41.5% higher profitability. During our matching process, MNEs are matched based on their characteristics in the first available year (t0). The longitudinal nature of data allows us to compare MNEs' performances after year t0. We find that our baseline results are largely unchanged, apart from that profit returns from investing in developing countries are insignificant from t+2 onward. Overall, as expected, investing in rich, well developed markets improves multinational firms' internal efficiency, with knowledge transfer and absorptive capacity leading to

4 We also conduct a novel ATT bias test to test the validity and the performance of different matching estimators. Our findings suggest that care should be taken when matching quality is low: the kernel matching estimator is more appropriate than the nearest neighbour estimator when matching quality is poor because it attaches more weight to control observations that are closer in terms of propensity score. Further, it , prevents bias due to bad matches dominating good matches when calculating the ATT. These additional tests are available on request.

5 Further, we employ the caliper and radius methods to exclude any "matched" firms that are too far away from their partner. The value entered in caliper draws a maximum distance of matched firms in the treated and control groups that is closest in terms of the propensity score. Caliper is quite often conducted with radius matching to avoid the bad matching issue. Radius matching uses not only the nearest neighbour within each caliper but all of the comparison members within the caliper, and it allows for usage of extra (or fewer) units when good matches are not available – see Caliendo & Kopeinig (2008). Radius matching is used as the second matching method in our paper. Nearest neighbor matching is also conducted in our analysis as a robustness check. See the similar approach conducted in Greenaway & Kneller (2008).

higher productivity. Gains in profits from investments in developing countries are independent of any internal efficiency but are rather linked to successful market.

Table 3: Productivity and Profitability differences between the matched MNEs From t0 to t+5 years, matching method: kernel

Years	Differences	t-ratio	No. (Group A)	No. (Group B)
*MNEs investing **more** in developed (Group A) vs. MNEs investing **more** in developing countries (Group B)*				
Productivity differences				
t0	**0.070**	4.078	14743	4142
t+1	**0.061**	3.232	11118	3099
t+2	**0.079**	3.806	9299	2456
t+3	**0.087**	3.850	7943	1984
t+4	**0.083**	3.271	6557	1610
t+5	**0.090**	3.083	5553	1228
Profitability differences				
t0	**-0.415**	-2.317	14743	4142
t+1	**-0.366**	-1.891	11118	3099
t+2	**-0.116**	-0.538	9299	2456
t+3	**-0.324**	-1.310	7943	1984
t+4	**-0.276**	-1.027	6557	1610
t+5	**-0.396**	-1.234	5553	1228
*MNEs investing **only** in developed (Group A) vs. MNEs investing **only** in developing countries (Group B)*				
Productivity differences				
t0	**0.078**	4.309	13061	3645
t+1	**0.073**	3.688	9813	2711
t+2	**0.094**	4.350	8077	2135
t+3	**0.090**	3.821	6880	1732
t+4	**0.071**	2.602	5604	1387
t+5	**0.092**	2.997	4679	1059
Profitability differences				
t0	**-0.002**	-0.010	13061	3645
t+1	**-0.116**	-0.571	9813	2711
t+2	**0.175**	0.773	8077	2135
t+3	**-0.094**	-0.359	6880	1732
t+4	**-0.180**	-0.622	5604	1387
t+5	**-0.330**	-0.989	4679	1059

Notes: Column two calculates the average performance differences (productivity or profitability) between the matched MNEs investing more in developed countries and the matched MNEs investing more in developing countries. `t-ratio (ATT)' is the t-ratios of the average differences. The differences and significant levels are overall robust when using different methods in Appendix B.

In order to verify our baseline test as to whether investing in developed countries enhances firm productivity, we did an additional robustness exercise. We compare firms only investing in developing countries with firms only investing in developed countries (we report these in the second half of Table three). This approach improves the precision with which we can determine the actual performance gains from investment in either developed or developing countries, rather than by merely comparing firms who invest more in developing countries with firms who invest more in developed countries. Our results show that productivity captures internal efficiency, whether this be achieved through, inter alia, learning, knowledge sourcing, or technology transfer, and these effects are much greater for investments in developing countries. In terms of a comparison of financial returns between investing in developed countries and investing in developing countries, we find the latter is bigger overall but at the insignificance level. Apart from the kernel matching method, we also use nearest matching and radius matching approaches as robustness exercises, and we find results from different matching estimations are very robust. We report the results from nearest matching approach in Appendix B, and the results from radius matching approach are robust and available upon the request.

6. RESULTS

6.1. Converting Productivity growth to profitability - testing H1:

Having established results showing that investment in developed countries improves efficiency but does not necessarily lead to a profitability increase, we build a simple model to test if the continued productivity growth, as a result from investing in developed country location, will lead to profitability improvement using the following equation based on the matched samples.

$$\Delta ROS_{it} = \beta_1 \Delta TFP_{it} + \beta_2 X_{it} + \gamma_t + a_i + e_{it}$$

(3) where the key variables are ΔROS_{it}, profitability increase of multinational parent *i* in year t when investing more in developed countries, relative to a matched MNE investing more in developing countries, and ΔTFP_{it}, productivity improvement of the same parent *i* in the same year t when investing more in developed countries, relative to a matched MNE investing more in developing

countries. Of importance for our Eq. 3, the calculated ΔROS_{it} (ΔTFP_{it}) refers to the extent of profitability (productivity) change seen when an MNE shifts its focus from developing to developed country locations. The equation also includes other control variables such as capital per worker, firm age, total assets and the debt-to-equity ratio (X_{it}), year effects (γ_t) and firm fixed effects (a_i). The key parameter is β_1 , which indicates MNE's profitability changes as a result of the continued productivity improvement. We report our results in table 4.

Table 4: Productivity and financial returns, Linear and Nonlinear Effects

	MNEs investing more in Developed countries versus matched MNEs investing **more** in Developing countries						MNEs investing only in Developed countries versus matched MNEs investing **only** in Developing countries					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All sectors	H-tech	L-tech	All	H-tech	L-tech	All sectors	H-tech	L-tech	All	H-tech	L-tech
Productivity	**3.757**	**4.166**	**3.281**	**4.464**	**4.770**	**4.110**	**3.831**	**4.079**	**3.559**	**4.441**	**4.603**	**4.278**
	[0.000]	**[0.000]**	**[0.000]**	**[0.000]**	**[0.000]**	**[0.000]**	**[0.000]**	**[0.000]**	**[0.000]**	**[0.000]**	**[0.000]**	**[0.000]**
Productivity squared				**-0.589**	**-0.545**	**-0.634**				**-0.526**	**-0.477**	**-0.585**
				[0.000]	**[0.000]**	**[0.000]**				**[0.000]**	**[0.000]**	**[0.000]**
Capital per worker	-0.473	-0.522	-0.414	-0.487	-0.536	-0.426	-0.481	-0.467	-0.478	-0.492	-0.473	-0.497
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Total assets	1.716	2.036	1.398	1.669	2.007	1.330	1.574	1.846	1.346	1.518	1.802	1.274
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Gearing ratio	-0.012	-0.014	-0.011	-0.012	-0.014	-0.011	-0.011	-0.012	-0.011	-0.011	-0.012	-0.011
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Firm age	-1.060	-0.964	-1.146	-1.102	-1.007	-1.180	-1.045	-0.933	-1.095	-1.063	-0.955	-1.110
	[0.000]	[0.004]	[0.001]	[0.000]	[0.003]	[0.000]	[0.000]	[0.018]	[0.002]	[0.000]	[0.016]	[0.001]
Obs.	57236	26542	30694	57236	26542	30694	46676	20522	26154	46676	20522	26154
F statistics	148	74.8	78.6	137	69.7	72.4	116	51.9	68.4	106	47.8	62.9
Adj R-squared	.843	.834	.852	.843	.835	.852	.838	.831	.845	.839	.832	.845

Note: The dependent variable in each regression is profitability difference for an MNE investing more in developed countries, relative to its matched MNE investing more in developing countries in columns 1-6. `Productivity difference' refers to productivity difference for an MNC investing more in developed countries, relative to its matched MNE investing more in developing countries in columns 1-6. In columns 7-12, we compare MNEs investing only in developed countries with matched MNEs investing only in developing countries. Capital per worker, total assets and firm age are in logs. Columns 1, 4, 7 and 10 include all MNEs, while columns 2, 5, 8 and 11 include MNEs in high technology sectors, and columns 3, 6, 9 and 12 include MNEs in low technology sectors. Values in parentheses are P-values.

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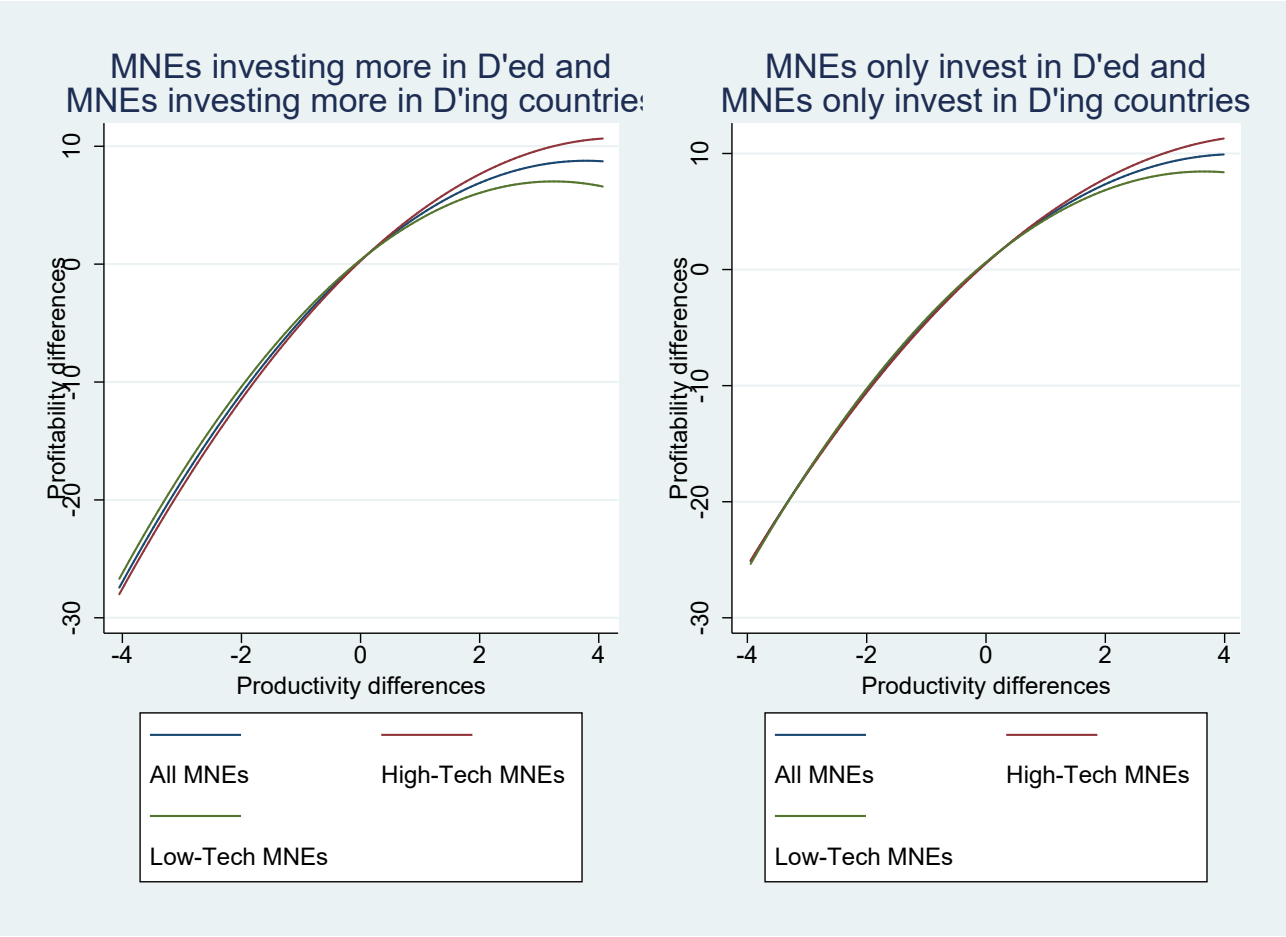
Column 1 shows that productivity gains play a positive and significant role in profitability improvements, suggesting that in order to improve financial returns from investing in developed countries, foreign subsidiaries need to achieve continued productivity growth. Our hypothesis one is therefore supported. We further split our MNEs samples into high-tech and low-tech companies, and re-ran the regression for an interesting comparison. Columns 2 and 3 show the estimate is higher (4.166 vs. 3.281) for high-tech sectors, suggesting that the continued productivity enhancement has a bigger impact on firm profitability in sectors with a greater degree of technological sophistication. We extend the analysis to examine the existence of nonlinearities by including the squared terms of productivity gains, and we re-ran the estimations. We find evidence of an inverted U shape relationship between productivity improvement and profitability increase in all sectors (column 4), high-tech sectors (column 5) and low-tech sectors (column 6). In columns 1-6, ΔROS_{it} and ΔTFP_{it} are the performance difference between the multinational parent investing more in developed countries, relative to the matched MNE investing more in developing countries. In columns 7-12, we re-ran the analysis by using the performance difference between the multinational parent investing *only* in developed countries, as compared to the matched MNE investing *only* in developing countries. We found our results are largely unchanged.

In addition, we present the plotted inverted U shape in Figure 2, and note that the importance of productivity gains for profitability improvement is bigger and occurs over a longer period of time for high-tech sector MNEs relative to low-tech sector MNEs. This adds an interesting nuance to the testing of the first hypothesis. The figure illustrates the hitherto unexplored relationship between productivity and profitability in the context of firm internationalisation. As well as highlighting the differences between sectors, it provides support for the premise of this paper, which is that the first challenge for firms seeking to generate profitability growth through internationalisation is to harness productivity growth at home or abroad, and then lever that into financial performance. Clearly this occurs (and decays) at different rates for different firms, and this is at least in part dependent on the nature of firm specific assets. This therefore extends the existing work in this area (see, for example, Bouquet and

Birkinshaw (2008), or Rabbiosi and Santangelo (2013) since we are able to determine the nature of investments that generate both productivity growth and profits growth in the context of affiliate development. In turn, we offer a more detailed interpretation of Mudambi and Navara (2004) concerning intra-firm knowledge transfer, arguing that the timing of the investment is also crucial for firms wanting to reap the rewards from internationalisation.

Figure 2: Productivity for financial returns



Note: 'Productivity difference (profitability)' refers to productivity (profitability) difference between the matched MNEs investing more in developed countries and the matched MNEs investing more in developing countries.

6.2. Firm specific assets as a moderator - testing H2a and H2b

Our next interesting test is to explore whether investment in firm-specific assets can facilitate the speed of converting productivity growth to rent generation. We add the interaction between productivity improvement and firm-specific assets in Eq. 4, all other variables having the same interpretations as in Eq. 3. Firm specific assets have two measurements including the expenditure of research and development and intangible assets growth.

$$\Delta ROS_{it} = \beta_1 \Delta TFP_{it} * FSA_{it} + \beta_2 \Delta TFP_{it} + \beta_3 FSA_{it} + \beta_4 X_{it} + \alpha_i + \gamma_t + e_{it} \qquad (4)$$

Table five reports our results. In Column one, we find that the interaction term between productivity gains and R&D investment is positive and at the significance level, suggesting that the ability of a firm to deploy resources through investing more R&D leads to more rent creation when the firm experiences technology upgrade and productivity improvement. We re-ran the analysis on firms in high-tech sectors (column two), and then on firms in low-tech sectors (column three). We find that R&D investments are more important for low-tech sectors to covert productivity to rent generation. In column four, we use intangible assets as firm-specific assets and again found that the firm's investment in FSA can augment its ability to reap the rent from productivity improvement. Therefore, our hypotheses 2a and 2b are supported.

Table 5: Productivity for financial returns, Moderating roles of R&D and Intangibles

	MNEs investing more in developed countries and MNEs investing **more** in developing countries						MNEs investing only in developed countries and MNEs investing **only** in developing countries					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All sectors	H-tech	L-tech	All	H-tech	L-tech	All sectors	H-tech	L-tech	All	H-tech	L-tech
	Role of RD investment			Role of Intangibles			Role of RD investment			Role of Intangibles		
Productivity difference * R&D	0.245	0.035	0.507				0.330	0.321	0.377			
	[0.046]	[0.824]	[0.003]				[0.006]	[0.030]	[0.053]			
R&D	-0.921	-1.072	-0.748				-0.643	-0.800	-0.323			
	[0.000]	[0.000]	[0.005]				[0.000]	[0.001]	[0.236]			
Productivity difference * Intangibles				0.102	0.096	0.102				0.100	0.140	0.052
				[0.040]	[0.219]	[0.086]				[0.078]	[0.103]	[0.476]
intangibles				0.073	0.090	0.057				0.027	0.023	0.032
				[0.093]	[0.198]	[0.282]				[0.578]	[0.770]	[0.588]
Productivity dif.	-0.412	3.703	-6.230	4.051	4.455	3.569	-1.820	-0.998	-4.485	4.060	4.168	3.930
	[0.831]	[0.134]	[0.018]	[0.000]	[0.000]	[0.000]	[0.311]	[0.659]	[0.127]	[0.000]	[0.000]	[0.000]
Capital per worker	-2.084	-2.501	-1.097	-0.520	-0.586	-0.441	-2.439	-2.871	-1.206	-0.501	-0.458	-0.521
	[0.000]	[0.000]	[0.045]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.003]	[0.000]	[0.003]	[0.000]
Total assets	2.895	3.384	1.234	1.976	2.412	1.526	1.909	2.382	0.513	1.869	2.338	1.449
	[0.000]	[0.000]	[0.053]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.453]	[0.000]	[0.000]	[0.000]
Gearing ratio	-0.020	-0.023	-0.016	-0.014	-0.017	-0.012	-0.015	-0.015	-0.014	-0.013	-0.014	-0.012
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Firm age	-3.407	-3.790	-1.329	-1.633	-1.363	-1.968	-3.471	-3.135	-4.149	-1.225	-0.900	-1.515
	[0.001]	[0.001]	[0.598]	[0.000]	[0.007]	[0.000]	[0.007]	[0.039]	[0.077]	[0.004]	[0.142]	[0.011]
Obs.	6909	4989	1920	39658	18454	21204	4462	3124	1338	31558	13824	17734
F statistics	20.4	17.8	5.66	103	55.7	53.1	14.2	10.8	4.2	74.4	36.8	42.1
Adj R-squared	.821	.811	.859	.867	.861	.875	.818	.803	.861	.861	.857	.865

Note: The dependent variable in each regression is profitability difference for an MNE investing more in developed countries, relative to its matched MNE investing more in developing countries in columns 1-6. `Productivity difference' refers to productivity difference for an MNC investing more in developed countries, relative to its matched MNE investing more (all) in developing countries in columns 1-6. In columns 7-12, we compare MNEs investing only in developed countries with matched MNEs investing only in developing countries. R&D, sales, capital per worker, total assets and firm age are in logs. 'Intangibles' is the growth of intangible assets as the measure of increments in firm-specific knowledge. Columns 1, 4, 7 and 10 include all MNEs, Columns 2, 5, 8 and 11 include MNEs in high technology sectors, and other columns include MNEs in low technology sectors. Values in parentheses are P-values.

We again show that investments in firm-specific assets are more important for firms in low tech sectors to reap the rent from productivity enhancement. We offer an interesting extension to the work of Sirmon, Hitt, Ireland & Gilbert (2011). In their resource orchestration framework, they argue that a better understanding of knowledge flows is required, particularly in terms of the deployment of resources. As they note, the existing literature has to an extent focused on the timing of investments, but this has not been considered in conjunction with resource allocation and knowledge sourcing. In columns 7-12, we again re-ran the analysis by using the performance difference between the multinational parent investing only in developed countries, as compared to the matched MNE investing only in developing countries. We find our results are largely robust.

6.3. The effect of board international experience on profits growth - testing H3

Our final test is to explore whether the firm's board international experience, which is used to measure the firm's ability to deal with international complexity, affects financial returns from investing in developing countries using the following equation

$$\Delta ROS_{it} = \beta_1 \text{ Board internationalisation} + \beta_2 X_{it} + \gamma_t + a_i + e_{it}$$

(5), where ΔROS_{it} is profitability increase of multinational parent i in year t when investing more in developing countries, relative to a matched MNE investing more in developed countries. `Board internationalisation' used in the above equation has three measures which are all based on the clustering maps of Ronen and Shenkar (2013). Our results are reported in table 6, Ronen and Shenkar (2013) includes two clustering maps, one including 70 countries and the other including 94 countries, and therefore in columns one-three we present the effect of board experience using the 70 country map, and in columns four-six we re-ran the analysis using the 94 country map. In columns one-three, we find that board experience in foreign subsidiaries' global clusters (column one) or regional clusters (column two), will yield higher financial returns from investing in developing country location. The results are largely similar when we use the 94 country map (columns 4-6). In columns 7-12, we again re-ran the analysis by using the profitability difference between the multinational parent investing only in developing countries, as compared to the matched MNE investing only in developed countries. The result is largely unchanged and our hypothesis 3 is therefore supported.

Table 6: Board internationalisation and financial returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	MNEs investing **more** in developing countries						MNEs investing **all** in developing countries					
	The 70 country map			The 94 country map			The country 70 map			The 94 country map		
	Global cluster	Regional cluster	Local cluster	Global cluster	Regional cluster	Local cluster	Global cluster	Regional cluster	Local cluster	Global cluster	Regional cluster	Local cluster
Board internationalisation	**2.451**	**2.054**	**1.715**	**2.090**	**2.085**	**1.053**	**2.562**	**1.966**	**1.360**	**2.388**	**1.985**	**0.451**
	[0.023]	**[0.045]**	**[0.119]**	**[0.045]**	**[0.042]**	**[0.332]**	**[0.058]**	**[0.123]**	**[0.310]**	**[0.058]**	**[0.121]**	**[0.730]**
Capital per worker	-0.884	-0.892	-0.902	-0.809	-0.906	-0.914	-0.733	-0.739	-0.746	-0.675	-0.733	-0.735
	[0.004]	[0.004]	[0.004]	[0.005]	[0.004]	[0.004]	[0.045]	[0.044]	[0.042]	[0.051]	[0.047]	[0.047]
Total assets	1.793	1.816	1.806	1.743	1.834	1.836	1.962	1.990	1.986	1.858	2.015	2.032
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Gearing ratio	-0.016	-0.016	-0.016	-0.015	-0.016	-0.016	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Firm age	-1.704	-1.725	-1.732	-1.679	-1.630	-1.632	-2.152	-2.190	-2.232	-1.946	-2.084	-2.104
	[0.229]	[0.222]	[0.220]	[0.229]	[0.250]	[0.246]	[0.188]	[0.177]	[0.167]	[0.224]	[0.201]	[0.190]
Obs.	5413	5411	5403	5828	5346	5338	4525	4523	4515	4864	4500	4492
F statistics	13.8	13.7	13.8	14.6	13.9	13.8	10.2	10.2	10.1	11	10.4	10.3
Adj R-squared	0.805	0.805	0.805	0.808	0.807	0.806	0.812	0.812	0.812	0.813	0.815	0.815

Note: P-values are reported in square brackets. The dependent variable in columns 1-6 is the profitability difference for an MNE investing more in developing countries, relative to its matched MNE investing more in developed countries. In columns 7-12 is the profitability difference for an MNE investing only in developing countries, relative to its matched MNE investing only in developed countries. Capital per worker, total assets and firm age are in logs. For each MNE we calculate the percentage of its foreign subsidiaries that locate in the same "global" cluster as one of its board member home country, in relation its total number of foreign subsidiaries. Using a similar approach, we calculate regional cluster ratio and local cluster ratios. Ronen and Shenkar (2013) includes two clustering maps, one including 70 countries and the other including 94 countries. We run the analysis based on each map.

7. CONCLUSION

This paper offers some implications for the literature on FDI, knowledge transfer and performance. First of all, by differentiating the benefits that a firm can obtain from investing in different locations, we are able to distinguish productivity increase from the returns to shareholders. This paper builds on the knowledge-based view and the resource-based view of the firm, by offering an understanding of the process by which knowledge transfer occurs, at the same time linking this to firm level outcomes. While previous synthesis of the knowledge-based view has focussed on the need for a multi-layered approach to knowledge transfer, we seek to nuance this, emphasising not merely the importance of absorptive capacity (Cohen & Levinthal 1990), but what is required to lever knowledge transfer into productivity growth and subsequently profits growth. The paper hypothesizes and empirically demonstrates firstly that a firm can derive productivity enhancement from investing in a developed country. This we link to the knowledge-based view of knowledge transfer. Further however, insights from the resource base view offer an understanding of how firms may speed up this process, using insights from the resource-based view. A faster rate of profits growth can be subsequently achieved if the firm can sustain its productivity improvement from knowledge seeking, and finally that investments in firm-specific assets can augment the speed of reaping the rent from knowledge seeking.

We evidence in this paper that, in general, investing in advanced country locations generates productivity enhancement, while investing in developing country locations leads to greater profitability (Pantzalis 2001; Demirbag & Glaister 2010; Berry 2017). The issue of technology sourcing has hitherto been ignored by the MP literature, even though it is likely that a significant proportion of FDI between developed countries may have a distinct technology sourcing element (Driffield et al 2014). This generates long term productivity growth, thus increasing competitiveness in both the host and source country. FDI to developing countries however is independent of productivity growth but is rather associated with offshoring/outsourcing type activities, or a desire to exploit an existing technology in new markets. As such, it generates profitability gains as long as the competitive advantage in these markets can be sustained.

Extending the KBV, not only does a firm need superior capability to effectively absorb and assimilate knowledge (Cohen and Levinthal 1990, Mudambi & Navarra 2004), but that it is crucial for the firm to correctly time the deployment or allocation of the necessary resources in order to reap higher rents. As a corollary, irrespective of how large a bundle of resources a firm may have, its ability to manage and deploy those resources is requisite for sustaining competitive advantages (Sirmon, Hitt, Ireland, Gilbert 2011). We extend the rich and burgeoning literature on knowledge transfer by emphasizing that the timing of resource deployment plays an important role for a firm wishing to reap the rent, especially when a firm is experiencing productivity advancement. It is acknowledged that the absorptive capability of a firm is vital to an understanding of externally incoming knowledge (Gupta and Govindarajan, 2000; Minbaeva, Pedersen, Björkman, & Fey 2014), and that the degree of arduousness in the relationship between sources and recipients also determines the extent of knowledge transferred from a subsidiary to its parent company (Szulanski 1996; Szulanski, Ringov, & Jensen 2016). Nevertheless, we argue that absorptive capacity *per se* may not effectively translate productivity to firm profitability, and it is essential for a firm to deploy the necessary resources (e.g. investment in firm-specific assets) to convert productivity gains to profitability increase. Besides, we also extend the literature by addressing the role of board directors' international experience (Masulis, Wang & Xie 2012; Miletkov, Poulsen & Wintoki 2017) in dealing with challenges and complexities (Simon 1962) faced in developing country location, which enables the firm to yield a greater return.

We also make an empirical contribution to the relevant MP and knowledge transfer literature by using a matching technique (Heckman, Ichimura, & Todd 1997, 1998; Driffield, Love & Yang 2016). A rigorous matching exercise has been implemented to find pairs of matched MNE. The literature on estimating the relationship between multinationality and multinational performance has generally disregarded some form of reverse causality. It ignores the fact that multinational firms self-select by choosing the location of FDI themselves. This paper contributes to multinationality-performance literature (to our best of knowledge, for the first time) by using the PSM approach to derive matched samples and produce a more precise estimate of the effect of FDI location on firm performance. To our

knowledge, no prior study has used this matching approach to explore the link between multinationality and firm performance.

Finally, we suggest an agenda for future research to explore this topic further. Aside from R&D and intangible asset investment, there can be other firm capabilities that can accelerate the speed of translating productivity to profitability for a firm. Great scope remains for future research to explore the importance of other firm capabilities, such as the employee skills. One might argue that it is not merely firm-specific resources but also the external environment that can accelerate the speed of rent generation from knowledge seeking FDI. Subsidiaries are heterogeneous in terms of size and strategic roles, so future research can re-run our analysis by using parent-subsidiary linkage data.

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APPENDIX

Appendix A: Country list and the characteristics of key variables, average by country – Top 30 countries with largest MNEs.

Countries	Number	TFP	ROS	OS_D'ed	OS_D'ing	RD	Sales
Austria	286	5.70	6.50	2.53	0.42		332.69
Belgium	934	5.65	4.80	3.49	0.41	17.93	367.48
Bermuda	107	6.15	7.94	6.74	5.04	8.29	966.01
Bulgaria	99	5.59	6.85	0.39	0.96	1.81	65.71
China	1236	5.98	9.32	1.71	0.87	32.26	2595.11
Croatia	177	4.92	5.25	0.28	1.37	0.50	104.90
Czech Republic	627	5.19	5.95	1.34	0.06		124.98
Finland	587	5.56	4.67	3.30	0.25	10.47	345.99
France	2168	5.83	5.78	2.67	0.63	49.46	427.35
Germany	2735	5.58	5.68	2.53	0.32	34.59	574.62
Hungary	171	5.20	5.78	0.51	0.81	1.85	204.31
India	230	5.10	9.21	2.88	1.01	12.15	1242.69
Israel	74	6.41	6.54	3.96	0.56	33.23	500.07
Italy	3173	5.61	5.02	2.18	0.84	39.56	219.03
Luxembourg	94	5.64	6.44	3.10	0.63	14.08	999.74
Netherlands	75	5.99	6.30	6.60	1.41	126.04	3837.72
Norway	175	5.73	8.27	3.70	0.56	72.19	1641.84
Poland	187	5.87	6.28	2.20	0.45	1.86	821.62
Portugal	382	5.30	5.05	1.28	0.53	5.03	271.67
Romania	62	5.00	5.96	0.62	0.99	0.00	337.36
Serbia	125	5.02	6.42	0.34	1.30		103.43
Slovakia	155	5.27	4.94	1.15	0.15	0.64	121.49
Slovenia	160	5.32	4.37	1.14	1.11	92.37	192.26
South Korea	66	5.30	5.77	0.88	0.41	5.00	194.20
Spain	2084	5.40	5.31	1.74	0.87	4.10	311.80
Sweden	705	5.67	5.41	3.31	0.30	28.34	337.63
Switzerland	94	5.77	7.02	6.81	0.99	25.62	1658.72
Turkey	56	6.07	8.02	2.82	1.03	7.18	882.55
United Kingdom	539	6.29	9.76	3.82	2.91	24.43	1003.38
United States of America	895	6.51	8.76	5.14	1.22	115.15	3216.07

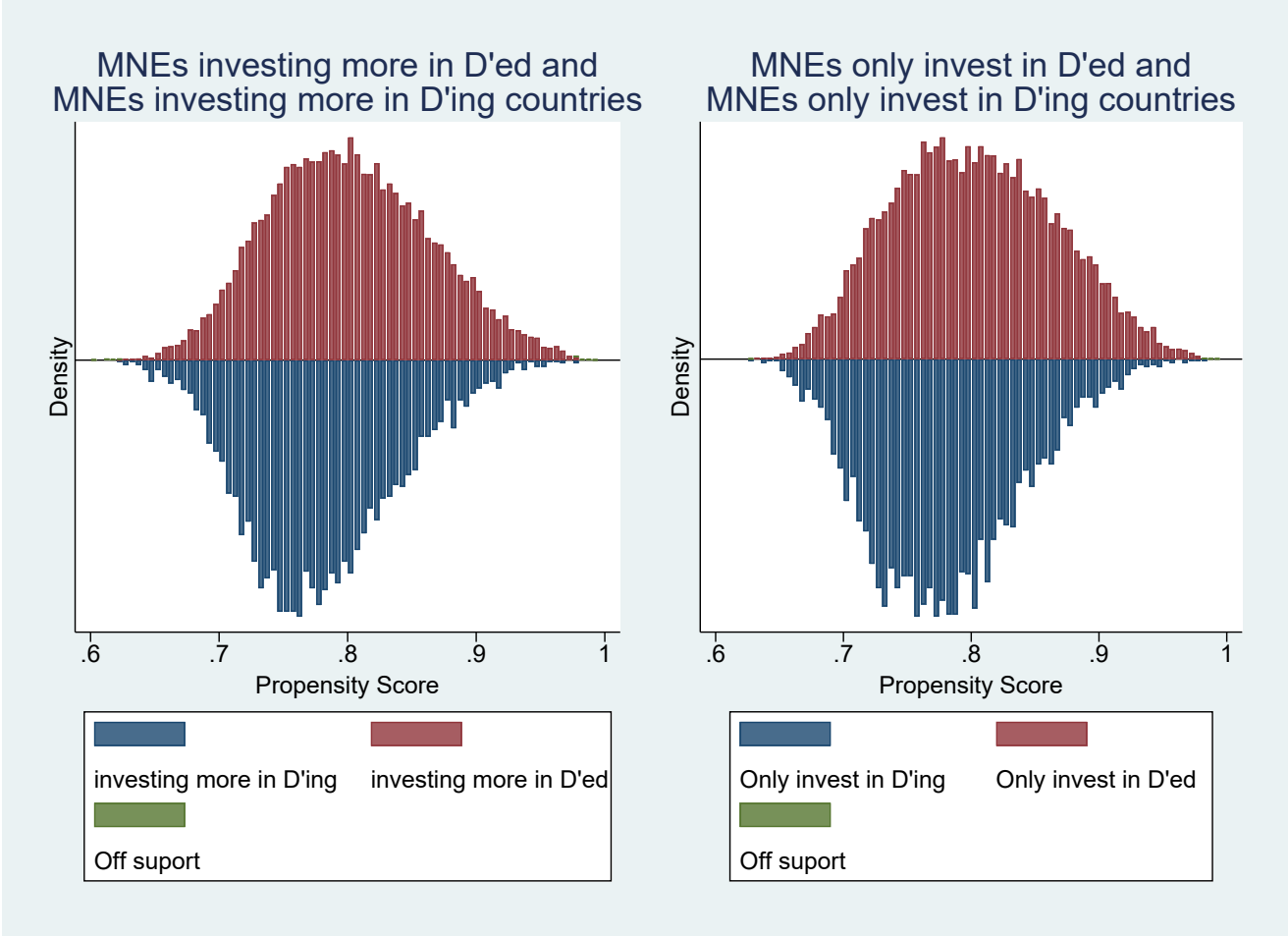
Notes: `OS_Ded (OS_Ding)' refers to the number of overseas subsidiaries in developed (developing countries). RD refers to the expenditure on research and development. `RD' and `Sales' are in millions of US dollars.

Appendix B: Productivity and Profitability differences between the matched MNEs matching method: nearest neighbour

Years	Differences	t-ratio	No. (Group A)	No. (Group B)
MNEs investing more in developed (Group A) vs. MNEs investing more in developing countries (Group B)				
Productivity differences				
t0	0.056	2.664	11994	4142
t+1	0.059	2.619	8633	3099
t+2	0.076	3.083	6891	2456
t+3	0.058	2.253	5684	1984
t+4	0.065	2.237	4551	1610
t+5	0.057	1.700	3571	1228
Profitability differences				
t0	-0.354	-1.613	11994	4142
t+1	-0.272	-1.137	8633	3099
t+2	0.150	0.565	6891	2456
t+3	-0.402	-1.325	5684	1984
t+4	-0.045	-0.137	4551	1610
t+5	-0.448	-1.176	3571	1228
MNEs investing only in developed (Group A) vs. MNEs investing only in developing countries (Group B)				
Productivity differences				
t0	0.071	3.305	10420	3645
t+1	0.041	1.764	7481	2711
t+2	0.082	3.293	5896	2135
t+3	0.064	2.339	4803	1732
t+4	0.061	1.946	3698	1387
t+5	0.072	2.110	2865	1059
Profitability differences				
t0	0.088	0.394	10420	3645
t+1	-0.081	-0.328	7481	2711
t+2	0.336	1.239	5896	2135
t+3	0.179	0.562	4803	1732
t+4	0.253	0.713	3698	1387
t+5	-0.160	-0.412	2865	1059

Notes: Column two calculates the average performance differences (productivity or profitability) between the matched MNEs investing more in developed countries and the matched MNEs investing more in developing countries. `t-ratio (ATT)' is the t-ratios of the average differences. This robust exercise in appendix B shows the consistency to Table 3.

Appendix C: The propensity score histogram



Notes: ` Off support' are those MNEs investing more in developed countries are out the range (between minimum and maximum) of propensity score of MNEs that invest more in developing countries. The propensity score histogram allows us to compare the quantity of matched treated and untreated firms, which are accumulated within a given number of intervals of the propensity score range. We find that there is a high rate of overlapped propensity scores between treated and untreated firms - particularly in the score range of 0.7 to 0.85. Overall, we demonstrate that the quality of matching is good by the using propensity score histogram analysis. Also see Table 2 showing a good quality of matching process.