

**INTANGIBLE ASSETS OF MNE FOREIGN SUBSIDIARIES: THE ROLE OF
INTERNAL FINANCIAL RESOURCES AND HOST COUNTRY INSTITUTION**

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ABSTRACT

In this study, we examine key factors which affect knowledge-based intangible asset holdings and investments of foreign subsidiaries of multinational enterprises (MNEs). We develop our hypotheses by drawing upon the international accounting standard IAS38 on Intangible assets, the pecking order theory in the finance literature and the institution theory. We theorise that MNE foreign subsidiaries combine and utilize their internal financial resources, namely, cash holdings (finance-based firm-specific advantages - FSAs) with externally accessed institutional factors of host countries, specifically economic freedom and rule of law (host country-specific advantages - CSAs) in their holdings and investments of intangible assets through self-creation and/or purchases. We empirically test our hypotheses using a new original dataset of European subsidiaries of U.S. MNEs. We find that cash holdings and host country economic freedom share a significant and positive relationship with intangible asset holdings and investments. However, host country rule of law has a negative relationship. These findings would be useful to MNE subsidiary managers and policy makers. The results clearly show that to attract more intangible asset holdings and investments from MNE foreign subsidiaries, government should encourage them to use their internal financing sources to fund the investments along with ensuring a sound and stable institutional environment of economic freedom. These factors are important to explain the phenomenon and also cost effective in terms of implementation. However, over-regulation may impede the investments in knowledge-based intangible assets. **Key words:** subsidiary-level intangible assets; the pecking order theory; IAS38 – Intangible assets; the institution theory.

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INTRODUCTION

Intangible assets are important inputs for the manufacturing of the final output goods and the provision of services, and are necessary for the creation and sales of new or improved products and services (Arrighetti, Landini & Lasagni, 2014). The literature has used a wide variety of terminologies, definitions and measurements for intangible assets. For the purpose of consistency between conceptualization and measurement, we refer to the International Accounting Standard IAS38 on Intangible assets. The accounting rule provides a clear definition and strict accounting criteria for recognition and measurement (for a detailed explanation, see appendix 1). Specifically, intangible asset is defined as “non-monetary identifiable asset without physical substance. An asset is a resource that is controlled by the entity as the result of past purchase or self-creation and from which future economic benefits (inflows of cash and other assets) are expected”. Examples of intangible assets are (a) assets related to marketing, such as newspaper masthead, trademarks, non-compete agreement, and internet domain names; (b) assets related to customers, such as order backlog, lists of customers, and existing relationships with these clients; (c) artistic assets, such as literature, music performance, photographs, and movies; (d) assets based on contracts, including agreements for licensing, services, franchises, broadcast rights, employment and use; (e) technological assets, including computer software, trade secrets, and patents (Wiley IFRS, 2017; IAS38). Intangible assets can be acquired by separate purchase, as part of a business combination, by a government grant, by exchange of assets, and/or by self-creation (internal generation) (IAS38). They must meet strict recognition criteria of intangible

assets to be recorded on the firm's balance sheet (Canibano, Garcia-Ayuso & Sanchez, 2000; Zaghal & Maaloul, 2011; Marrocu, Paci & Pontis, 2011).

Intangible assets are broadly based on information, knowledge, and intellectual properties. Arguably, R&D, innovation, and marketing activities are the inputs of the knowledge-creating process while intangible assets are the outputs of internally generated knowledge. Moreover, intangible assets can be acquired externally. Intangible assets are a source of international competitiveness and drivers of value creation for multinational enterprises (MNEs) and their subsidiaries (Buckley & Casson, 1976; Hennart, 1982; Rugman, 1981; Rugman, Verbeke & Nguyen, 2011; Caves, 1996; Hall, 2001; Dischinger & Riedel, 2011; Zingales, 2000). The literature reports the links between intangible assets and firm financial performance (Denicolai, Zucchella & Strange, 2014), and firm- and industry-level productivity (O'Mahony & Vecchi, 2009). Intangible assets are found to contribute significantly to market value (Hall, Jaffe & Trajtenberg, 2005; Greenhalgh & Rogers, 2006; Sandner & Block, 2011; Clausen & Hirth, 2016). Prior research also finds a positive relationship between intangible assets and internationalization (Denekamp, 1995; Braunerhjelm, 1996; Delgado-Gomez & Ramirer-Aleson, 2004).

Moreover, the international business (IB) literature documents that foreign subsidiaries actively contribute to the generation of knowledge-based stock for MNEs (Pearce, 1999a, b; Papanastassiou & Pearce, 2009; Rugman & Verbeke, 2001). As MNEs and their subsidiaries have shifted their investments more and more from tangible (physical) assets to intangible assets, it becomes important to understand this phenomenon.

However, little research has been conducted so far on the determinants of intangible asset holdings and investments of MNE foreign subsidiaries. In the majority of cases, the level of intangible assets has been taken as a given and treated more as an explanatory variable rather

than as a variable that needs to be explained (Arrighetti et al., 2014). There are research in the international taxation and public economics literature which directly examine intangible assets as a dependent variable from the tax perspective. From the point of view of both managers and policy makers, gaining a clear understanding of what affects MNE foreign subsidiaries to hold and invest in intangible assets in the first place beyond tax reasons can be of importance, especially if it helps to identify the variables which distinguish between high and low performing subsidiaries (Arrighetti et al., 2014). Moreover, such a perspective is also relevant for academic research because it may offer an opportunity to develop alternative theories to explain the phenomenon. For these reasons, this study aims to fill the gaps.

Furthermore, financing is instrumental to the decisions of intangible asset holdings and investments. Compared to tangible (physical) assets, intangible assets tend to be more difficult to identify, separate, utilize and value. Their value is sensible to who owns and employs them (Falato, Kadyrzhanova & Sim, 2012). Currently, banks tend to lend money based on the borrower's physical and financial assets as collaterals, which can be easily bought and sold, borrowed against, and used to back other financial instruments (Jarboe & Ellis, 2010). These features make financing intangible assets particularly challenging. However, little is known about how intangible assets are financed at the subsidiary level. Many of the previous studies in the extant IB literature tend to focus on the international connectivity, technology, innovation and knowledge (for a literature review, see Andersson, Dasi, Mudambi & Pedersen, 2016; for a review on innovation and international business, see Cantwell, 2017; location, collocation and innovation by MNEs, see Mudambi, Narula & Santangelo, 2017). However, there is a dearth of research that explicitly and directly examines intangible assets in general and the financing aspect of intangible assets in particular. As such, our academic and managerial understanding of this

important phenomenon from a strategic perspective is significantly limited. This reflects a notable research gap.

Additionally, the IB literature shows that MNE foreign subsidiaries contribute to the generation of knowledge stock by tapping into and accessing host country institutional factors (host country-specific advantages - CSAs). Country-level institutions have impact on firm-level strategy (Wan & Hoskisson, 2003). Among country-level factors, education system, public policy and training system are important institutional attributes for national innovation system (Dosi, Pavitt & Soete, 1990; Freeman, 1987; Lundvall, 1992). In the related manner, prior research in the IB literature tend to focus on how MNE foreign subsidiaries access host country national innovation system (Cantwell, 2009) because the internationalization and diverse geography of knowledge sourcing of MNEs is at the centre of the IB research agenda (Cantwell, 2009; Cantwell & Mudambi, 2011). Consequently, there is scarce insight into how MNE foreign subsidiaries use host countries' broader institutional factors, such as economic freedom and rule of law to support the generation of knowledge-based intangible assets. Although institutional setting of a country may include various other formal and informal institutions as suggested by North (1990), the selected variables are more concrete than others. Economic freedom is defined as the strengths and the consistency of national policies and formal institutions of a given country (Economic Freedom of the World Index, Fraser Institute, 2015). Rule of law refers to the restriction of the arbitrary exercise of power by subordinating it to well-defined and established laws (World Bank Institute in Governance and Anti-Corruption, Kaufmann et al., 2010). This is another gap that warrants further research.

Our study attempts to address these limitations and aims to contribute to the IB literature. The central research questions are

1. How do MNE foreign subsidiaries finance their intangible asset holdings and investments?
2. How do MNE foreign subsidiaries utilize host country institutional factors, especially economic freedom and rule of law to support their intangible asset holdings and investments?

Our theoretical development is built upon the pecking order theory (Myers & Majluf, 1984) and the institution theory (North, 1990). According to the pecking order theory, internal funds are always preferred to debt and equity in financing investments due to information asymmetry between owner manager and the equity market. Specifically, we propose that the availability of cash holdings/ liquid assets (a type of finance-based firm-specific advantages - FSA) enables foreign subsidiaries to finance the self-creation or the purchases of intangible assets. The financing of intangible assets of the subsidiary may be subject to the headquarters' approval in the annual budgeting cycle. Furthermore, we build upon the institution theory (North, 1990) to argue that host country economic freedom and rule of law (a type of host country-specific advantages - CSAs) are important factors which MNE foreign subsidiaries take into consideration when they make strategic decisions in intangible asset holdings and investments.

We empirically test our hypothesis using a new original dataset of European subsidiaries of U.S. MNEs. Our study adopts a subsidiary-centric perspective which emphasises that knowledge-based intangible assets can be generated anywhere in MNEs and that subsidiaries not only receive knowledge from their parent firms but also create new knowledge. Additionally, we focus on the efficiency and value creation aspects of MNE foreign subsidiaries when they hold and invest in intangible assets.

Our data is compiled from Amadeus database, which provides detailed accounting information at the subsidiary level and identification of a multinational group's ownership structure. We also use other public data sources for country-level variables. The empirical results confirm our prediction and points to a robust relationship between cash holdings and host country economic freedom and intangible assets holdings and investments of MNE subsidiaries. The effects are statistically and economically significant and consistent across a range of specifications and our estimation models address endogeneity concerns and the nature of intangible assets. However, rule of law is negatively related to intangible asset holdings and investments.

We make three new contributions to the IB literature, which are elaborated in more detail in the discussion. First, our core contribution is to develop a new theory to explain intangible asset holdings and investments of MNE foreign subsidiaries from a strategic perspective. We integrate the accounting, finance and IB theories to develop a conceptual model which examines both subsidiary-level and country-level institutional factors affecting intangible asset investments. This is aligned with the traditional IB framework of FSAs and CSAs (Rugman, 1981).

Second, our study responds to the increasing calls for more contextualization in IB research (Michailova, 2011). Specifically, we test our theoretical model in the context of European subsidiaries of US MNEs. Our findings show that these subsidiaries are driven by efficiency and value creation rather than value appropriation (tax avoidance, profit shifting and rent-seeking) in their strategic decision of intangible asset holdings and investments (Penrose, 1956). In this way, our work differs from prior research in the international taxation and public economics literature which examines the phenomenon using a parent-centric and tax-based perspective. In contrast, our study offers an alternative explanation using a non-tax-based explanation.

Third, our interdisciplinary approach in incorporating finance and accounting perspectives into our IB research is a new feature. We study the broad intangible (fixed) assets as reported in the balance sheet of foreign subsidiaries. Our work is a timely response to finance scholars' calls to integrate contemporary finance into IB research (Agmon, 2006; Bowe, 2009). Oxelheim, Randoy & Stonehill (2001) argue that international finance will enrich our understanding of international strategies of MNEs. Overall, to the best of our knowledge, our study is among the first few attempts to examine the phenomenon of intangible asset holdings and investments of MNE foreign subsidiaries from a strategic perspective.

LITERATURE SYNTHESIS AND THEORY DEVELOPMENT

Literature review

The IB literature documents that MNE subsidiaries actively engage in generating new knowledge and competences by utilizing knowledge transferred from parent firms and new knowledge developed locally by subsidiaries, which lead to improvements and augmentation in existing knowledge base (Rugman, 2014). They seek to combine not only internally generated knowledge and competences, but also externally-based host country institutional factors. Furthermore, subsidiaries play an important role in creating and transferring new knowledge (Mudambi, Pedersen & Andersson, 2016; Schmidt, Dzedek & Lehrer, 2014). They not only transfer knowledge back to their parent firms (Edwards & Tempel, 2010) but also coordinate knowledge flows across multiple host countries (Williams & Lee, 2011). Yet, little research has explicitly examined factors affecting intangible asset holdings and investments of MNE subsidiaries.

On the other hand, there is a related research stream in the economics and finance literatures which investigate firm-level factors affecting corporate innovation and R&D investments rather

than intangible assets per se. The firm-level variables include stock liquidity (Fang, Tian & Tice, 2014), financial analyst coverage (He & Tien, 2013), venture risk tolerance (Tian & Wang, 2014), banking competition (Cornaggia, Mao, Tian & Wolfe, 2015), going public or remaining private (Bernstein, 2012; Ferreira, Manso & Silva, 2014).

Furthermore, the literatures in the fields of economics, business and management examine a variety of country-level institutional factors which enhance or impede innovation and R&D investments. According to North (1990) and Daude & Stein (2007) investment decision may depend on different dimensions of institutional environment. Previous studies tend to examine single factors, such as legal institutions (Anderlini, Felli, Immordino & Riboni, 2013; Seitz & Watsinger, 2017); political stability and education system (Varsakelis, 2006); social institutions and culture (Nam, Parboteeah, Cullen & Johnson, 2014); government effectiveness (Dolfsma & Seo, 2013); regulations (Blind, 2012; Blind, Petersen & Riillo, 2017) and social, legal and political institutions (Alam, Uddin, Yazdifar, 2018). For example, Varsakelis (2006) and Krammer (2009) report that education, strong legal protection, stable political and economic environment are positively related to technological performance. Pattit, Raj & Wilemon (2012) find that both formal and informal institutions play a dominant role in shaping up the US technological change over a considerably long period of time. Wang, Yi, Kafouros & Yan (2015) observe that laws, regulations and policies influence firm-level innovation activities. Stronger institutional settings help to foster investments in innovation and R&D and improve knowledge accumulation (Priem & Butler, 2001; Yi, Wang & Kafouros, 2013).

It is noted that the majority of previous studies focus on either parent firm-level or country-level institutional variables separately. Our study differs from prior research by examining both subsidiary-level and country-level factors. Specifically, we focus on cash holdings, host country

economic freedom and rule of law as explanatory variables because they are largely under-researched in the extant literature. Thus, further research in this area will benefit both parent firm and subsidiary managers who are willing to invest in intangible assets, otherwise a lack of such knowledge will put investors at risk.

Theory development

We argue that MNE foreign subsidiaries are the engines to combine and utilize their internal financial resources of cash holdings and host countries' broad institutional factors of economic freedom and rule of law in generating and acquiring knowledge-based intangible assets. The use of cash holdings to finance intangible assets may be subject to the headquarters' (HQs) approval in the annual budgeting cycle. It is important to highlight that in comparison to the HQs, the top management team of MNE foreign subsidiaries has in-depth knowledge of the local business environments, thus they are in a better position to make decisions.

We build upon the pecking order theory to examine the relationship between cash holdings and intangible asset holdings and investments. Myers (1984) and Myers & Majluf (1984) suggest that firms follow a pecking order of financing to minimize costs related to information asymmetry. The order starts with internal sources and firms use external sources after the internal sources are exhausted. Internal financial sources are preferred to debt and equity issuance (for a review, see Al-Najjar, 2013). Cash holdings can be seen as an outcome of different financing and investment decisions proposed by the hierarchical pattern of financing (Dittmar, Mahrt-Smith & Servaes, 2003).

Furthermore, we argue that MNE subsidiaries may encounter difficulties in finding external financing sources to fund the self-creation and/or the purchases of intangible assets. Specifically, we draw upon findings from previous studies on investments in R&D and innovation, which

argue that capital market imperfections likely matter for intangible asset holdings and investments (Brown, Martinsson, Petersen, 2017). One reason is that these investments are particularly difficult for investors to evaluate, leading to potentially severe asymmetric information problems (Brown, Fazzari & Petersen, 2009; O'Mahony & Vecchi, 2009; Czarnitzki & Hottenrott, 2011). In addition, the nature of some forms of external financing, namely debt finance is poorly suited for funding intangible asset holdings and investments (Brown, Martinsson, Petersen, 2013; Hall & Lerner, 2010). Intangible assets are intangible in nature and offer little or no collateral value (Brown & Petersen, 2011; Himmelberg & Petersen, 1994; Hall, 2002; Berger & Udell, 1990). Prior empirical research finds a strong negative association between R&D and financial leverage across firms (for a survey, see Hall & Lerner, 2010). Moreover, investments in knowledge-based intangible assets are inherently risky and resource-intensive process with uncertain outcomes. Consequently, MNE subsidiaries must have adequate internal financial resources, namely cash holdings in order to pursue and to be able to cover failure and underperforming projects.

On the other hand, we draw upon the institution theory to suggest that MNE foreign subsidiaries access and utilize institutional factors of host countries. Formal institutions influence the cost of knowledge-creating inputs and also protects the knowledge outputs and thereby influence the subsidiary-level decisions of holdings and investments of intangible assets (Alam et al., 2018; Kramer, Marinelli, Iammarino, Diez, 2011). Choi, Yoshikawa, Zahra & Han (2014) find that effective institutions can encourage R&D investments by minimizing agency problems among decision makers. Better institutions promote financial market liberalization which in turn encourages R&D investments by reducing financial constraints of the firms (Laeven, 2003). In the related manner, host country economic freedom increases intra- and inter-firm resource flows,

which in turn support both the exploration and exploitation of corporate innovation (Zhu & Zhu, 2017). Rule of law and contract enforcement is found to be strongly associated with R&D investments (Alam et al., 2018; Seitz & Watzinger, 2017). Prior research also examines the effect of law for the incentive to innovate and the relationship between anti-trust and innovation (Lerner, 2009; Aghion, Bloom, Blundell, Griffith & Howitt, 2005; Segal & Whinston, 2007).

In summary, we theorize that of MNE foreign subsidiaries effectively combine and utilize internal financial resources of cash holdings and external institutional factors of host country to support their intangible asset holdings and investments. This is conceptually a valuable location-bound firm-specific advantage (Rugman & Verbeke, 1992).

HYPOTHESIS DEVELOPMENT

Subsidiary-level cash holdings (liquid assets)

To build our theoretical development on financing intangible asset holdings and investments, we draw upon the insights of previous studies in the finance literature which shows that liquidity is instrumental for the investments in R&D and innovation activities (Brown & Petersen, 2011; Himmelberg & Petersen, 1994; Hall, 2002). According to the “pecking” order theory (Myers & Majluf, 1984) which posits that firms hold cash for speculative uses because they can easily deploy cash holdings to take advantage of emerging opportunities. The firm will hold cash as a financial slack so that it can be used to finance investments when equity or debt finance is too expensive (for a review, see Ramirez & Tadesse, 2009).

The pecking order theory has been widely used in various applications. The most popular application is to examine the capital structure of the firm. Furthermore, the pecking order theory explains the inverse relationship between profitability and debt ratios, dividend payout ratios

(Brealey, Myers & Allen, 2008) and cash holdings (Dittmar, Mahrt-Smith & Servaes, 2003; Al-Najjar, 2013; Ramirez & Tadesse, 2009). Shyam-Sunder & Myers (1999) find that the pecking order is an excellent first order descriptor of firms' financing behaviour than by the trade-off theory. A number of studies using datasets of different countries have found that firms follow the pecking order theory (Aggarwal & Zong, 2006; Seifert & Gonenc, 2008; Zeidan, Galil & Shapir, 2018; for an international survey of the evidence on the pecking order theory, see Tsuji, 2011). Nguyen & Rugman (2015) find that foreign subsidiaries of British MNEs operating in South East Asian countries follow the pecking order theory in their capital structure.

In this study, we theorize that MNE foreign subsidiaries use subsidiary-level cash holdings to develop and/or to acquire intangible assets. We build upon previous studies on the financing of R&D and innovation and apply this line of thinking to our study of financing intangible assets for several reasons (Brown & Petersen, 2011; Himmelberg & Petersen, 1994; Hall, 2002). First, similar to investments in R&D, financing frictions are particularly relevant due to the lack of collateral value for most intangible assets, and reduce the scope of tangible asset-backed financing strategies (Brown & Petersen, 2011; Himmelberg & Petersen, 1994; Hall, 2002; Berger & Udell, 1990). Second, investments in intangible assets, especially internally created intangible assets, face large adjustment costs because of wage payments to highly skilled technology workers (Brown & Petersen, 2011). Third, there are potentially severe information asymmetries between firms and external investors. Firms frequently have better information about R&D and innovation projects, and intangible assets than potential investors (Himmelberg & Petersen, 1994). The nature of intangible assets precludes outsiders from making accurate appraisals of value, leading to a higher cost of capital (Himmelberg & Petersen, 1994; Hall, 2002). Furthermore, firms cannot reduce information asymmetries via full disclosures due to the risks

that imitators will appropriate any rents arising from their R&D (Himmelberg & Petersen, 1994). In addition, barriers to the valuation and marketability of intangible assets can lead to important gaps in the external credit funding. Long & Malitz (1985) and Brown et al., (2013) and other provide empirical evidence that financial leverage is negatively correlated with R&D (for a survey, see Hall & Lerner, 2010). Similarly, intangible asset holdings and investments may be subject to the same challenges in obtaining external debt financing.

Firms often rely more on internal funds than external funds to finance intangible assets (Myers & Majluf, 1984; Hall & Lerner, 2010). Brown & Petersen (2011) show that firms which most likely face financing frictions rely extensively on cash holdings to smooth R&D. Their findings provide new insights into the strategic value of liquidity and the financing of intangible investments, and suggest that cash reserve is important for R&D smoothing. Thus, cash holdings are expected to be instrumental in intangible assets holdings and investments. Taken the theoretical and empirical development altogether, we predict

Hypothesis 1: Cash holdings (liquid assets) of a subsidiary are positively related to its holdings and investments of intangible assets.

Host country economic freedom

Formal institutions of host countries are decisive factors when MNE subsidiaries consider allocating resources in productive and value-creating investments (North, 1990). We focus on the broad institution of economic freedom (for a detail discussion on economic freedom of the world, see Gwartney & Lawson, 2003). Economic freedom measures the quality of formal institutions in five broad areas, such as government, legal structure and security of property rights, access to sound money, freedom to trade internationally, and regulation of credit, labour and business (Economic Freedom of the World Index (EFWI), The Fraser Institute, 2015). There is a large

volume of studies which have extensively examined the role of economic freedom in the economic growth and financial development literatures. The consensus is that several elements of economic freedom enhance economic performance at the macro level (Barro, 1991; Easton & Walker, 1997; de Haan & Sturm, 2000; Greenaway, Morgan, & Wright, 2001; Gwartney & Lawson, 2006; Weede, 2006; Baier, Clance & Dwyer & Hafer, 2013; for a review, see Hall and Lawson, 2013).

We discuss the impacts of some of the components of the economic freedom index on the subsidiary-level holdings and investments of intangible assets. We build upon previous studies which examine the relationship between institutions and innovation and R&D investments (Alam et al., 2017; Zhu & Zhu, 2018). Prior research shows that government policies can have significant impacts on R&D and innovation activities leading to the creation and/or acquisition of knowledge-based intangible assets. These include national innovation systems, financial incentives for R&D (e.g. R&D tax credit and tax schemes of patent box and innovation box offered by a number of European countries, etc.), non-financial incentives through the promotion of cross-country knowledge exchanges, increase direct and effective involvement in initiatives by local institutions, and increase use of intellectual assets (Kramer, Marinelli, Iammarino & Revilla Diez, 2011; Hall & van Reenen, 2000).

According to Levine (2005), the security of property rights has two dimensions. First, government effectiveness assures fair application of legal regulations, law enforcement and protects property rights. Second, government effectiveness constrains coercion and prevents bribery and corruption. Laws provide not only necessary protection of the outputs of R&D, innovation activities and knowledge creation, but also protection of investments in complementary assets (Lin, Lin & Song, 2010).

Furthermore, government effectiveness affects firm performance through its effects on managerial assumptions and actions and therefore, it reduces agency costs (Pearce, Xin, Xu & Rao, 2011). Lower agency costs increase the likelihood of efficient investments. Investors have confidence in regulatory and legal systems, especially property rights to protect returns on their investments of intangible assets. In addition, prior research shows that keeping government spending at an appropriate level and implementing effective fiscal policies through taxation lead to increase in investments (DiLorenzo, 2004; Johansson, Heady, Arnold, Brys & Vartia, 2008).

In addition, freedom to trade internationally increases the potential value of returns on investments in knowledge-based intangible assets by selling innovative products and services in foreign markets. Alcalá & Ciccone (2004) find a relationship between trade and productivity, suggesting that freedom to trade internationally favours innovative products and ideas. Moreover, business freedom indicates the efficiency of a country's rules and regulations and the associated costs of doing business, which in turn influence investments in intangible asset holdings and investments. In the related manner, labour freedom lowers transaction costs, which in turn increases entrepreneurial activities (McMullen, Bagby & Palich, 2008).

It is highly likely that in the presence of economic freedom, holdings and investments in knowledge-based intangible assets becomes more rewarding and returns from these investments would be higher. Therefore, MNE subsidiaries operating in countries with higher degree of economic freedom would find it encouraging to hold and to invest in intangible assets. We propose the following hypothesis:

Hypothesis 2a: Economic freedom of a host country is positively related to intangible asset holdings and investments of a foreign subsidiary.

Host country rule of law

Much of previous studies tend to examine the relationship between rule of law and R&D and innovation investments. We build upon this research stream to apply to our study on intangible asset holdings and investments. Rule of law measures the judicial strength of a country (Wan & Hoskisson, 2003) and also ensures strict law enforcement (Seitz & Watzinger, 2017). Rule of law or a strong legal system is important in encouraging R&D investment (Seitz & Watzinger, 2017) as well as the creation and adoption of advanced technology (Claessens & Laeven, 2003).

Strong rule of law facilitates the development of financial market which in turn supports firms in their investments in R&D and innovation (La Porta, Lopez-de-Silanes, Schleifer & Vishny, 1997). Specifically, a developed and liquid financial market ensures firms to access to capital at a lower cost and reduces information asymmetry. Similarly, equity market development encourages innovation in high-tech and emerging industries with more external financing and growth opportunities (Hsu, Tian & Xu, 2014). Brown et al. (2009) show that the availability of external debt and equity financing is particularly important for corporate risky investments in innovation. Ayyagari, Demirgüç-Kunt & Maksimovic (2011) find that access to finance is associated with higher innovation rates for firms in developing countries.

Moreover, strong rule of law helps to reduce managerial expropriation, protect intellectual property rights and ensures contract enforcement (Seitz & Watzinger, 2017). In this way, strong rule of law provides the benefits of reducing risks and thus encourages investments in knowledge-based intangible assets. Chemmanur & Tian (2013) observe how anti-takeover provisions allow firms to be more innovative. Acharya, Baghai & Subramanian (2014) find that wrongful discharge laws which protect employees against unjust dismissal motivate innovation. Strong employment protection against unfair dismissal leads to more innovative efforts by employees because it limits employers' ability to hold up employees after an innovation has been

successful (Acharya et al., 2014). In a related manner, Acharya & Subramanian (2009) argue that creditors' right and employee right also help to encourage R&D. Strong creditors' right helps protect creditors from bankruptcy fear and encourages more investment in R&D and innovation. Employee right helps to encourage employees to devote to innovation activities regardless of the possibility of failure at the end.

Furthermore, Seitz & Watzinger (2017) show that superior rule of law and strict contract enforcement is instrumental in determining higher R&D investment in Germany than in Italy. Pindado, de Queiroz & de la Torre (2015) find that strong legal system enhances R&D by improving investors' protection and confidence. Similarly, Furukawa (2007) reports that stronger rule of law provides incentives for R&D investments.

Additionally, quality of regulations increases the investment opportunities of a country. Mahendra, Zuhdi & Muyanto (2015) find that good regulatory quality and access to finance have positive impact on innovation. Blind et al. (2017) find that regulations have positive influence on innovation in low uncertain markets while opposite effects in high uncertain markets.

However, the relationships between rule of law and R&D and innovation investments remain unsettled (for a thorough review, see Hall, 2007). In some cases, strict rule of law may discourage and hinder innovation activities. Strict rule of law and over-regulation may increase the compliance cost and therefore, firms feel discouraged to raise external finance which in turn reduces corporate investments in R&D (Blind, 2012). Waarden (2001) argues that de-regulation may encourage innovation as it provides more freedom to innovate and conclude that the relationship between rule of law and innovation is not straightforward. There is a growing controversy regarding the value of strong intellectual property protection (Lerner, 2009; Boldrin & Levine, 2013). Moreover, Francis, Kim, Wang & Zhang (2018) provide firm-level evidence

that the enhancement of labour protection has a negative impact on innovation. They discuss the potential channels and find that employee-friendly labour reforms induce investors shirking and a distortion in labour flow.

Overall, prior research has provided broad evidence on the positive relationship between rule of law and R&D and innovation investments. The relationship may be complicated in some cases.

Thus, we propose the following hypothesis

Hypothesis 2b: Rule of law of a host country is positively related to intangible asset holdings and investments of a foreign subsidiary.

We capture the direct effects of cash holdings, host country economic freedom and rule of law on intangible asset holdings and investments of MNE subsidiaries in our conceptual model in Figure 1.

Figure 1

METHODOLOGY

Research setting

We empirically test our hypothesis using a new dataset of European subsidiaries of U.S. MNEs for two reasons. First, this is an opportunity for us to look at the phenomenon of intangible asset holdings and investments of European subsidiaries of US MNEs from a strategic perspective by developing a new alternative theory which offers a non-tax-based explanation. This approach contrasts much of prior research in the international taxation and public economics literatures which explain the phenomenon using a tax-based explanation. The majority of these studies use datasets of U.S. parent firms which are considered to be the most aggressive in tax planning (Grubert, 2003; Lindsey & Wilson, 2015; Mutti & Grubert, 2009). The tax research stream adopts a parent-centric approach emphasizing the headquarters as the main source of knowledge

creation. The main arguments are that for tax saving purposes, MNEs relocate and migrate their valuable intangible assets from high-tax jurisdictions (e.g. the United States where the tax rate used to be 35% until the tax went down to 21% in the US Tax Cut and Jobs Act passed in December 2017) to low-tax jurisdictions (e.g. Ireland where the corporate tax rate is 12.5%). They establish intellectual property holding companies (a type of special purpose entity) in low-tax jurisdictions, offshore financial centres or tax havens, which charge royalties to operating subsidiaries and exploit profit shifting strategies through the distortion of transfer prices for intangible assets traded within the firm. This arrangement helps MNEs to minimize their corporate tax bills worldwide (Grubert, 2003; Mutti & Grubert, 2009).

Second, there are quite a number of countries in Europe on the list of offshore financial centres (a type of tax havens) by IMF (2000) and OECD (2014). These locations offer relatively low corporate income tax and do not require substantive productive and economic operations in the country, suggesting that policies are geared towards attracting income only on a preferential tax basis. Thus, it will be interesting to study this phenomenon at the subsidiary level in the European context from a strategic perspective focusing on value creation, and compare and contrast our findings with earlier studies with arguments of value appropriation through tax avoidance and profit shifting.

Data sources and sample: Subsidiary-level and parent-level data

We construct our dataset from Amadeus database by Bureau van Dijk, which is one of the world's leading financial intelligence service providers. This database has ownership and financial data of public and private parent firms and foreign subsidiaries in Europe. It has been widely used in academic research (Dischinger & Riedel, 2010; Beuselinck, Deloof & Vanstraelen, 2011).

We first retrieve all listed, non-financial US ultimate owners with at least one European subsidiary in their group structure. We discard all parents and subsidiaries from financial institutions, utilities, and quasi regulated industries, because their balance sheets are specific in these cases and potentially incomparable to industrial firms. This approach has been adopted in finance and IB research (Foley, Hartzell & Titman & Twite, 2007; Banalieva & Dhanaraj, 2013). From these MNEs, we retrieve subsidiaries which are directly held by the parent firm with an equity stake of at least 51 percent. They have non-zero total assets, and all necessary information for the year 2014 for the empirical analysis is available.

The sample consists of 150 largest subsidiaries by revenue ranking, of which 29 percent are located in the United Kingdom, 15 percent in Germany, 14 percent in the Netherlands, 10 percent in France, seven percent in Ireland, and the rest in other European countries (Austria, Belgium, Cyprus, Denmark, Finland, Hungary, Italy, Luxembourg, Norway, Poland, Russian Federation, Slovakia, Spain, Sweden and Switzerland). Furthermore, to assure our data integrity and to obtain an understanding of these subsidiaries' strategies, mandates, and operations, we manually consult the annual reports of the sampled subsidiaries in the UK because they are required to file their full accounts to the UK Companies House. The median subsidiary in our sample is large with average assets of EUR 5,462 million, average sales of EUR 6,762 million and average employees of 6,753 people.

Our sample size of 150 subsidiaries is sufficient for empirical tests for three reasons. First, it is enough for continuous data (Barlett, Kotrlik, & Higgins, 2001). Second, the ratio of observations to independent variables is satisfactory because it does not fall below the threshold of five (Hair, Anderson, Babin, & Black, 2010). Therefore, the sample is sufficient for statistical tests given that our regressions have 12 variables (three independent variables and nine control variables).

Third, this reasonable sample size allows us to be able to consult and perform manually the content analysis of the full accounts of UK subsidiaries filed with the UK Companies House to further corroborate regression results (the UK Companies House is a government body which registers/ dissolves company and makes documents and information available to the public). The content analysis is defined as a qualitative method to interpret meaning from the content of text data. Analyzing the content of the full accounts is quite demanding and time-consuming. For example, IBM United Kingdom's full accounts of 2014 have 85 pages. Given that there are 44 UK subsidiaries in our sample, it means that a substantial amount of pages of the full accounts, especially strategic reports, management discussion and disclosure notes, etc. need to be studied manually. In the next section, we will present one example using the content analysis method which aims to complement our findings from the multiple regression analytical approach.

Country-level data

We use the economic freedom of the world index (EFWI) from the published reports by the Fraser Institute, Vancouver, Canada with data sourced from more than 70 think-tanks around the world (The Fraser Institute, 2015). The summary index comprises of five sub-indexes, which are size of government (which captures size of government, expenditures, taxes, and enterprises); legal system and property rights (which capture legal system and security of property rights); sound money (which captures access to sound money); freedom to trade internationally (which captures freedom to trade internationally); and regulation (which captures the regulation of credit, labor and business). These sub-indexes are rated on a scale of 0-10 with higher value meaning of better quality. Because there is a high multicollinearity among sub-indexes, we use the summary chained index.

We also use the scores of country-level rule of law developed by the World Bank Institute in Governance and Anti-Corruption (Kaufmann et al., 2010). This project reports data of aggregate and individual indicators for 215 economies. The rule of law measures the extent to which agents have confidence in and abides by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence (Kaufmann et al., 2010).

Table 1 reports the sample structure by countries and economic freedom of the world index and rule of law of host countries.

Table 1

Variable definitions

Dependent variable: Intangible assets

We follow Deschinger & Riedel (2010) to measure intangible assets by the natural logarithm of the ratio of intangible assets over total assets. The use of a natural logarithm is appropriate for this variable because it has a highly skewed distribution and logarithm transformation makes a positively skewed distribution more normal (Hair et al., 2010).

Independent variables

Subsidiary-level cash holdings: We follow Foley et al. (2007) to measure subsidiary-level cash holdings by the ratio of cash and cash equivalents to net assets. Net assets are defined as total assets minus cash and equivalents. In all regressions, it is the natural logarithm of subsidiary-level cash holdings. We use a natural logarithm for this variable to address the highly skewed distribution because logarithm transformation normalizes a positively skewed distribution (Hair et al., 2010).

Host country economic freedom: We use economic freedom of the world index to measure the quality of the host institutions where the subsidiary is located. This index has been used in previous studies by Banalieva & Dhanaraj (2013) and Nguyen & Almodovar (2018).

Host country rule of law: We use the rule of law, namely, percentile rank among all countries (ranges from 0 (lowest) to 100 (highest) rank). This index has been used in previous studies by Beuselinck, Deloof & Vanstaelen (2011).

Control variables

Based on the literature, we include a set of control variables, which have been identified to explain intangible asset holdings and investments. These are subsidiary characteristics, parent firm characteristics, host country characteristics, and sectors.

Subsidiary size: Previous studies show that large firms have lower information asymmetries than small firms. It is less costly for large firms to convey information about the real value of their investment projects. In addition, they have competitive advantages of economies of scale in intangible asset accumulation (Dierickx & Cool, 1989). They have greater access to both debt and equity capital markets to obtain financing sources (Ramirez & Tadesse, 2009). Consequently, they have sufficient financial resources to invest in intangible assets. Furthermore, they can be more effective in protecting their intangible assets than smaller ones and thus have a greater incentive to invest. Additionally, large firms are also capable of supporting greater share of the uncertainty which is associated with intangible asset holdings and investments. On this basis, we predict a positive association between subsidiary size and holdings and investments o intangible asset holdings and investments. Subsidiary size is measured by the natural logarithm of the subsidiary's total assets.

Subsidiary age: This variable is an indirect indicator of the host-country cumulative experience of MNE foreign subsidiaries (Autio, Sapienza, & Almeida, 2000; Love, Roper & Zhou, 2016). Subsidiary age is measured by the natural logarithm of the number of years in operation since its inception.

Subsidiary financial leverage: Debt might be an alternative financing source to fund intangible asset holdings and investments (Brown & Petersen, 2011; Brown et al., 2013). We predict that debt is likely correlated with intangible asset holdings and investments. Subsidiary financial leverage is measured by long-term debts to total assets. Because intangible assets are a type of long-term assets in nature, it is more appropriate to use long-term financing sources, such as long-term debts rather than short-term debts.

Subsidiary working capital: We follow previous studies to control for the potential effects of working capital (Opler et al., 1999; Ozkan & Ozkan, 2004). Working capital is calculated by inventories and accounts receivable minus accounts payable, accrued expenses and short term debts to total net assets. It measures the existence of other liquid assets, which may be used to fund intangible asset holdings and investments.

Subsidiary effective tax rate: A concern, which arises from interpreting the holdings and investments in intangible assets of foreign subsidiaries, is corporate taxes. Tax is an important factor, because it influences the location decision of intangible properties (Lindsey & Wilson, 2015; Deschinger & Riedel, 2011).

In addition, a number of European countries have implemented innovation tax incentives, which focus on the income, rather than the development side of intellectual properties by adopting the “patent box” or “innovation box”. A patent box is a special tax regime for patent income. An innovation box offers a preferential rate for income from other intangible assets in addition to

patents (Atkinson & Andes, 2011; Graetz & Doud, 2013). Ireland exempted patent income starting in 1973. The United Kingdom, France, Belgium, Hungary, Luxembourg, the Netherlands, and Spain have also introduced similar tax incentive schemes. However, this type of innovation tax scheme is not available in the US.

We include the effective tax rate of the subsidiary, which is calculated by the amount of taxes payable in a particular year divided by earnings before taxes. This is an indicator of tax shields, in which low effective tax rates may encourage subsidiaries to invest in intangible asset holdings and investments.

Parent firm's degree of multinationality: The degree of multinationality of the parent firm likely influences foreign subsidiaries to access to the local innovation systems and to exploit host CSAs for intangible asset holdings and investments. This variable is measured by the natural logarithm of number of foreign subsidiaries and it has been widely used in the IB literature (Morck & Yeung, 1991; Yang, Martin & Driffield, 2013).

Parent firm's size: We control for the potential influence of the parent firm size on the subsidiary-level holdings and investments of intangible assets of MNE foreign subsidiaries. The core resources and knowledge of foreign subsidiaries are often transferred from their parent firms. This variable is measured by the number of employees of the parent firms (Nguyen & Rugman, 2015, Nguyen and Almodóvar 2018).

Host country as a location for offshore financial centre (a type of tax haven): There are arguments that U.S. MNEs have an incentive to relocate and migrate intangible assets from the U.S. headquarters to subsidiaries in countries, territories, and jurisdictions with offshore financial centres (OFCs), where the corporate tax rate is zero or relatively low by establishing special purpose entities (SPEs), and/or set up holding companies (HCs). Holding company is defined as

an immediate parent undertaking in a subsidiary or a portfolio of subsidiaries and deals specifically with assets, investments and management, rather than providing goods and services with a view to making a profit from production and sales. Assets could be in the forms of shares, intellectual property (patents, trademarks, etc.) and real property (real estates) and other assets, etc.

Intangible assets can constitute a major source of profit shifting opportunities in MNEs as they can charge other operating subsidiaries royalties for the use of intangible properties (Desai, Foley & Hines, 2006; Dischinger & Riedel, 2011; Grubert, 2003; Lindsey & Wilson, 2015; Mutti & Grubert, 2009). Transfer pricing for firm-specific intangible assets raises concerns of potential profit shifting, because intangible assets are usually firm-specific intermediate goods, for which comparable arm's length prices can be hard to be determined by tax authorities (Grubert, 2003; Desai et al., 2006). MNEs may overstate the transfer pricing for the intermediate immaterial good at relatively low expected costs and this shifts profits from the subsidiary in a high-tax country to the intangible asset holding subsidiary in a low- or zero-tax country (Dischinger & Riedel, 2011). This helps MNEs to lower their corporate tax bills worldwide.

The International Monetary Fund (IMF) produces a list of countries, territories, jurisdictions with offshore financial centres (IMF, 2000). The OECD also generates a similar list in its project on Base Erosion and Profit Shifting in 2014 (OECD, 2014). There is a high degree of similarities between these two lists. It is noted that to a large extent, locations of offshore financial centres are similar to tax havens. There is no precise definition of a tax haven. The OECD (2000) initially defines the following features of tax havens: zero or low taxes, lack of effective exchange of information, lack of transparency, and no requirement of substantive activity. According to the progress report in 2011 by the OECD's Committee on Fiscal Affairs, no jurisdiction is listed as

an uncooperative tax haven (OECD, 2011). In 2014, OECD focuses on OFCs instead of tax havens. In a related manner, UNCTAD (2013) identifies a number of countries in Europe, e.g. Luxembourg, the Netherlands, Hungary, Cyprus, Switzerland, Ireland, Portugal, Denmark, among others as popular locations for OFCs and SPEs. We create a dummy variable, which is assigned the value of 1 if the host country of the subsidiary is on the lists of offshore financial centres either by IMF or by OECD, otherwise 0.

Sectors: We control for the potential effects of sectors, which tend to have different dynamics in intangible assets holdings and investments. Makino, Isobe, and Chan (2004), Hansen and Gwozdz (2015), and Venaik, Midgley, and Devinney (2005) show that it is difficult to untangle industry effects and country effects, and that sector features may vary between countries. Thus, as sectors' effects might have the potential to confound the results of our study, we use a dummy variable where we assign the value of 1 for manufacturing and 0 for service.

Regression

We examine the relationships between cash holdings and host country economic freedom and rule of law and intangible asset holdings and investments of MNE foreign subsidiaries while we control for other known variables in the estimated regression equations.

RESULTS AND DISCUSSIONS

Descriptive statistics

Table 2

Table 2 reports descriptive statistics (means and standard deviations) and Pearson correlation coefficients between variables. The median European subsidiary of US MNEs had intangible asset holdings and investments at approximately 14 percent of total assets before it was

transformed into a natural logarithm. This ratio was lower than the median subsidiary of European MNEs which hold and invest intangible assets at approximately 26 percent of total assets in the study by Dischinger & Riedel (2011). The average ratio of cash holdings (cash-to-net-assets) was nine percent before it was transformed into a natural logarithm. The cash holdings mainly came from the profits of the existing operations of these subsidiaries. The majority of them operated at profits. Only six subsidiaries incurred loss. They had an average gross profit margin of 9.31 percent (standard deviation of 17.11 due to a variation with the maximum gross margin of 89 percent and the minimum of loss making at minus six percent). They had very low financial leverage as shown in the mean ratio of long-term debt over total assets of 0.08. During the period of the study, there was no new share issuance. All of them are private subsidiaries, meaning that they are not publicly listed in the host countries' stock exchanges and their shares are not publicly traded.

We find that all the pair-wise correlations are lower than the recommended 0.5 threshold, excepting the host country rule of law variable. We use two diagnostic tests, which are the variance inflation factor (VIF) and the tolerance analysis to detect any potential bias introduced by this high correlation. Individual VIF values are under 2, which are below the recommended cutoff point of 10, and all measures of tolerance are above the suggested cutoff point of 0.1 (Hair et al., 2010). Thus, the test results suggest that multicollinearity is not a problem. Consistent with our expectations, the correlations suggest that a foreign subsidiary holds and invests in intangible assets when it holds cash. The economic freedom of the host country is correlated with the holdings and investments of intangible assets of a subsidiary.

Hypothesis testing, results, and discussion

Table 3

To test our hypothesis, we estimate multiple regressions with standard errors. Table 3 reports the estimates of the subsidiary-level intangible asset holdings and investments. Model 1 shows control variables. Model 2 adds the main effects of independent variables. Model 3 is a full model including both independent and control variables. Hypothesis 1 predicts a positive relationship between cash holdings and intangible asset holdings and investments of a foreign subsidiary. This relationship is significant ($\beta=0.19$; $p\text{-value}<0.001$) and the sign is positive. Thus, hypothesis 1 is fully supported. Our finding is consistent with the prediction of the pecking order theory (Myers & Majluf, 1984). To a large extent, our empirical evidence is consistent with previous studies in the finance literature (Brown & Petersen, 2011).

It is interesting to observe that our views differ from previous studies in the international taxation literature. The taxation literature argues that taxation is the main reason for European subsidiaries of US MNEs which generate income have incentives to hold cash abroad to avoid taxes upon repatriation (Blouin et al., 2012; Foley et al., 2007; Bloomberg, 2015). We show that investments in intangible assets are correlated with cash holdings. Our study is in line with Pinkowitz, Stulz, & Williamson (2012) because these scholars suggest that additional research is needed to explain other non-tax reasons why MNEs hold cash in foreign subsidiaries. Here, we show that MNE foreign subsidiaries use cash holdings to finance intangible asset holdings and investments.

Hypothesis 2, which predicts a positive relationship between host country economic freedom and intangible asset holdings and investments of a foreign subsidiary, is fully supported. We find a significant and positive relationship ($\beta=1.57$, $p\text{-value}<0.05$). In our study, the median host country has a score of economic freedom index of 7.5, which is higher than the average chained

linked EFW rating for 101 countries with ratings since 1980 (The Fraser Institute, 2015). The majority of Western European countries have high economic freedom. However, transition countries have lower score (see Table 1).

Hypothesis 3, which predicts a positive relationship between the host country rule of law and intangible asset holdings and investments of a foreign subsidiary, is not supported. We find that the relationship is significant but the sign is negative ($\beta=-0.05$, $p\text{-value}<0.05$). Our finding appears to support Rugman et al. (2011) because these scholars argue that national institutional regimes are not sufficient to protect knowledge-based intangible assets, and thus MNEs' internal markets replace external ones in order to be able to compete abroad as outlined in internalization theory. Furthermore, Hall, Helmers, Rogers & Sena (2014) surveys the economics literature on the choice of intellectual property protection by firms. They find that most firms consider patents a relatively ineffective means to protect their inventions. Instead, they favour a range of different protection mechanisms, above all, lead time. They also regard secrecy as more effective than patents. The finding suggests that MNE foreign subsidiaries may use other alternative solutions to protect their intellectual properties besides relying on the host country rule of law, given that the sampled subsidiaries operate in both Western countries with strong institutions and in transitional countries with weak institutions. To some extent, our study is also in line with previous studies about the need for de-regulation to encourage investments in R&D (Lerner, 2009; Boldrin & Levin, 2013).

The test results of control variables also present interesting findings. The coefficients of subsidiary size ($\beta=0.78$; $p\text{-value}<0.01$), subsidiary financial leverage ($\beta=3.01$; $p\text{-value}<0.05$) and subsidiary effective tax rate ($\beta=0.21$; $p\text{-value}<0.01$) correspond with our expectations and consistent with prior findings, in which they are statistically significant and the signs are positive.

However, subsidiary working capital is significant but negatively related to the holdings and investments in intangible assets ($\beta=-0.99$; $p\text{-value}<0.1$). Subsidiary age and sectors are insignificant control variables.

It is argued that many intangible assets can generate cash flows like tangible assets. Thus, intangible assets that generate substantial future cash flows may be suited to be financed by financial leverage (long-term debt). In addition, banks tend to provide financing for MNE subsidiaries which are more able to service their debts regardless of the collaterals they can provide. This might be a plausible explanation for our finding on the positive relationship between subsidiary financial leverage and intangible assets. The finding is aligned with our expectation that long-term debt may be used to finance intangible assets, which are long-term in nature.

On the other hand, there are arguments that if intangible asset holdings and investments are risky, the cost of borrowing becomes so high for these subsidiaries. They might not consider financing the investments by long-term debt and they will have to resort to short-term or convertible debt instead to reduce the cost of borrowing (this is why we also control for the potential impact of subsidiary working capital ratio, in which short-term debt is taken into account). However, we find that working capital is negatively related to intangible asset holdings and investments. So, the overall finding is that the subsidiaries follow the pecking order theory (Myers & Majluf, 1984) in financing of intangible asset holdings and investments, by using first cash holdings, then debt and finally equity.

The parent firm's degree of multinationality has no significant relationship to intangible asset holdings and investments of foreign subsidiaries and the sign is negative. One plausible

explanation is that intangible assets tend to be location-bound, and thus it is very challenging and costly for international transfer. Therefore, foreign subsidiaries need to invest in developing or in purchasing a new set of location-bound knowledge-based intangible assets in host countries. In a related manner, the literature on the geography of innovation emphasizes the complex nature of knowledge and thus it makes knowledge exchange and transfer difficult. Knowledge creation is a systematic, cumulative, partially tacit and sticky phenomenon (Nelson & Winter, 1982). In other words, knowledge is embodied in people, places, and routines, and is therefore sticky.

Parent firm size has no significant relationship to intangible asset holdings and investments and the sign is negative. Our finding suggests that it is not sufficient for MNE subsidiaries to rely on economies of scale and scope and knowledge stock of their parent firms. This reinforces the necessity of developing new knowledge assets in host countries, integrating with the existing knowledge stock of the parent firm, and exploiting the enhanced and integrated knowledge bundles effectively in generating intangible assets (Nguyen, 2014, 2015; Nguyen & Rugman, 2015; Verbeke, 2013).

Interestingly, we find that the control variable of host country locations of offshore financial centres (a type of tax havens) exhibits no significant relationship to intangible asset holdings and investments of MNE subsidiaries.

The content analysis of an example for illustration

To obtain an in-depth understanding of the phenomenon, we use the content analysis method to examine the description of business activities, financial data, strategic report/ management discussion and disclosure notes in the full accounts of UK subsidiaries filed with the UK Companies House, given that they are among the largest percentage in our sample. This approach

has been frequently used in the accounting and international taxation literature (Bewley & Schneider 2013; Chen, Su & Wu 2010; Donohoe, McGill & Outslay 2012; Hageman & Bobek Schmitt 2014); however, it is not often used in the IB literature.

We find that the UK subsidiaries of US MNEs hold both large intangible and tangible physical fixed assets. The finding suggests that the locations of actual business activities in terms of value-added activities (e.g. manufacturing, marketing, sales, distribution and service provision, etc.) and the location of intangible and tangible assets are not separated from each other. To some extent, our findings are consistent with Loretz (2012), who has found co-location between firms' tangible and intangible assets (Loretz, 2012). The findings suggest the focus on efficiency and value creation aspects of MNE subsidiary strategy.

An example may help illustrate our findings. IBM United Kingdom Limited is one of the largest subsidiaries of IBM Corporation headquartered in the U.S, offering a broad range of hardware and software solutions, technology services and business consulting to clients in all industries, including large, small and midsize businesses. The income statement for the year ended December 31, 2014 showed that the subsidiary generated revenue of £3,672.2 million, of which domestic sales accounted for 78 percent and exports for 22 percent (IBM United Kingdom Limited, Full Accounts, 2014, page 12-13). The total comprehensive income for the year was £385.9 million, a growth of eight percent from the previous year of £357.6 million.

The balance sheet as at December 31, 2014 showed that the subsidiary carried total assets of £4,344.3 million, of which non-current assets was of £1,388.6 million and current assets of £2,955.7 million. A detailed analysis revealed an interesting finding, in which it had more intangible assets than tangible assets as outlined in our earlier argument that firms have invested more in intangible assets than tangible assets. Specifically, tangible assets were £230.8 million

while intangible assets were £282.2 million (accounting for 16.62% and 20.32% respectively of total non-current assets of £1,388.6 million). Its cash and cash equivalents was £14.5 million (accounting for 0.49% of total current assets of £2,955.7 million) (IBM United Kingdom Limited, Full Accounts, 2014, page 15). It did not have any short-term debt and long-term debt finance from external financial institutions. The total liabilities were £1,943.3 million. Total equities were £2,401.0 million, of which retained earnings were £725.3 million. There was no new share issuance.

The subsidiary had a net positive cash position and loaned this cash to the Treasury Centre, namely, IBM International Treasury Services Company in Ireland. The subsidiary invested and borrowed cash internally. Given the cash position, any liquidity risk was minimal. In case the subsidiary needed to borrow from the Treasury Centre, the interest rate of short-term intra-firm loan was structured on a short-term three-month or six-month loan based on a three-month or six-month London Interbank Offered Rate (LIBOR) rate plus certain basis points for risk premium (IBM United Kingdom Limited, Full Accounts, 2014). The directors did not recommend a dividend payment to the parent firm. During the year, the subsidiary made a number of acquisitions.

We find that with the availability of internal financial resources and the access to internal capital markets (Treasury Centre in Ireland acts as an in-house bank – a type of internal capital markets, for a comprehensive discussion, see Rugman, 1980; Nguyen & Rugman, 2015), IBM United Kingdom Limited can advance monies to fund research and development (R&D) activities and then recharged to the U.S. HQs. The strategic report in the full accounts of 2014 stated that “IBM United Kingdom Limited has carried out product development projects at laboratories in various locations throughout the UK, on behalf of IBM Corporation and its subsidiaries. The expenditure

incurred on these projects in the year of £410.2 million was recharged to IBM Corporation” (IBM United Kingdom Limited, Full Accounts, 2014, page 6).

The content analysis of the subsidiary’s full accounts showed that the availability of internal financial resources, especially cash holdings is an important financing source for self-creating innovation through R&D activities and/or acquiring external intangible assets through acquisitions. Given that R&D is costly and risky, debt is poorly suited to fund R&D (for a survey, see Hall and Lerner 2010; Brown et al. 2013; Brown and Petersen 2011; Brown et al. 2009).

The full accounts also stated that “UK expertise and skills continue to be in demand from the IBM group, as such export revenues, which are derived from sales of services, including research and development, to companies in the IBM group overseas, rose by 3.9 percent compared to 2013” (IBM United Kingdom Limited, Full Accounts, 2014, page 3). In other words, the subsidiary has utilized host country institutional factors to support the knowledge-creating activities, through self-creation. The subsidiary has also engaged in acquisitions mainly within the UK to acquire complementary intangible assets from other firms.

Endogeneity tests

We perform additional tests to address the potential concerns on endogeneity. We use two-stage least square (2SLS) where we estimate the subsidiary-level cash holdings, host country economic freedom and rule of law in the first stage and use them to estimate intangible asset holdings and investments in the second stage. We use an instrumental variable (IV) approach for the main regression. The IVs must satisfy the conditions of relevance and exogeneity (Reeb, Sakakibara & Mahmood, 2012; Roberts & Whited, 2011; Wooldridge, 2009). We follow the suggestions by Wooldridge (2009) to search for instrumental variables which are correlated with the independent variables but unrelated to the dependent variable. We find that the subsidiary-level gross profit

margin and the subsidiary-level cash holdings are exogenous. The correlation table (Table 1) shows that the subsidiary-level profit margin is significantly correlated to subsidiary-level cash holdings, thus confirms that they are exogenous. In the same manner, we use host country using Euro currency (a dummy variable) and host country offering patent box/ innovation box tax incentives (a dummy variable) as IVs for host country economic freedom and rule of law. The correlation table shows that host country using Euro currency is correlated to the host country economic freedom, and that the host country offering patent box/ innovation box tax incentives is correlated with host country rule of law, thus confirms that they are exogenous.

In the first stage, we run the multiple regressions for the explanatory variables against IVs and save the prediction. The variables in the first stage are significant, and this indicates instrument variable acceptability. The new variables with the prediction from the first-stage regressions have been saved as the subsidiary-level cash holdings (predicted value), host country economic freedom (predicted value) and host country rule of law (predicted value) for the regressions in the second stage. The result of the first-stage regression confirms that the subsidiary-level gross profit margin, host country using Euro currency and host country offering patent box/ innovation tax incentives are significantly related to the subsidiary-level cash holdings, host country economic freedom and host country rule of law respectively.

In the second stage, we regress the subsidiary-level intangible assets against the new predicted variables. We include the control variables of subsidiary characteristics (subsidiary size, age, financial leverage, working capital, and effective tax rate), parent firm characteristics (degree of multinationality, and size), host country factor (host location with OFC – a type of tax haven), and sectors. The second-stage regression (full model) shows that the predicted values of cash

holdings and host country economic freedom are significantly and positively related to subsidiary-level intangible asset holdings and investments whereas the predicted value of host country rule of law is significantly but negatively related. Overall, the results of the 2SLS regressions (Table 4) are consistent with those of the multiple regressions (Table 3). The control variables in Table 4 show similar relationships as reported in Table 3. We have no over-identifying restrictions because we have only one IV for each of the endogenous explanatory variables. This makes our models just have enough instruments. Thus, they are said to be just identified (Wooldridge, 2009).

Table 4

Robustness tests

We also conduct robustness tests to exclude alternative explanations. First, we run the interaction terms between cash holdings and host country economic freedom, and between cash holdings and host country rule of law. They are insignificant. Due to space constraints, we do not report the results here.

Second, we test the moderating effects of parent-firm characteristics (degree of multinationality and size) on the relationship between cash holdings and intangible asset holdings and investments of MNE subsidiaries. They are built upon the arguments of economies of scale and scope in the literature. The unreported results are insignificant.

Third, we test the moderating effect the host country as a location with offshore financial centre (OFC) on the relationship between subsidiary-level cash holdings and intangible assets holdings and investments. We also test the moderating effects of subsidiary characteristics (subsidiary

size, age and effective tax rate). They are based on theoretical arguments of the impacts of corporate taxation and location of offshore finance centres, and subsidiary-level economies of scale and scope, subsidiaries' accumulation of knowledge and experience over time (organizational learning). The unreported results are insignificant.

DISCUSSION

Implications for theory

Our study makes three new contributions to the IB literature. First, our core theoretical contribution is to combine the pecking order theory in the finance literature with the institution theory to formulate a new theory to explain factors affecting intangible asset holdings and investments of MNEs foreign subsidiaries. Specifically, we theorize, empirically test, and establish the link between the use of cash holdings to finance the self-creation and/or the purchases of intangible assets (a type of knowledge-based FSA). Subsidiaries may encounter difficulties in raising external funds from banks, other intermediaries and equity markets due to the lack of collateral value of intangible assets and the hard-to-measure nature in monetary value terms of intangible assets. They have to rely on internal financial resources, especially cash holdings (liquid assets) to fund the holdings and investments of intangible assets, which is in line with the prediction of the pecking order theory (Myers & Majluf, 1984). In addition, we also show the important role of host country economic freedom in facilitating intangible asset holdings and investments. However, our study also finds that over-regulation may impede intangible asset holdings and investments.

Second, our study offers an alternative theoretical explanation of the phenomenon by contextualizing our research using a new dataset of European subsidiaries of US MNEs

(Michailova, 2011). Our findings focus on the efficiency and value creation aspects rather than value appropriation (tax avoidance, profit shifting and rent-seeking) in their strategic decision of intangible asset holdings and investments (Penrose, 1956). In this way, our work confirms the centrality of efficiency and value creation aspects of MNE subsidiaries, which emphasize new knowledge development at the subsidiary level (Rugman & Verbeke, 2001).

Our study presents an interesting finding is that host country location of offshore financial centre (tax haven) per se is not an incentive for intangible asset holdings and investments in our tests of its direct effect or moderating effect. In this way, our perspectives differ from previous studies which examine the phenomenon from an international tax perspective in which tax avoidance/ profit shifting and value appropriation are primary motives. It is argued that parent firms relocate valuable intangible assets from the US to low-tax jurisdictions/ offshore financial centres by using special purpose entities for tax planning purposes. We show that host country economic freedom is more important factor (higher coefficient with significant relationship).

Third, our examination of the financing of intangible asset holdings and investments is an original feature given that this phenomenon has been largely under-researched in the IB literature. We find that European subsidiaries of US MNEs which generate earnings overseas retain their profits as reflected in their cash holdings. Cash holdings are used to fund the holdings and investments of intangible assets through self-creation or purchases. This is known as permanently reinvested earnings. As such, our findings also contrast to previous studies in the finance and international taxation literatures which argue that holding cash abroad leads to deferment of tax payment in the past years (Blouin, Krull & Robinson, 2012; Foley, Hartzell, Titman & Twite, 2007).

Implications for practice

Our findings provide important implications for managers of parent firms and foreign subsidiaries. Firstly, subsidiaries are recommended to use internal financial resources to finance knowledge-based intangible assets because this is an effective and sustainable financing strategy. Intangible assets are a source of international competitiveness to assure sustainable growth of subsidiaries. Subsidiaries are recommended to combine internal resources with externally accessed host institutional factors to support their holdings and investments of intangible assets.

Second, our study also provides important implications for policy makers. It is important to highlight that MNE subsidiaries holding and investing in intangible assets must have real economic activities (substance) with appropriate levels of local management team to manage these intangible assets. This requires high-skilled workforce, which is in turn an important part of the decisive corporate human capital (Bresnahan, Brynjolfsson & Hitt, 2002).

Third, host country governments are recommended to develop policies, which encourage foreign subsidiaries to invest in intangible assets because they are sources of innovation, economic growth, and productivity gains (Andrews, & de Serres, 2012; Baldwin, Gu & Macdonald, 2011). The potential benefits include creating new jobs and accessing to knowledge capital which may spill over and increase the productivity of local firms. In an era with increasing calls for protectionism, our findings suggest that governmental institutions interested in increasing the investments in knowledge-based intangible assets should facilitate economic freedom, free trade and investment liberalization. Moreover, de-regulation may help encourage investments in intangible assets.

Limitations and suggestions for future research

Our study has several limitations, which might serve as avenues for future research direction. First, we observe and explain the phenomenon by using a cross-sectional dataset of the largest European subsidiaries of US MNEs. Nevertheless, the selection of research context and research design provides a fruitful case and generates interesting findings. Thus, it invites opportunities for future research to extend our study further using a panel data. Alternatively, future studies may contextualize the research setting by using foreign subsidiaries of European, Japanese and other Asian MNEs operating in Europe, and compare and contrast the results with our findings.

Second, we examine the subsidiary-level internal financial resources of cash holdings and host country institutional factors. Future research may extend our study by examining whether a subsidiary's intangible assets holdings and investments are affected by information asymmetries between subsidiaries and external financing sources, such as external creditors and considering the effects of host country institutional factors, such as financial development conditions. Third, while our study uses quantitative techniques follow-up research may examine intangible assets using the case study method with insights from subsidiary managers.

CONCLUSIONS

In this study, we find that subsidiaries act strategically in knowledge-based intangible assets holdings and investments by combining and utilizing their cash holdings/ liquid assets and host country economic freedom to support the self-creation and/or the purchases of intangible assets. We develop a new theory to explain the phenomenon by combining the pecking order theory in the finance literature and the institution theory. We have shed new lights into this important phenomenon from a strategic perspective with a non-tax-based explanation, and compare and contrast our findings with previous studies from a tax-based explanation in the international

taxation and public economics literature. We show that MNE foreign subsidiaries are the engines to generate new sources of competitive advantages of knowledge-intensive intangible assets through effective combination and utilization of internal and external resources. This is conceptually a valuable subsidiary-specific advantage.

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Appendix 1: Note 1 on IAS38 – Intangible assets

Due to the unique nature of intangible assets, we draw upon the international accounting standard IAS38-*Intangible Assets* to explain the key attributes and recognition criteria relating to intangible assets, and R&D costs. The three critical attributes of intangible assets are: identifiability, control (power to obtain benefits from the asset), and future economic benefits (such as revenues and future reduced costs). An intangible asset is identifiable when it is separable (capable of being separated and sold, transferred, licensed, rented or exchanged, either individually or together with a related contract) or arises from a contractual or legal rights, regardless of whether those rights are transferrable or separable from the entity or from other rights and obligations (IAS38).

IAS38 requires an entity to recognize an intangible asset, whether purchase or self-create (at cost) if, and only if it is probable that the future economic benefits that are attributable to the asset will flow to the entity, and the cost of asset can be measured reliably. This requirement applies whether an intangible asset is acquired externally or generated internally. The probability of future economic benefits must be based on reasonable assumptions about conditions that will exist over the life of the asset. The probability recognition criterion is always considered to be satisfied for intangible assets that are acquired separately or in a business combination.

Intangible assets meeting the relevant recognition criteria are initially measured at cost or using the revaluation model, and amortised on a systematic basis over their useful lives (unless the asset has an indefinite useful life, in which case it is not amortized). If an intangible item does not meet both the definition of and the criteria for recognition as an intangible asset, IAS 38 requires the expenditure on this item to be recognized as an expense when it is incurred.

It is important to note that all research cost is charged to expense. Development costs are capitalized only after technical and commercial feasibility of the asset for sale or use have been established. This means that the entity must intend and be able to complete the intangible asset and either uses it or sells it and is able to demonstrate how the asset will generate future economic benefits. If an entity cannot distinguish the research phase of an internal project to create an intangible asset from the development phase, the entity treats the expenditure for that project as if it were incurred in the research phase only (IAS38). Many countries allow the inclusion of intangible assets on the balance sheet irrespective of how they are acquired – that is, internally generated or externally purchased. However, in the US, Austria, Denmark and Germany, only assets that have been acquired can be held on the balance sheet.

Figure 1: Conceptual model

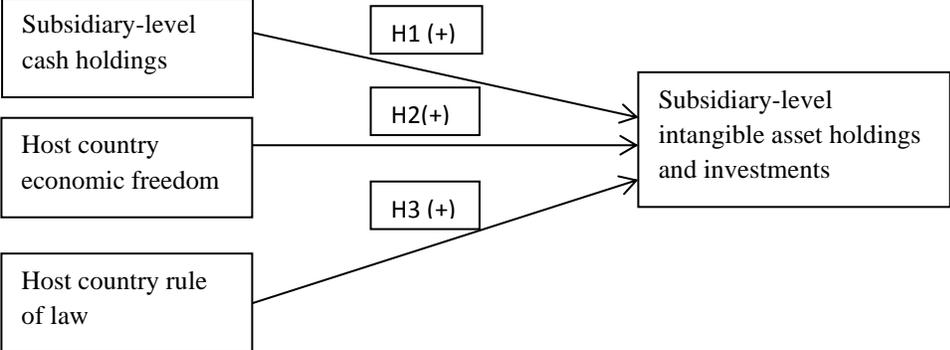


Table 1: Sample structure by countries, economic freedom of the world index and rule of law score of host countries

Countries	Subsidiaries (count)	Subsidiaries (percentage)	Economic Freedom Index (range 1-10)	Rule of Law Score (range 1-100)
The UK	44	29	7.81	89.47
Germany	23	15	7.55	88.99
The Netherlands	21	14	7.45	90.43
France	15	10	7.21	85.16
Ireland	10	7	7.80	89.00
Italy	7	5	6.92	60.28
Spain	7	5	7.29	75.11
Belgium	4	3	7.27	86.12
Luxembourg	4	3	7.40	89.00
Norway	4	3	7.52	92.34
Switzerland	2	1	8.19	90.90
Austria	1	1	7.48	90.43
Cyprus	1	1	7.61	76.55
Denmark	1	1	7.66	92.82
Finland	1	1	7.84	92.82
Hungary	1	1	7.30	65.07
Russian Federation	1	1	6.65	17.22
Sweden	1	1	7.47	90.43
Slovakia	1	1	7.22	77.99
Sweden	1	1	7.47	90.43
Total	150	100		

Sources: Amadeus database; Fraser Institute, Vancouver, Canada; World Bank Institute in Governance and Anti-Corruption (Kaufmann et al., 2010).

Table 2: Descriptive statistics and Pearson correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Subsidiary-level cash holdings (log)	4.10	2.88	1														
2. Host country's economic freedom	7.54	0.27	0.03	1													
3. Host country's rule of law	86.26	9.14	0.03	.67***	1												
4. Subsidiary size (log)	14.71	1.19	0.11	0.01	0.06	1											
5. Subsidiary age (log)	3.08	1.00	-0.04	-0.05	-0.13	0.13	1										
6. Subsidiary financial leverage	0.08	0.14	0.09	0.14	0.11	.29***	0.04	1									
7. Subsidiary working capital	0.21	0.24	-0.02	-0.12	0.04	-0.06	-0.07	-0.04	1								
8. Subsidiary effective tax rate	0.11	1.69	0.02	0.07	0.03	0.03	-0.09	0.01	-0.06	1							
9. Parent firm's degree of multinationality (log)	5.88	0.89	0.05	-0.09	-0.01	0.07	-0.12	0.09	-0.03	-0.01	1						
10. Parent firm size (log)	11.10	1.26	-.29***	-0.15	-0.13	.17**	-0.03	-.18**	-0.07	0.05	-0.01	1					
11. Host country with financial offshore centre (a type of tax haven)	0.26	0.44	.22**	0.07	0.14	0.12	-0.01	0.09	.35***	0.04	0.02	-0.05	1				
12. Sectors	0.59	0.49	-.25***	-0.14	-0.09	-0.01	-0.01	-0.02	0.04	0.10	-0.05	-0.14	-.22***	1			
13. Subsidiary gross profit margin	9.31	17.11	.19**	.31***	.16**	.21**	0.06	0.05	0.03	0.07	0.03	0.01	.34***	-.26***	1		
14. Host country's use of Euro currency	0.60	0.49	-0.05	-	-0.14	0.06	-0.03	-0.06	.35***	-0.01	0.03	0.12	.32***	0.11	-0.01		
15. Host country's patent box/ innovation box tax schemes	0.70	0.45	.17**	.23***	.26***	0.01	-0.02	.17**	.17**	-0.06	-0.01	-0.09	.22***	-0.06	0.08	-0.11	1

Note: n = 150, p* < 0.1, p** < 0.05, p*** < 0.01, 2-tail test.

Table 3: Multiple regression results

Variables	Model 1	Model 2	Model 3
(Constant)	1.26 (2.71)	0.73 (5.68)	-6.38 (6.28)
<i>Independent variables</i>			
Subsidiary cash holdings (log)		0.26*** (0.06)	0.19*** (0.06)
Host country economic freedom		2.12** (0.92)	1.57** (0.84)
Host country rule of law		-0.05** (0.02)	-0.05** (0.02)
<i>Control variables</i>			
Subsidiary size (log of assets)	0.83*** (0.15)		0.78*** (0.15)
Subsidiary age (log)	0.07 (0.17)		0.07 (0.16)
Subsidiary financial leverage	2.97** (1.26)		3.01*** (1.21)
Subsidiary working capital	-1.21* (0.68)		-0.99* (0.67)
Subsidiary effective tax rate	0.25*** (0.10)		0.21*** (0.09)
Parent firm's degree of multinationality (log of number of foreign subsidiaries)	-0.12 (0.19)		-0.09 (0.18)
Parent firm size (log of employees)	-0.16 (0.14)		-0.01 (0.15)
Host location with offshore financial centre (a type of tax haven)	0.43 (0.44)		0.33 (0.43)
Sectors	-0.62 (0.36)		-0.26 (0.36)
R-square	0.32	0.12	0.39
Adjusted R-square	0.28	0.10	0.34
F-change	7.56***	0.12***	7.42***

Notes: n = 150. Variables are shown with unstandardized coefficients followed by standard errors in brackets. *p<0.1; **p<0.05; ***p<0.01.

Table 4: Two-stage least square (2SLS) regression results

	First stage	First stage	First stage	Second stage
Variables	Subsidiary cash holdings	Host country economic freedom	Host country rule of law	Subsidiary intangible assets
(Constant)	-4.40*** (0.25)	7.74 (0.02)	82.61*** (1.31)	3.82 (10.87)
<i>Instrumental and independent variables</i>				
Subsidiary gross profit margin	0.03*** (0.01)			
Host country's use of Euro currency		-0.33*** (0.03)		
Host country's patent box/ innovation box tax schemes			5.22*** (1.57)	
Subsidiary cash holdings (predicted value)				0.53* (0.33)
Host country's economic freedom (predicted value)				1.71* (1.18)
Host country's rule of law (predicted value)				-0.15** (0.07)
<i>Control variables</i>				
Subsidiary size (log of assets)				0.78*** (0.15)
Subsidiary age (log)				0.05 (0.17)
Subsidiary financial leverage				3.43** (1.26)
Subsidiary working capital				-0.71 (0.71)
Subsidiary effective tax rate				0.21** (0.10)
Parent firm's degree of multinationality (log)				-0.12 (0.18)
Parent firm size				-0.11 (0.14)
Host location with offshore financial centre (a type of tax haven)				0.54 (0.47)
Sectors				-0.40 (0.36)
R-square	0.03	0.36	0.06	0.36
Adjusted R-square	0.03	0.36	0.06	0.31
F-change	5.95***	85.76***	10.97***	0.36***

Notes: n = 150. Variables are shown with unstandardized coefficients followed by standard errors in brackets. *p<0.1; **p<0.05; ***p<0.01.