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Subsidiary capability upgrading under emerging market acquirers

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ABSTRACT

This article leverages a case study of a recent Chinese acquisition in the United Kingdom to explore the upgrading of capabilities in the subsidiaries in developed countries acquired by emerging market multinational enterprises (EMNEs). The seemingly implausible upgrading phenomenon is explained by the EMNEs' complementary assets, their GVC lead firm positions and the unique power relationship between the acquirer and acquired firms, which enable the EMNEs to 'impel' upgrading and encourage 'co-learning' in their acquired subsidiaries. The contributions to the literature on EMNEs, global value chains, and organizational learning are outlined and discussed.

1. Introduction

There has been a recent surge in research on the outward foreign direct investment (OFDI) activities undertaken by emerging economy multinational enterprises' (EMNEs), including their acquisitions made in developed countries (Buckley et al., 2007; Tung, 2007, 2017; Gubbi, Aulakh, Ray, Sarkar, & Chittoor, 2010; Hennart, 2012; Williamson & Raman, 2011). Most of the research on EMNE acquisitions in developed countries has focussed on their knowledge-seeking motives and on how parent firms acquire strategic assets to enhance their own capabilities and competitiveness (for example, see Awate, Larsen, & Mudambi, 2015; Gubbi et al., 2010; Hansen, Fold, & Hansen, 2016; Meyer & Peng, 2016; Yang & Deng, 2017). Indeed, the emergent view is that EMNEs adopt a 'light touch' approach to their western acquisitions (e.g., Liu & Woywode, 2013) so as not to disrupt the superior capabilities of the acquired targets.[1] However, we know very little about whether and how the acquired advanced firms also benefit in terms of capability upgrading and learning (Govindarajan & Ramamurti, 2011; Rui, Cuervo-Cazurra, & Un, 2016). This paper seeks to fill this void, taking advantage of a rare access to both an EMNE parent firm and its acquired subsidiary in a developed country.

The Global Value Chain (GVC) literature acknowledges that upgrading is affected by the governance structure of and power relationships in the value chains. However, in this literature, firms are largely treated as black boxes (Kadarusman & Nadvi, 2013), with little understanding of firm-level learning in the upgrading process (Morrison, Pietrobelli, & Rabellotti, 2008; Hansen et al., 2016). In addition, in both the management and GVC literatures, the empirical narrative is dominated by the subsidiaries or suppliers of developed economy MNEs (DMNEs) (e.g., Birkinshaw & Hood, 1998; Cantwell & Mudambi, 2005; Corredoira & McDermott, 2014; Ivarsson & Alvstam, 2011; McDermott & Corredoira,2010), with very little being said about upgrading in EMNE subsidiaries. Above all, the extant literature has a contextual bias towards developing country firm upgrading and provides a rather static and unidirectional view of capability upgrading, focussing on its antecedents but lacking a multidirectional understanding of subsidiary upgrading during and after the acquisition. Based on the above, this paper aims to answer the following research question: *how and why can subsidiary firms in developed countries upgrade their capabilities under emergent acquirers?*

In this paper, we cross-engage different disciplinary strands to achieve a deeper understanding of upgrading in EMNE acquired subsidiaries. In particular, we draw upon the GVC, international business and organizational learning literatures to unlock the 'black box' of the upgrading process, paying special attention to the underlying learning process and the role played by the EMNE parent firms.

This research is based on the case study of a recent Chinese acquisition in the United Kingdom (UK). The results demonstrate that multiple types of capability upgrading (product, process, functional, and inter-sector) had taken place in the subsidiary. The underlying learning process reveals a dual role played by the EMNE acquirer firm, that of an '*impeller*', which was associated with its global value chain lead firm

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position and complementary assets, and that of a '*co-learner*', which was associated with EMNE 'liability of emergingness' (Madhok & Keyhani, 2012) and with the relatively balanced power relationship between the acquirer and acquired firms.

This paper makes a number of contributions. Empirically, it responds to the call for 'phenomenon-based research' (Doh, 2015) by presenting a detailed study of the seemingly unlikely phenomenon of the upgrading of capabilities occurring in a technologically advanced firm in a developed country after it had been acquired by an EMNE. This paper contributes to the study of EMNEs in a number of ways. In particular, it reveals how an EMNE can leverage its unique capabilities, strategies, and GVC lead firm position and shape the upgrading process in an acquired, technologically advanced subsidiary in a developed country. Taking an interdisciplinary approach, this study is one of the first to examine the much needed learning effect and development impact of EMNE investments in developed countries (Buckley, Doh, & Benischke, 2017; Govindarajan & Ramamurti, 2011; Luo & Tung, 2017; Rui et al., 2016). In addition, it contributes to the study of EMNE power (Sinkovics, Yamin, Nadvi, & Zhang, 2014). The contribution made by the EMNE acquirer firm as a source of knowledge and learning in a global value chain and the power it exercised in the upgrading process challenge the conventional wisdom that sees EMNEs as mere learners and beneficiaries of knowledge transfer from developed economies. This paper also contributes to the GVC and organizational learning literatures by building a connection between firm-level learning and upgrading outcomes but also by revealing how the learning process is induced and shaped by firm strategies and characteristics.

2. Theoretical foundations

2.1. Capability upgrading

Subsidiary evolution is a persistently key topic in international business and strategy (e.g., Birkinshaw & Hood, 1998; Cantwell & Mudambi, 2005; Dhanaraj & Beamish, 2009; Enright & Subramanian, 2007). Much of the subsidiary evolution literature, however, has tended to narrowly focus on the visible mandate of the subsidiary—with an emphasis on change in the hierarchy of roles or functions such as marketing, production, and development—or a simple two stage mandate evolving from competence-exploiting to competence-creating (e.g., Cantwell & Mudambi, 2005; Collinson & Wang, 2012; Dörrenbächer & Gammelgaard, 2006, 2016; Schmid & Schruig, 2003).

The extant subsidiary evolution literature has therefore tended to reduce subsidiary development to a change in the charter or mandate of the subsidiary without much discussion of its underlying capabilities. In this study, in order to capture capability development in a more comprehensive fashion, we adopted the capability upgrading definition given in the GVC literature. This literature specifies four types of upgrading: *product upgrading,* by which firms move into more sophisticated product lines, thus increasing unit values; *process upgrading*, by which firms enhance their efficiency by re-organising their production processes or by introducing superior technologies; *functional upgrading,* by which firms climb to new functional areas in the value chain, such as design or marketing; and *inter-sector upgrading,* by which firms move horizontally into new sectors involving new production activities that exploit their existing competences (Giuliani, Pietrobelli, & Rabellotti, 2005; Humphrey & Schmitz, 2002a). We believe that the GVC literature's definition of capability upgrading enables a more comprehensive understanding and examination of the phenomenon, affording the ability to capture capability development beyond functional upgrading.

2.2. Learning, subsidiary capability upgrading, and EMNEs

In the discourse of the GVC literature, upgrading involves organizational learning to improve the positions of firms in global production networks (Gereffi, 1999). Developed against the backdrop of increasing DMNE lead firm outsourcing of peripheral and often low-value activities to developing countries, the GVC literature views the capability upgrading of firms and industries in developing countries as the result of learning opportunities exploited by local producers inserted into global value chains via DMNE lead firms that are assumed to possess superior technologies and knowledge (Gereffi, 1999; Marin & Giuliani, 2011). The idea is that both upgrading and knowledge transfer are affected by the governance structures of the value chains; i.e., the nature of the relationships that exist among the various value chain participants.

The classic GVC frameworks place governance structures on a continuum of relationships between global lead firms and other value chain participants—one that ranges from loose to very tight, with arm's-length market relations at one extreme and hierarchical ones at the other—with two or three more network-based governance structures in between. The GVC literature further argues that these governance structures dictate what, how, when, and how much is produced, offering different upgrading opportunities to local producers connecting with GVCs (Gereffi, 2005; Humphrey & Schmitz, 2002a). Lead firms may, for example, set and enforce product parameters and monitor compliance to process standards (Humphrey & Schmitz, 2002b). They may also exercise their 'normative power' by "*shaping expectations of how business should be organised, how quality should be assessed, or guidelines to be followed*" (Gereffi & Lee, 2016, 28). A key tenet of the GVC literature is that lead firm power and the way it is exercised vary in different governance structures, implying different upgrading prospects for other value chain participants. Indeed, a large volume of empirical studies has documented upgrading success and failure in different governance structures and various industries—including apparel, automotive, horticulture, and electronics (see, for example, Gereffi, 1999; Marin & Giuliani, 2011; Sturgeon, 2002; Tokatli, 2007).

The aforementioned insights notwithstanding, the GVC literature suffers from a lack of understanding of the firm-level learning processes that underpin the upgrading outcomes (Hansen et al., 2016), and the extant literature tends to "*reduce learning to the transfer of specific kinds of technological know-how or knowledge about technologies and products*" (Herrigel, Wittke, & Voskamp, 2013, 111). Above all, much of that literature has focussed on the upgrading processes found in DMNE-dominated value chains (e.g., Corredoira & McDermott, 2014; Ivarsson & Alvstam, 2011; Khan & Nicholson, 2015; Marin & Giuliani, 2011; Sturgeon, 2002; Tokatli, 2007). Little attention has been paid to the upgrading of participants in EMNE-led value chains in spite of the fact that we may, however, observe different upgrading mechanisms there because of the EMNEs' unique characteristics and of the different power relationships found in such value chains. Below, we review studies from some cognate disciplines to gauge a way of solving these issues.

In our effort to establish a link between firm-level learning and upgrading, we were particularly inspired by some recent studies. For example, in their study of technological upgrading in foreign subsidiaries in Thailand, Hobday and Rush (2007) paid particular attention to firm-level motivations, barriers, and inducements to upgrading, as well as to decision-making in subsidiaries. Investigating how a Chinese firm upgraded to a lead firm position in the global biomass power plant industry through international acquisition, Hansen et al. (2016) studied the micro-level dynamics of technological changes in firms—including the establishment of R&D units, the recruitment of engineers, and the establishment of experience-collection procedures—at the same time, observing the social conditions for knowledge transfer—including working practices, and trust and communication patterns. Herrigel et al. (2013) studied upgrading in supply chains in the automotive and machinery sectors with an emphasis on mutual learning processes in upgrading, which may involve 'communities of practice' (Brown & Duguid, 1991) and collective reflection and experiment. In the spirit of these previous studies, we floated the idea that upgrading involves organizational learning to improve the position of firms in global

production networks (Gereffi, 1999). In our pursuit of the learning processes that underpin capability upgrading, we have drawn upon the organizational learning literature, which recognizes that learning can involve changes in behaviours/actions (e.g., Argote & Hora, 2017; Aranda, Arellano, & Davila, 2017; Easterby-Smith, Crossan, & Niccolini, 2000; Lyles & Salk, 1996). This literature also emphasises that learning, rather than being a unilateral process involving the transfer of 'discrete nuggets of knowledge or technology' from one firm to another, is likely to encompass mutual relations between firms (Herrigel et al., 2013).Yet, changing behaviours/actions and mutual learning, and how these influence the upgrading of capabilities in cross-border EMNE acquisitions, remain underexplored.

The sparsely researched upgrading of capabilities in EMNE-acquired subsidiaries in developed countries requires a careful examination of EMNE characteristics and of the specific power relationships found in their value chains. To start with, unlike their DMNE counterparts, EMNEs may not own superior knowledge. Indeed, EMNEs are traditionally perceived to lack firm-specific advantages and knowledge-based capabilities (e.g., Dunning, Kim, & Park, 2008; Rugman, 2010). Some recent studies, however, have challenged this view and have argued that many EMNEs do have ownership advantages and unique innovative capabilities involving, for example, the novel use of existing technologies, new business models and processes, and new ways of merging different technologies (e.g., Cuervo-Cazurra & Ramamurti, 2014; Kumar, 2007; Luo & Tung, 2017; Yin & Williamson, 2011). Others have argued that some EMNEs have developed 'accelerated innovation' capabilities and the ability to combine these with the rapid scaling-up to high volumes at low cost (Williamson & Yin, 2014). Further studies have contended that some EMNEs, despite lacking key strategic assets such as proprietary technology and global brands, have developed 'composition capabilities' that enable them to compete successfully by creatively combining ordinary resources to generate impressive speed and efficiency and present superior price-value equations to customers (Luo & Child, 2015; Luo & Tung, 2017). The result is the rapid emergence of EMNEs from global challengers to global leaders (BCG, 2014; Horner, 2013; Kotabe & Kothari, 2016) who are increasingly taking over lead firm positions in global value chains traditionally dominated by DMNEs (He et al., 2017).

In a bid to further enhance their capabilities and improve their positions in GVCs, many EMNEs have engaged in internationalisation in order to obtain the ownership advantages they lacked (Kotabe & Kothari, 2016; Lebedev, Peng, Xie, & Stevens, 2015; Tung, 2007, 2017; Mathews, 2006; Meyer & Peng, 2016; Yang & Deng, 2017). It is argued that the main motives behind EMNE investment in developed countries and 'south-north acquisitions' in particular are to seek knowledge and access and develop strategic assets (Chen, Li, & Shapiro, 2012; Gaur, Kumar, & Singh, 2014; Lebedev et al., 2015; Rabbiosi, Elia, & Bertoni, 2012; Yang & Deng, 2017). The argument was recently advanced further by the concept of 'liability of emergingness' (Held & Berg, 2015; Madhok & Keyhani,2012). Madhok and Keyhani (2012), for example, viewed overseas acquisitions undertaken by EMNEs—who tend to possess mainly ordinary resources but not proprietary advantages—as acts of opportunity-seeking entrepreneurship. Such entrepreneurial alertness and learning agility has enabled EMNEs to transform their capability portfolios and turn their 'liabilities of emergingness' into 'assets of emergingness'. Nevertheless, many EMNE acquisitions in developed countries have distinctive features, often involving 'light-touch' post-acquisition integration strategies (Liu & Woywode, 2013) and unique parent-subsidiary relationships in which the acquired subsidiaries enjoy high degrees of decision-making autonomy (Awate et al., 2015).

Taken together, the rising positions of EMNEs in GVCs, their unique capabilities and 'liability of emergingness' in their venturing in developed countries may therefore indicate the existence of different power relationships in value chains (compared to those that had been reported in DMNE-dominated GVCs). Here, we need to depart from the structuralist view in which the agency of power typically entails an authoritative or legitimated delegation from the GVC lead firms or MNE headquarters (Birkinshaw & Hood, 1998; Bouquet & Birkinshaw, 2008; Dörrenbächer & Gammelgaard, 2016; Mayer, Phillips, & Posthuma, 2017; Morrison et al., 2008; Ponte & Sturgeon, 2014; Sturgeon, 2002). We feel that this should be complemented by 'Resource Dependency Theory' (Pfeffer & Salancik, 1978), which argues that power relationships are shaped by "*resource criticality and the availability of alternative providers of critical resources*" (Casciaro & Piskorski, 2005). Given the different resource bases played out in our research context, it is not unreasonable to expect a unique power relationship to exist between the EMNE—as the GVC lead firm—and its developed country acquired subsidiary. This will have important implications for upgrading, which, as we already discussed, is conditioned by power relationships.

In light of the above, our pursuit of a multidirectional understanding of the capability upgrading of EMNE-acquired overseas subsidiaries necessitates a comprehensive investigation of the following elements: product, process, functional and inter-sector upgrading; firm-based learning, taking into account changes in behaviours/actions and mutual learning; the power relationship between EMNE acquirers and their acquired subsidiaries, and the EMNEs' unique characteristics.

3. Research methods and context

3.1. Research methods

As the extant literature had not examined subsidiary capability upgrading under emerging market acquirers, we took an inductive exploratory approach, using a single in-depth case study approach (Eisenhardt, 1989; Ghauri, 2004; Welch & Piekkari, 2017). This suited our aim to understand how and why EMNE subsidiaries can upgrade their capabilities. We viewed the case study as a necessary first step in building a theory about the capability upgrading of EMNE-acquired subsidiaries. As an exploratory research, our intention was not to "*generalise our findings to the entire population but to establish robust findings and arguments for further study*" (Hobday & Rush, 2007, 1340).

We took advantage of our unusual research access to the case study firms—China's Times Electric and its UK acquired subsidiary Dynex. While Chinese firms are notoriously difficult to access (Vukicevic, 2014), one co-author had a long relationship with Times Electric, while another had previously met the Dynex CEO and had forged a relationship with him. This gave us a rare opportunity to conduct 'elite interviews' (Welch, Marschan-Piekkari, Penttinen, & Tahvanainen, 2002) with senior managers and key engineers in *both* the acquirer and subsidiary firms, producing rich data.

We focussed on the period between 2008 and 2015, with multiple visits to both the acquirer and subsidiary sites. We believed a seven year period to be sufficiently long to uncover the upgrading in Dynex and its underlying learning process (Birkinshaw, Ambos, and Bouquet (2017), for example, investigated five years of boundary spanning activities undertaken by corporate executives). The data were mainly collected from primary interviews and publicly available secondary sources. We gathered as much public data as possible on our case firms, including annual firm reports, news archives, and media reports in both English and Chinese. We collected over 900 pages of documents from secondary sources, which were useful to build a detailed picture of the case study firms, and helped to develop an in-depth understanding not only of the subsidiary's capability upgrading but also of the strategy adopted by Times Electric (the acquirer firm). Dynex's annual reports and news archives, in particular, provided very rich information on the impact that Times Electric had on it, and provided much of the evidence of the upgrading that had occurred in Dynex after the acquisition. Unlike He and Khan (2015) who had mainly used part of their secondary data to present evidence of upgrading in a subsidiary, we took a fresh approach to the actual process—how and why it happened—and provided theory development illustrating the role played by the EMNE acquirer firm as a

Table 1
Information about interviews.

Date of Interview	Place	Interviewees	Length (mins)
16/8/2013	Zhuzhou, China	Director of Strategy and Development, Times Electric – Interviewee 1	60
7/10/2014	Lincoln, UK	CEO, Dynex – Interviewee 2	30
10/9/2015	Lincoln, UK	CEO, Dynex – Interviewee 2	25
23/11/2015	Lincoln, UK	CEO, Dynex – Interviewee 2	70
		Sales and Marketing Director and Board Member, Dynex, – Interviewee 3	70
		Deputy R&D Director, Dynex- Interviewee 4	50
		HR Manager, Dynex, – Interviewee 5	40
		IGBT Wafer Fab Process Technology Manager, Dynex – Interview 6	60
4/7/2016	Zhuzhou, China	Vice Chief Engineer, Times Electric – Interviewee 7	50
		Board Secretary, Times Electric – Interviewee 8	50
		Adviser to General Manager, Times Electric – Interviewee 9	50
		Director of the Semiconductor Business Unit, Times Electric – Interviewee 10	60
		Vice Director of IGBT Manufacturing Centre, Times Electric – Interviewee 11	45
18/3/2017	London, UK	Deputy General Manager, Times Electric – Interviewee 12	60

source of knowledge and learning in the upgrading process. In addition, this paper also covered a longer time period and collected much richer interview data in order to unravel the subsidiary's capability upgrading and the underlying learning process.

Having gained substantial knowledge of the two firms and of the acquisition, we carried out face to face semi-structured interviews with senior managers from both firms. The interviewees were identified via personal relationships and by applying the snowballing technique (Patton, 1990). All together, we conducted 14 interviews with 12 different managers and lead engineers from both the parent and subsidiary firms from 2013 to 2017, amounting to 720 min of recordings (see Table 1 for details). Each interview lasted, on average, just over 50 min. In those instances in which we felt it necessary to probe further, these were followed up by further email exchanges between the authors and the interviewees. In addition, we held a two-hour focus group discussion with about 20 managers and engineers from the parent firm during their training stay in Dynex in 2015. Those data collection methods were complemented by multiple site visits to both the acquirer and subsidiary firms and the staff canteens. Our primary data collection phase lasted about four years—from 2013 to 2017—which favourably compares to other case study research published in leading international management journals (e.g., four months in Johnson and Duxbury (2010); under a year in Balogun and Johnson (2004), three years in Piekkari, Vaara, Tienari, and Säntti (2005)).

The interviews were carried out with the aid of an interview guide (Kvale, 1983). The interview protocols were developed based on the initial theoretical considerations regarding subsidiary upgrading (Kvale, 2007). However, the interview guide evolved as the study progressed and was modified following each of the interviews, thus ensuring the relevance of the questions to the main topic of the study and increasing the internal validity of the data (King, 2004). The fluid and flexible nature of semi-structured interviews allowed unexpected and emerging themes to surface. Mindful of the possible transfer of various kinds of knowledge (technological, market, etc.) from the acquirer that may have led to the upgrading of the subsidiary, the earlier questions included the generic changes that Times Electric brought to Dynex since the acquisition and Times Electric's role in bringing in such changes. The interviewees were also asked to comment on the other party's competences and changes to them, the relationship between the parent and the subsidiary, and differences in management style. As time progressed and after some initial data analysis, we delved deeper into firm-level learning with questions about knowledge flow and its management, firm strategies, parent-subsidiary relationships and the role played by the acquirer firm in the subsidiary's capability improvement. In the Appendix A, we attach two typical interview guides, one for the early stage and the other for later stage; of course, they only served as guides, as the questions did vary across interviewees and there were many instances in which we needed to probe further.

We greatly benefited from the interviewees' willingness to share their experiences and views. The interviews were tape-recorded, then transcribed and carefully reviewed immediately after they had been conducted. This was done to ensure that each interview was still fresh in the researcher's mind and could be accurately recalled.

We applied well-established qualitative data analysis protocols such as content analysis (Drisko & Maschi, 2016; Gaur & Kumar, 2017; Ghauri, 2004; Miles & Huberman, 1994). This involved an iterative process of theory development and analysis (Eisenhardt & Graebner, 2007; Eisenhardt, 1989; Miles & Huberman, 1994; Welch & Piekkari, 2017) and "*cycling between emergent data, themes, concepts and dimensions and the relevant literature*" (Gioia, Corley, & Hamilton, 2013). Data analysis benefits from a coding process that involves "*devising a consistent system for indexing the whole of a data set according to a set of common principles and measures*" (Mason, 2002, 150). Part of the data were coded according to the conceptual background. For example, evidence of subsidiary upgrading was coded into *product, process, functional* or *inter-sector upgrading* depending on its nature. Coding for other data was less straightforward and this was particularly the case when we were seeking to understand how and why upgrading took place at Dynex. We followed Gioia et al. (2013) in allowing terms and categories, usually as reported by the informants, to emerge and then in reducing any germane categories to a manageable number. This process produced about 80 first-order categories. We then moved to second-order themes by searching for similarities and differences between the first-order categories. The relevant data were drawn together "*in a bag or slice of data*" (Mason, 2002) to be further explored. This was followed by a process of data organisation, retrieval, and interpretation, which involved mapping the range and nature of the phenomenon, finding associations, and seeking explanations (e.g., Miles & Huberman, 1994; Ritchie & Spencer, 1994; Welch, Piekkari, Plakoyiannaki, & Paavilainen-Mäntymäki, 2011). At this stage of the data analysis, we consulted the literature on the topic and considered the data and the extant literature in tandem (Gioia et al., 2013; Welch et al., 2011). A further distillation of the emergent second-order themes finally generated a few 'aggregate dimensions'. We present our data structure in Appendix B. Continuously cycling between the emergent data, categories, themes, and dimensions, and the relevant literature enabled us to uncover relationships between our conceptual building blocks (Gaur & Kumar, 2017; Welch & Piekkari, 2017) and, gradually, the upgrading process became clear (Fig. 1).

3.2. The case study firms

The acquisition of Dynex in the UK by China's Times Electric resembled many other acquisitions by EMNEs in developed countries: the acquired firms are usually smaller but hold renowned brands and are technology leaders in their sector, whereas the acquiring firms are

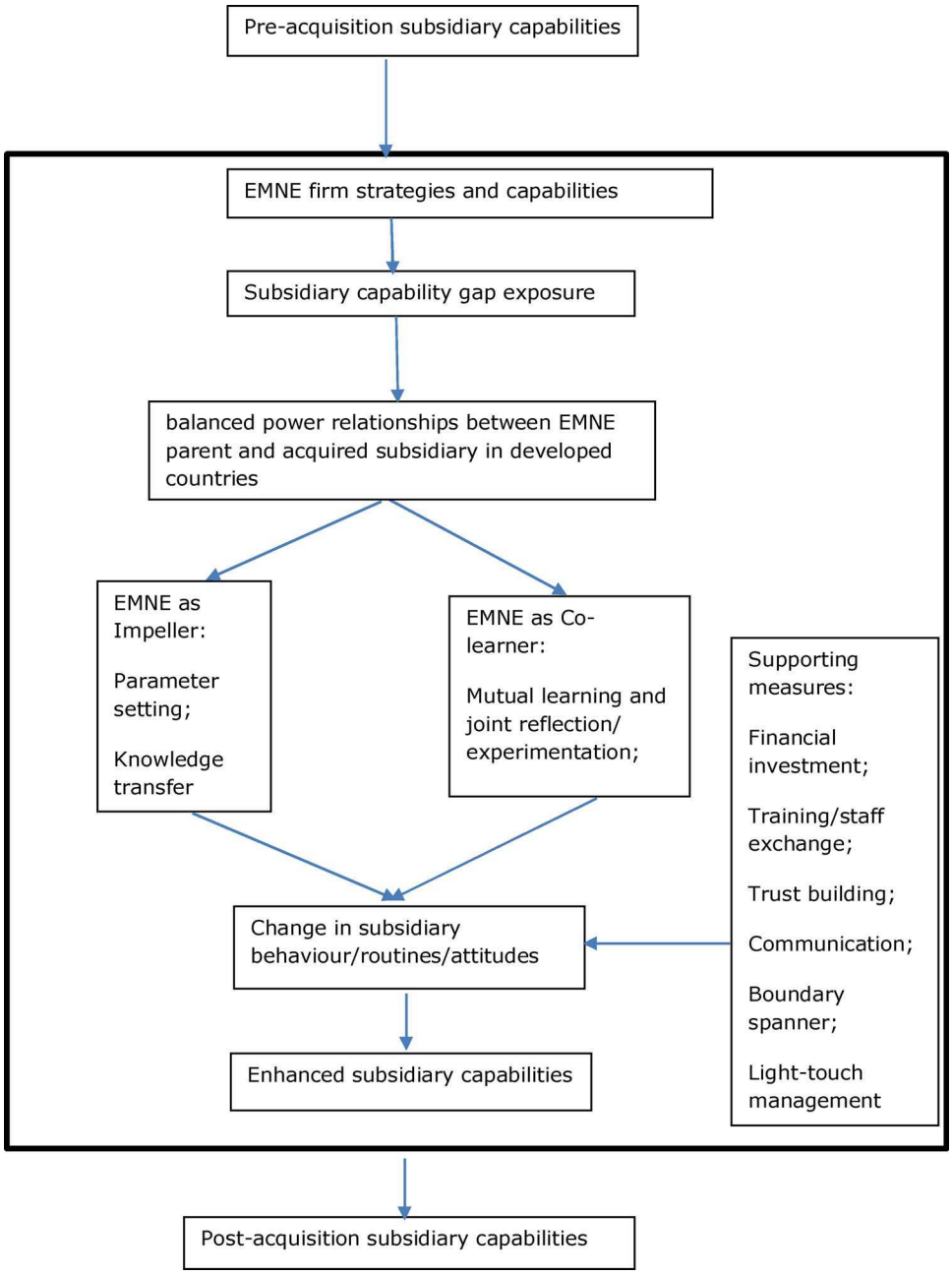

Fig. 1. Learning and upgrading in EMNEs' acquired subsidiaries.

usually larger but tend not to own global brands and superior proprietary knowledge.

Dynex was established in 1956 in Lincoln, UK, and, over time, had become a global supplier of specialist, high power semiconductor products. It manufactured some of the world's first silicon based semiconductor components and, at the time of the interviews, designed and manufactured high power bipolar discrete semiconductors, power modules, including insulated-gate bipolar transistors (IGBTs) and high power electronic assemblies. During the 1980s and 1990s, the firm changed hands a few times until it was purchased by a Canadian group and renamed Dynex. At its peak, Dynex had about 400 employees and five product lines with no synergies between them (CEO, Dynex). The firm hence lacked a clear focus, and was then forced to narrow its line to semiconductors. The workforce shrank to about 140. Being in an investment-hungry industry, Dynex found it difficult to survive independently and ran into financial troubles. By 2004, it was very close to bankruptcy and its senior managers recognized that new shareholders were required to support investment in the future of the business.

Based in Hunan, China, Times Electric was listed on the Hong Kong stock exchange and was majority owned by CSR China, one of the largest global railway equipment suppliers. Quoted in Shanghai and Hong Kong, CSR China was majority owned by the Chinese State–owned Asset Supervision and Administrative Commission. By 2015, it was one of the two largest railway equipment suppliers in the world, along with its home rival CNR China. CSR China invested heavily in innovation, spending €431 M on R&D in 2013 (European Union, 2014), 11th in the Industrial Engineering sector, behind only a handful of household names such as Volvo, Caterpillar, and ABB. In 2015, it merged with CNR China to form CRRC Corporation Limited. Table 2 provides some basic information about Times Electric and Dynex before the acquisition.

Times Electric was engaged in the research, development, manufacture and sales of locomotive train power converters, control systems, and other train-borne electrical systems, as well as the development, manufacturing, and sales of electric systems for urban railway train

Table 2
Basic firm information before the acquisition.
Source: firms' 2008 annual reports (Times Electric's finance figures are based on £1 = 10RMB).

	Sales revenue (£)	Gross profit (£)	Fixed assets (£)	Employees
Times Electric	154.2m	67.6m	77m	2830
Dynex	14.1m	3.3m	0.6m	250 (in year 2008)

systems. It was a key force behind the design, engineering, and production of Electric Multiple Units (EMUs) that ran at speeds of 350kph on China's high-speed railways. Having established its core competence in propulsion and control technologies in the railway industry, Times Electric pursued a 'Concentric Circles' strategy, aimed at further improving its competency in propulsion and control and diversifying into other sectors using that core competency as a common platform technology. This saw them successfully entering into the urban transit, electric vehicle, and renewable energy sectors. Like other leading Chinese firms, Times Electric had accelerated its internationalisation in recent years. The last few years had seen a series of major overseas investments made by Times Electric, including its acquisition of Dynex and SMD in the UK in 2008 and 2015 respectively.

Before the acquisition of Dynex, Times Electric and CSR China were already the main suppliers of China's railway equipment. However, despite being the leading player in electric traction drive technologies in China, Times Electric had been unable to design and manufacture its own IGBT modules and silicon chips—the 'heart' of electric traction drives—and had to rely on imports. This had constrained not only Times Electric and CSR China's railway expansion, but also their 'Concentric Circles' strategy and their internationalisation effort. Once it had learned that the then Dynex owner wanted to sell the firm, it had acted quickly and completed the acquisition in 2008.

4. Case analysis

Dynex was subjected to many changes since its acquisition. With financial support from Times Electric, Dynex built a new £12 M R&D centre to develop IGBT technology. Times Electric also helped Dynex secure finance to build two new IGBT production lines funded with a £12 M investment, upgrading its production facilities. The acquisition also gave Dynex much improved access to the Chinese market, which was relatively less affected by the global financial crisis. All of these changes proved to be transformational for Dynex. The subsidiary's sale revenues grew from US$30.2 million in 2007 to US$39.6 million in 2012, unfavourable economic environment notwithstanding. The number of employees grew from fewer than 250 in 2008 to 315 in 2013.

Below, we provide detailed evidence of the capability upgrading that took place at Dynex. In so doing, we seek to provide a comprehensive picture of the overall impact the acquisition has had on Dynex.

4.1. Evidence of capability upgrading

4.1.1. Process upgrading

After the takeover, Dynex was able to upgrade its production facilities with significant help and investment from Times Electric. In 2011, Dynex completed a £12 million project to install two new 6-inch IGBT wafer fabrication production lines to upgrade and expand its fabrication facility for silicon chips to be used in IGBT modules. The new IGBT lines replaced Dynex's existing 4-inch production line that had originally been set up over 20 years earlier. This increased technological ability enabled Dynex to increase its production capacity tenfold, resulting in large volume chip manufacturing for the first time in the firm's history. The result is evidenced by a 155% increase in the firm's 2010 IGBT module revenue to US$9.2 million in 2011, and a further 63% one to US$15 million in 2012 (Dynex, 2012, 2013). Dynex reckoned that the advances in its power module assembly and test techniques led to improved reliability and robustness, and improved manufacturability, laying down a basis for new products incorporating the next generation of its IGBT and fast recovery diode chips (Dynex, 2012).

4.1.2. Product upgrading

Product upgrading was evident at Dynex. The 6-inch bipolar thyristor wafer fabrication line installed in 2009, for example, helped the firm increase capacity and extend the power rating of its i2 thyristor products. The extension of the i2 range of thyristors continued with the development of advanced thyristors that were taking the firm into a new generation of high performance products (Dynex, 2013).

During the second half of 2011, Times Electric took over the production of lower power (and hence lower margin) bipolar products from Dynex. This enabled Dynex to concentrate its bipolar business on the production of higher power, higher margin parts (Dynex, 2012). Significant progress was also made in developing more advanced high voltage IGBT and fast recovery diode chips. The resulting new products offered lower operating energy losses and increased power capability, rendering them suitable for both railway and electric grid applications (Dynex, 2012).

4.1.3. Functional upgrading

The takeover by Times Electric brought changes to the way R&D was undertaken in Dynex. A careful examination of Dynex's annual reports suggests that, prior to the acquisition, the firm had struggled to maintain strong and consistent R&D investment. The takeover did not only see the establishment of a brand-new R&D centre but also significant and stable growth in R&D expenditure at Dynex, increasing from 3.9% of revenue in 2009 to 10.6% in 2012 (Dynex, 2012, 2013). The R&D team increased from 12 in 2008 to about 50 in 2014. This expanded R&D team not only developed new sophisticated products such as the 3300 V IGBT modules, but also made significant advances in the fundamental research for thyristors and IGBT technology. Responding to Times Electric's request, Dynex also made progress in developing new power devices on a new Silicon Carbide base material that offer superior performance and have a wide range of applications (IGBT manager, Dynex). The growing R&D expenditure not only helped sustain and strengthen Dynex's research and development activities, but also reflected Times Electric's ambition to develop Dynex into a world leading industrial high power semiconductor supplier.

4.1.4. Inter-sector upgrading

Historically, Dynex's power modules had found their applications mainly in the marine drive and industrial power control sectors. The acquisition by Times Electric, however, meant that Dynex was increasingly applying its existing competences in new sectors, in accordance with its new parent firm's 'Concentric Circles' strategy. We have earlier reported the staggering growth in IGBT modules, which was itself a result of Dynex's shift to the railway industry.

The last few years also saw the strategic focus of the firm's R&D activity expand to the development of new applications in the low carbon sectors such as renewable energy, smart grids, and electric cars. For example, with the support of its parent firm, Dynex started to produce IGBT and diode processes and designs using the 8-inch silicon production base recently established in Times Electric. The intention was to increase capacity and ability in order to service higher volume markets such as electric vehicles, wind turbines, and solar power systems (Dynex, 2012). Such expansion would clearly not have been possible without the capabilities, resources, and spread of the parent firm.

4.2. Subsidiary capability upgrading and the role of EMNE acquirers

The evidence presented above demonstrates that Dynex underwent significant upgrading in various areas since its acquisition. In this section, we pay particular attention to how this happened and, especially, to the role played by the EMNE acquirer in the process.

4.2.1. EMNE acquirer firms as impellers

In this acquisition, Times Electric's knowledge-seeking motive clearly manifested itself in the establishment of a state-of-art 8-inch IGBT wafer and module production base in Hunan in 2015 with engineering support from Dynex. However, Times Electric was also keen to combine Dynex's technology capability in IGBT and its own manufacturing advantage and knowledge of the Chinese railway system (senior managers of Dynex and Times Electric). Shortly after the completion of the acquisition, the President of Times Electric said:

> "We expect Dynex to develop high power technology, R&D capability, and proven reliability and quality, thus to complement the rapidly growing manufacturing capability and power electric system know-how of Times Electric" (Dynex, 2008).

However, there was a significant obstacle as, before the acquisition, Dynex had little experience in the railway sector. Then, Dynex's IGBT modules had mainly been used in marine drive and industrial power control. The railway market, however, attaches great importance to reliability and has special requirements in areas such as power loss and electricity current balance (senior managers, Dynex). This exposed a significant capability gap: Dynex needed to learn to design and manufacture IGBT modules specifically for the railway market and meet its special requirements.

Times Electric played a key role in enabling Dynex to modify its IGBT modules for the railway market. Firstly, it helped invest in the new £12 million 6-inch wafer fabrication production lines, which not only significantly expanded Dynex's manufacturing capacity but also improved the reliability and robustness of its products. Secondly, being lead firms in the railway equipment global value chain, CSR China and Times Electric had the ability and authority to set specific requirements for the IGBT modules produced by Dynex. They also arranged and monitored field trials for their application in China's railway locomotives and provided vital knowledge on how to improve product functionality through testing. In other words, CSR China and Times Electric set parameters for the manufacturing process in terms of what was to be produced and how (Humphrey & Schmitz, 2002b). Thus, the Chinese parent not only enabled Dynex to vertically extend its business but also put the acquired firm in a direct downstream line from the regulator, creating, in effect, '*monopolized synergies*' that competitors would have found very difficult to match.

Last but not least, the newly-established parent-subsidiary relationship provided Dynex not only with vital access to the Chinese market but also with key customer knowledge to improve its products, all of which had not been available to Dynex as an independent firm. Before the acquisition, Dynex had found it difficult to penetrate into the railway market because of the latter's emphasis on reliability and because it had lacked previous reference and reputation in this market (senior managers of Dynex and Times Electric). Its CEO said in interview:

> "The railway sector is very demanding in terms of reliability and costs. And we could not enter the railway sector without Times Electric because the other main railway firms are already so tied up with existing IGBT manufacturers that they could not give us space or time to do the qualification. So that was something that has been enabled by the relationship with Times Electric." (Interview)

Being an independent firm had also meant that, in the past, Dynex had found it difficult to obtain product feedback to implement any potential product improvements and adaptations; customers would only report whether or not a product was acceptable, without providing any further details. Leading global firms such as Infineon and Mitsubishi had their own system firms or train firms to which they could sell products and from which they could get feedback. Becoming part of Times Electric created a critical 'internal market' (IGBT manager, Dynex) for Dynex to receive that feedback, which helped it design particular applications and improve the quality of its manufactured components (senior managers of Times Electric). The acquisition therefore gave Dynex an ideal platform from which to apply its technologies in the expansive Chinese railway market and beyond, enabling it to further improve its technologies. The firm's IGBT Wafer Fab Process Technology Manager commented in the interview:

> "With Times Electric, it was a close enough relationship for us to get completely the information of what problems our product had for the application. We were able to give them component, they tested them, tried them and we could go over there and actually see that problems they had. That was a completely different scenario to the way we used to work. … I think because of that we now have a much better product and it has been better tested in its application. … *We would not have learned what the problem with that product was without that relationship*" (emphasis added).

4.2.2. EMNE acquirer firms as co-learners

Compared to global leading firms such as Infineon and Mitsubishi, Dynex had been a small power semiconductor player. Times Electric and CSR China wanted to significantly enhance its capability so that it could compete with global leading players at least in the Chinese market (senior managers of Dynex and Times Electric). Part of the strategy involved significantly expanding Dynex's R&D team. In a ceremony to celebrate the completion of Dynex's new R&D centre, which—following its integration with Time Electric's existing R&D group—had become CSR China's global R&D centre, Mr. Changhong Zheng, the then President of CSR China, emphasised that the centre would focus on developing new technologies and products to expand the high power semiconductor product portfolio of both Dynex and Times Electric, noting that the products were key to a wide range of sectors that CSR China and Times Electric wished to pursue; i.e., railways, electric vehicles, wind power generation, solar power, electric power grids, and high voltage power conversion (Dynex, 2011).

This expectation for Dynex to significantly expand and enhance its technological competence meant that Dynex was required to not only focus more on advanced technological areas, but also to develop new products in much broader areas. A Dynex senior engineer commented:

> "Really, the business strategy has changed from a small firm trying to do niche products to a broad-based firm that really wants lots of technologies. We are starting to work now in R&D on products that we would never have done before." (IGBT manager, Dynex)

Although this strengthened the competency-creating mandate, it also exposed a capability gap, particularly with regard to the global leaders. In 2015, Dynex's CEO admitted that

> "As a firm, we are still very much in a catch-up situation for the power semiconductor. We are not as strong as many of our competitors. So we have got a degree of catch-up." (Interview)

To address that capability gap, Dynex and Times Electric had to, for example, work together to qualify the IGBT modules for the Chinese railway market, which generated a mutual-learning process in which the flow of information became increasingly recursive and multi-directional. Dynex's CEO, for example, reflected that the flow of knowledge between the subsidiary and parent firms had become more two-directional and that there had been a change in the balance of the flow of knowledge, particularly after the establishment of the 8-inch IGBT facility in Hunan in 2015.

> "So that continued, if you like, with the flow being very much into China in terms of showing them what to do, giving them processes and stuff like that … We have also started to get information coming back now as they respond to ramping up that production line [in Hunan]. … in a lot of cases, they are finding things that are actually very beneficial to the overall process and design of the process, design of the chips [on our side] … The other change is more related to our power assemblies business. We lack a bit of information about how to control the subunits. How to interface that subunit through the control system into the main system? And it is how that control interfaces and so on which is where our parent firm's expertise and core competency comes in. So, as we gradually move our business more into this sector … we can get more support from our Chinese firm. We are just starting to talk to them about how we can work with them to develop new systems, new subsystems, and enter new markets with that sort of support. So this is the first time, really, where we have begun to see that bigger flow of technology coming back into filling a gap that we don't really have … So I think that is one of the benefits we are starting to see now, this relationship we have, the win-win, the *symbiotic relationship* between Dynex and our parent firm that the *information* [know-how] *is becoming more and more two directional*." [CEO, Dynex, emphasis added]

This symbiotic relationship started to create a favourable mutual learning environment so that both the parent and subsidiary firms were learning both from each other's expertise and from third party organisations such as universities. Some of the new application areas that Dynex was required to develop for its IGBT modules—for example, electric vehicle and renewable energy—were also new to its parent firm. Thus, both the parent and subsidiary firms had to experiment together. Indeed, the joint R&D centre established after the acquisition demanded that both parent and subsidiary firms share IP and development costs (senior managers, Dynex and Times Electric). A 'community of practice' was being established; one in which the parent and subsidiary firms joined forces and created a strong R&D team, dedicated to electric vehicles, which was also working with a few universities in the UK. Engineers from the UK and China held monthly reports and quarterly reviews to reflect any problems and progress (IGBT manager, Dynex). What we observe is the formation of "*recursive*, *multidirectional*, *mutual learning relations* based in joint reflection and experimentation" (Herrigel et al., 2013) between the acquirer and subsidiary. Despite being in a nascent stage, this mutual learning relationship had already seen the firms working both together and with external institutions to produce a prototype of an electric vehicle and diversifying into industries beyond railway equipment.

4.3. Subsidiary upgrading and the underlying learning process

In this acquisition, Times Electric clearly had a strong knowledge-seeking motive, as is the case for many other acquisitions conducted by EMNEs in developed countries (Awate et al., 2015; Hansen et al., 2016). However, it also had a keen interest in further developing Dynex's capabilities, which, combined with their own competencies, could help them to enhance their position in the railway and other markets by means of its 'Concentric Circles' strategy.

Therefore, quick and consistent efforts were made to improve Dynex's capabilities in designing and manufacturing IGBTs for the railway market. Times Electric also wanted to strengthen R&D in Dynex so that the subsidiary could develop more advanced technologies to be used not only in railway equipment but also in the other industries (such as electric vehicles and renewable energy) that Times Electric and CSR China wanted to penetrate. These strategies, however, exposed significant capability gaps between Dynex and global leading power semi-conductor suppliers in terms of both the understanding of the application industries and of the depth and breadth of technological competency.

Our analysis revealed two important roles played by Times Electric and CSR China to help Dynex to address such capability gaps. Firstly, as lead firms in the railway equipment global value chain, CSR China and Times Electric played the role of 'impellers' in Dynex's upgrading process. This was, for example, made manifest in the knowledge of the railway system and of the propulsion and control subsystem they brought to the subsidiary, which significantly helped Dynex to understand the application market of its IGBTs. As lead firms in the value chain, they also set specific parameters for the subsidiary to comply with and monitored the process (Bresman, Birkinshaw, & Noble, 1999; Humphrey & Schmitz, 2002b) in order to qualify Dynex's IGBT modules for the railway and related markets. Thus, similar to their DMNE counterparts, EMNE lead firms, because of their positions in the value chain, can also 'impel' upgrading in other value chain participants.

The 'co-learner' role played by Times Electric in Dynex's upgrading process was equally significant and interesting. This could be seen in the joint effort they made in producing electric vehicles and diversifying into the renewable industries. Being aware of the gaps between Dynex's existing capabilities and its expectations, Times Electric did not just leave Dynex alone waiting for new capabilities to emerge. Rather, it played an active role in reflecting, together with Dynex, on what needed to be addressed and on how to address and achieve it. In the words of one of Times Electric's senior managers:

> "We did not want to strip off Dynex and leave it empty. We treat it as our asset and consider technological co-operation in order to fulfil our strategic aims. We then use the strengthened capabilities [in China] to help and feed Dynex's development. So, in a sense, we want both sides to improve together." (Board Secretary, Times Electric)

When we talked to senior managers and engineers in Dynex, it was clear that the subsidiary was also increasingly eager to learn from its parent firm. Furthermore, an expectation that such learning would occur had been formulated and gradually solidified, establishing an environment conducive to learning, in which mutual upgrading, driven by the co-learner role, was not only possible but also probable. Over time, a 'symbiotic relationship' and mutual learning environment was established that facilitated a 'recursive, multidirectional' information flow and joint reflection and experimentation (Herrigel et al., 2013) between the parent and subsidiary firms. Despite still being in the early stage, this 'symbiotic' and mutual learning relationship was already apparent in the qualification process of Dynex's IGBTs for the railway market, the R&D agreement negotiation and both parties' joint effort in electric vehicle R&D.

Via its '*impeller*' and '*co-learner*' roles, Times Electric successfully induced significant changes in Dynex's behaviour, routines, and attitudes, including its production processes, product focus, R&D management, and even risk attitudes, leading to the enhanced capabilities that we reported in section 4.1. Dynex's production processes went through a significant change after the acquisition as the result of the new production facilities being put in place. The subsidiary was also required to focus on high power, high value products instead of volume manufacturing. In addition, efforts were made to change Dynex's R&D management style from a relatively casual to a more structured one in order to improve knowledge management and flow (CEO, Dynex). Engineers were encouraged to attend key power electronics workshops, seminars, and conferences to ensure their continued professional development (Dynex, 2013). Dynex's attitudes towards risk also changed. To integrate it into its fast innovation mode, Times Electric had to induce changes in Dynex's attitude towards risk and risk management. Dynex's CEO suggested that, despite being state-owned, its ultimate parent firm, CSR China was not risk averse; rather, it took many calculated risks. This was because of China's unique working ethic and efficiency, if any problem arose it would get fixed right away; through this strategy Dynex gained a great deal of knowledge.

> "It affects Dynex as well and, actually, it is a beneficial effect because they are prepared to take the products that are coming from our R&D area and put them into a close to real life application quickly to try them out, to see if they work. And that is sort of their qualification process. They will take a small number, put them into service and, if it is all right, they will move on and take a large number. The process here [in the UK] is much, much slower. We will take a few, we will run lots of test on them and, thus, we will get independent views and lots of stuff would go on before we dare to put it into real life service. And it is the vertical integration that allows [them] to do that because it means that the same firm that is producing the locomotive is the same firm that is producing the component that they are trying out. … We are learning and, maybe, we will get a balance between the two [approaches]." (CEO, Dynex)

It should be noted that a range of supporting measures were put into place by both parent and subsidiary firms in order to facilitate these changes. We have already mentioned the significant financial investment made in Dynex since 2008. There have also been dedicated efforts by senior managers of both Times Electric (and CSR China) and Dynex to help the subsidiary's employees appreciate the parent firm's strategies, capabilities, and ambition and therefore enhance trust building between the acquirer and the subsidiary. This, coupled with the parent firm's 'light touch' (Liu & Woywode, 2013) management of the subsidiary (e.g., Times Electric not seeking domination of the Board, little change to Dynex's management team), helped to ease Dynex's employees' doubts on their Chinese parent firm and encouraged a stronger motivation for knowledge sharing. In addition, regular exchanges of engineers had become a routine (senior managers, Dynex and Times Electric). Indeed, every year, a 40-strong team of managers and engineers from CSR China are trained in the UK, spending a few weeks in a renowned British university and a few more weeks in Dynex. Managers and engineers from Dynex also visited the parent firm regularly. Moreover, various efforts were made to build trust and facilitate communication between the Chinese and British engineers, including dedicated team-building activities and social events. Dynex even introduced Chinese food in its staff canteen to encourage Chinese engineers to stay at lunch time, thus creating opportunities for them to engage with their local counterparts (senior managers, Dynex). Furthermore, it is worth noting the role played by a few 'boundary spanners' (Reiche, 2011) in facilitating trust building and communication between the acquirer and the subsidiary. The few senior managers sent by Times Electric to work in Dynex—including the Sales Director and the Deputy Director of the R&D Centre, for example, who spoke good English and had a very good understanding of Western culture—did not see themselves and were not seen by their Dynex colleagues as 'controllers' from the parent firm, but as an integral part of the subsidiary (senior managers, Dynex). Likewise, the CEO of Dynex had dealt with the Chinese market for over 30 years and had a profound understanding of the country and its culture.

5. Theoretical development

Up to now, we have revealed the learning process underlying capability upgrading in the subsidiary firm. The acquirer firm's strategy exposed significant gaps (in terms of designing and manufacturing IGBTs for the railway market, but also of the depth and breadth of Dynex's technological capabilities) between the subsidiary's existing capabilities and the acquirer firm's expectations. To help Dynex address these capability gaps, Times Electric played a dual, 'impeller' and 'co-learner' role. The former involved the acquirer firm setting specific product parameters and monitoring the processes, providing critical product feedback, and bringing in key technological and market knowledge. In its 'co-learner' role, however, we observed how Times Electric engaged in joint reflection and experimentation with Dynex, leading to the formation of a 'symbiotic relationship' and mutual learning environment that facilitated a 'recursive, multidirectional' information flow. Facilitated by a range of supporting measures, the acquirer firm had, over time, induced significant changes in the subsidiary firm's behaviours, routines, and attitudes, leading to enhanced capabilities.

But what explains Times Electric's 'impeller' and 'co-learner' roles? Here, we note the firm's distinctive EMNE characteristics and strategies as well as the unique power relationship it had with Dynex. Rising fast, initially in the Chinese and then in the global railway market, CSR China and Times Electric exhibited distinctive EMNE characteristics; on the one hand, it could be argued that they lacked core technological competence in IGBT—the 'heart' of Electric Traction Drives; on the other hand, they developed significant capabilities (e.g., competence in propulsion and control, fast innovation and the ability to apply their competence in one area, such as railways, to different but related areas such as renewable energy) building upon 'ordinary resources' (Madhok & Keyhani, 2012). These capabilities, along with the Times Electric's knowledge of the railway system and of the Chinese market, may not have represented superior technologies, but were critical and complementary to Dynex's IGBT capabilities and, once transferred, led to the upgrading of the subsidiary. In addition, as lead firms in the global railway value chains, CSR China and Times Electric carried with them significant power both in setting and enforcing product parameters and in monitoring compliance (Gereffi & Lee, 2016; Humphrey & Schmitz,2002) for downstream players such as Dynex. Therefore, an EMNE such as Times Electric, despite its lack of competency in the core IGBT technology, could still 'impel' upgrading in Dynex because of its GVC lead firm position and also of its 'ordinary' but critical and complementary assets.

Despite CSR China and Times Electric's GVC lead firm positions, the power relationships between them and Dynex seemed to be more balanced than those reported in DMNEs dominated GVCs. This could be explained by Resource Dependency Theory (Pfeffer & Salancik, 1978), which argues that power relationships are shaped by "*resource criticality and the availability of alternative providers of critical resources*" (Casciaro & Piskorski, 2005). In our studied case, whilst Dynex owned the critical IGBT technology and had access to the leading knowledge clusters in the west, CSR China and Times Electric brought with them complementary resources and capabilities (knowledge of the railway and Chinese markets, fast innovation, etc.), but also coordination of activities and access to key actors in the value chain. In a different dimension, Dynex struggled to find a stable platform to apply its IGBT technology, whereas Times Electric could source IGBT from other suppliers (although that had proven not to be a very stable approach and hadn't given any access to learning the technology itself). This indicates that the power asymmetry typically exhibited between GVC lead firms and other participants was here counterbalanced by the mutual dependence between Times Electric and Dynex. In addition to that, CSR China and Times Electric, despite being GVC lead firms, had to deal with the 'liability of emergingness' (Held & Berg, 2015) when they expanded into the UK (for instance, in the early years of the acquisition, the suspicion of Dynex's employees towards their Chinese acquirer and their ignorance of Times Electric's particular knowledge strengths and competencies). This induced a 'more humble approach to learning' (Madhok & Keyhani, 2012) on the side of Times Electric. Together, the 'liability of emergingness' and the relatively balanced relationship between Times Electric and Dynex were conducive to a mutual learning environment and, therefore, to the 'co-learner' role played by Times Electric in the upgrading process.

Our holistic approach has thus enabled us to establish a learning-based understanding of subsidiary upgrading and unravel the underlying leaning process, which involves a chain of actions: the EMNE firm's strategies exposed capability gaps in its subsidiary; shaped both by its unique strategies and capabilities and by its power relationship with the acquired subsidiary, the parent firm played a dual, 'impeller' and 'co-learner' role, with a range of supporting measures, to help its

subsidiary to address its capability gaps; this led to a behaviour/routines/attitudes change in the subsidiary and, ultimately, to enhanced capabilities. In Fig. 1, we summarise the learning process underlying subsidiary upgrading. Readers may refer to the data structure (Appendix B) for the development of the inductively derived constructs. The learning process and the chain of actions will certainly need further refinement; nevertheless, we believe that this is a promising direction that deserves more attention and further research in order to open the 'black box' of the upgrading process (Hansen et al., 2016; Morrison et al., 2008).

The fact that Times Electric, although lacking superior knowledge and technology, impelled and induced capability upgrading in Dynex, which did have superior knowledge in IGBT, is intriguing. This seems to suggest that GVC lead firms having superior knowledge is not a necessary condition of upgrading. This is in contrast to the extant upgrading literature, which focussed upon a one-way knowledge flow from DMNEs to local producers in developing countries (Marin & Giuliani, 2011) and on an implicit theoretical reliance on the existence of a superior knowledge on behalf of the value chain lead firms. Our paper endorses the view that, in the upgrading process, the flow of knowledge is multidirectional (Herrigel et al., 2013), and that mutual learning plays a significant role in subsidiary upgrading in addition to the flow of knowledge from parent firms. The role that an EMNE parent firm plays in subsidiary upgrading is therefore complicated: on one hand, it is a knowledge contributor injecting complementary knowledge into the upgrading process, while also being part of a mutual learning process; on the other hand, the parent firm's superior knowledge is not a prerequisite for subsidiary upgrading as the former can transfer complementary but critical knowledge and induce upgrading via parameter setting and monitoring, but also jointly learn with the subsidiary. Ultimately, what really matters is whether changes are induced in the subsidiary's behaviour/routines/attitudes (in our case, changes in Dynex's risk attitudes and R&D management, for example). This paper therefore calls for a re-examination of the extant upgrading literature's theoretical reliance on the existence of a superior knowledge on behalf of value chain lead firms.

Our analysis also points to the importance of investigating the specificity of power relationships in value chains and MNE networks taking into account firms' characteristics and power sources. In particular, there is a need to recognize the different sources of power (Zheng, 2016) (e.g., power stemming from expertise and superior knowledge, and power stemming from lead firm positions, ownership, and authority) that different players have and that shape the power relationships and, ultimately, the upgrading process and outcomes.

6. Managerial implications and future research

6.1. Managerial implications

In developed countries, both governments and the public tend to view EMNEs acquiring local firms simply as finance providers that have little to offer to the latter. Our analysis, however, demonstrates that their roles could go much further than that, to also include those of knowledge provider (for example, when Times Electric transferred its knowledge of the train traction system to Dynex and helped the latter develop and improve its IGBT modules for Chinese railways) and co-learner (for example, when the acquirer and acquired firms jointly experimented in the field of electric vehicles). It is therefore important for governments and businesses in developed countries to appreciate the wider benefits of EMNE investment and, in particular, the potential depth and breadth of knowledge spillovers and mutual-learning opportunities.

This paper suggests that, in order to maximise these benefits, it is particularly important for subsidiaries to develop symbiotic relationships with their parent firms as this would help to establish a mutual-learning environment and facilitate the sharing of knowledge. In addition, as the underlying learning processes are induced and shaped by the parent firms' strategies and characteristics, it would be helpful for potential targets to understand their acquirers' strategies and characteristics to gauge the subsequent upgrading potential. It is also important for managers in the west not to dismiss EMNE capabilities. Although they suffer from the 'liability of emergingness', many EMNEs do own complementary assets and competences that could turn out to be very useful for firms in developed countries (e.g., Luo & Tung, 2017). Perhaps there is a need for a more humble attitude from firms in developed countries, to recognize the EMNEs' particular strengths and capabilities and benefit more from the latters' acquisitions and investment.

6.2. Limitations and suggestions for further research

Its contributions notwithstanding, this study is limited by its single case prism. Time Electric and CSR China held global value chain lead firm positions and had significant technological competencies; features that may not be shared by other EMNE acquirers. Future studies could build on our findings and undertake a wider study to examine multiple EMNE subsidiaries from different industrial settings. Still, this paper demonstrates that there is a pressing need to understand the capability upgrading of EMNE- acquired subsidiaries in developed countries. In addition, given the distinctive characteristics of EMNEs (Ramamurti, 2012) and the possible new governance structures and value chain relationships in EMNE-led GVCs (He et al., 2017), it would be interesting to compare the upgrading outcomes of EMNE subsidiaries in developed countries with those of developed country MNEs subsidiaries, and examine how they are shaped by different governance structures and value chain power relationships.

We urge future research to pay closer attention to the underlying learning process in their investigation of upgrading. In particular, in line with Herrigel et al. (2013), we call for future studies to look beyond one-way knowledge transfer and consider mutual learning in the upgrading process. We believe that future studies should also take into account any firm characteristics that could help to shape the power relationships between lead firms and other value chain participants and, ultimately, the upgrading process and outcomes.

7. Conclusion

In this paper, we examined capability upgrading in an EMNE-acquired firm in a developed market and the underlying learning process. The paper reveals that, despite its lack of superior knowledge, the EMNE acquirer had a positive impact on its acquired firm's learning and capability upgrading. The results indicate that multiple types of upgrading took place in the subsidiary and that these had been facilitated by the parent firm playing a dual, 'impeller' and 'co-learner' role shaped by its unique EMNE characteristics and strategy.

Our multidirectional conceptualisation of upgrading enables us to unravel the important but complicated roles that can be played by EMNE lead firms in the capability upgrading of their acquired subsidiaries in developed countries. In particular, the paper reveals how the EMNEs' unique characteristics (e.g., their complementary capabilities and more balanced GVC power relationships) shape the upgrading process in their acquired, technological-advanced subsidiaries in developed countries.

There is a dearth of research on what 'power' EMNE-lead firms actually possess and exert (Sinkovics et al., 2014) despite the belief that their rise will eventually lead to significant changes in the governance of global value chains (GVCs) (Henderson & Nadvi, 2011). Our paper illustrates how, because of their GVC lead firm positions and unique strategies and capabilities, EMNEs can exercise power and impel and encourage subsidiary upgrading. It also contributes to the study of the learning effect and development impact of EMNE investment in developed countries, an area that has been so far little researched

(Buckley et al., 2017; Govindarajan & Ramamurti, 2011; Luo & Tung, 2017; Rui et al., 2016), by showing how EMNEs may act as sources of knowledge and learning and facilitate upgrading in their acquired subsidiaries in developed countries. Our approach challenges the conventional wisdom that tends to view EMNEs as mere learners and beneficiaries of knowledge transfer from developed economies.

Our paper also emphasizes the need for a multidirectional conceptualisation of upgrading. This requires scholars to look beyond the governance and power relationship issues emphasised by the traditional GVC approach, but to also consider organizational learning and firm characteristics. This paper contributes to the upgrading and organizational literature by not only building a connection between firm-level learning and upgrading outcomes but also by revealing how the learning process is induced and shaped by firm strategies and characteristics.

Finally, our research context is a departure from the extant literature on the internationalisation of EMNEs in developed countries, in which the focus was on how EMNEs acquire strategic assets to compensate their ownership disadvantages and enhance their competitiveness (e.g., Gaur et al., 2014; Gubbi et al., 2010; Hansen et al., 2016; Luo & Tung, 2007). It is also in contrast with the extant upgrading literature, the focus of which was on upgrading in developing country firms as a result of the knowledge possessed by DMNEs trickling down in the global value chain (e.g., Khan & Nicholson, 2015; McDermott & Corredoira, 2010). Our paper represents a healthy complementation by studying how and why firms in developed countries can upgrade as the result of being inserted into EMNE lead firms' global value chains. This paper therefore highlights the need for future research to avoid contextual bias on DMNEs and their subsidiaries. It also highlights the need for future studies to distance themselves from the theoretical bias on EMNEs being purely knowledge-seekers but to also consider them as sources of knowledge and learning.

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Appendix A. Interview guides

Earlier stage interview guides for Dynex (acquired subsidiary):.

1. How and why did the acquisition happen? What were you looking for?
2. What are your comments on Times Electric's competitiveness and capabilities?
3. What has been changed in Dynex since the acquisition? And how?
4. What is the role of Times Electric in the process?

Later stage interview guide for Dynex:

1. What are your comments on Times Electric's management of Dynex?
2. Do you think Dynex's competitiveness/capabilities have been improved since the acquisition? How? And what is the role of Times Electric?
3. How do you integrate knowledge (if there is any)coming from your parent firm to your firm?
4. What are the barriers to knowledge flow and how did you overcome them? Any specific examples?
5. What coordination mechanisms have you used to facilitate knowledge flow between the two firms?
6. How would you comment on your working relationship with the Chinese?
7. Can you talk about your experience of working with Chinese colleagues on specific projects?
8. How has the role of the R&D centre changed before and after the acquisition?

Earlier stage interview guide for Times Electric (Parent firm):

1. Why did you acquire Dynex? What did you want to achieve?
2. What is your future strategy? What is your plan for Dynex?
3. How has Dynex changed since the acquisition?
4. What is the role of Times Electric in the process?

Later stage interview guide for Times Electric:

1. How would you comment on the impact of the acquisition on Dynex?
2. How have you helped to further develop Dynex?
3. What measures have you taken to integrate Dynex into the parent network?
4. What are your comments on Times Electric's management of Dynex?
5. Can you reflect on Times Electric's relationship with Dynex? How do you manage that relationship?
6. What sort of coordination mechanisms have you used to facilitate knowledge flow between the two firms?
7. What are the barriers to knowledge flow and how did you overcome them? Any specific examples?
8. Can you talk about your experience of working with British colleagues on specific projects?

Appendix B. Data Structure.

Ist order categories	2nd order themes	Aggregate Dimensions
Shift towards higher power, high margin products; New IGBT and diode chips; Release of new thyristors.	Product upgrading	Enhanced capabilities
New IGBT wafer fabrication line; New bipolar thyristor wafer fabrication line; The six-inch enables finer geometry and different types of process; Leading to improved reliability and robustness.	Process upgrading	
Now developing silicon carbide, a new technology because CSR are moving into that area; (Dynex) now working in R&D on products that we would never have done before.	Functional upgrading	
Developing IGBT for railways; R&D shifted to new applications e.g. renewably energy and electric cars.	Intersectoral upgrading	
To compete quite heavily with Infineon, Mitsubishi etc.; To further develop Dynex's IGBT technology and apply it to the Chinese railway market; Changed from a small firm trying to do niche products to a broad-based firm with lots of technologies; Times Electric wanting both sides to improve together	Strategic intention	Firm strategies
Railway being very demanding in terms of reliability and costs and forms; Dynex not being big enough to do them all; Dynex still being a small firm relative to (the global leader); Dynex formerly concentrating on some small specific areas; Times Electric wanting lots of technologies; Starting to work in R&D on products Dynex would never have done before; Speed to improve because Times Electric are trying to grow a lot faster; Dynex's IGBTs having pre-profiled parameters, but needing much more narrow-banded parameters	Gaps between existing capabilities and expectations	Capability gap exposure
More hands-on or direction in terms of improving Dynex's quality to match Times Electric's expectations; Times Electric telling Dynex what the requirements for the silicon chips are.	Lead firm power	Power relationships
Difficulty for Times Electric to develop IGBT in house; Dynex struggling as a small, independent firm; Dynex would not have learnt what the problem with a product was without its relationship with Times Electric; Dynex moving into silicon carbide because of CSR's competence, but allowing them to access the knowledge that exists in the West;	Mutual dependency	Power relationships
Dynex having to set standards a lot higher; Dynex having to work to tighter tolerances and the customers expecting all of the products to be good; To be a supplier in that market place, Dynex needing to start working to CSR's procedures and quality standards;	Parameter setting and monitoring	impeller
Bigger flow of technology coming back to Dynex; A close enough relationship with CSR for Dynex to get the information of what problems its product had; Dynex, as an independent component manufacturer, never having that feedback; CSR bringing in its technology, its experience of manufacturing and quality management to Dynex to help.	Knowledge transfer from parents	
Symbiotic relationship; Information becoming more two directional; CSR really wanting Dynex to be an equal part of the whole firm; CSR developing Dynex's and its own expertise at the same time; Joint R&D team for electric vehicles working together day in and day out; Joint monthly R&D report and quarterly review; CSR bringing in its converter technology to the UK and using the UK as the base to develop that technology specifically for electric vehicles. This merging with what Dynex can do with semiconductors; CSR working very closely with the guys that used to be in China who are now in the UK in terms of doing experiment or process trials; Many joint papers being prepared for conferences;	Mutual learning and joint reflection/experiment	Co-learner

The 6-inch enabling finer geometry and different types of process, using better technologies;	Change in production process	Changes in behaviours/ routines/attitudes
Dynex moving away from some manual processes into more automatic processes;		
Dynex having moved low power products to China to focus on high power products;	Change in product focus	
R&D in much broader areas;		
Dynex R&D being more structured to improve knowledge management and flow;	Change in R&D management	
CSR takinga lot of risks, but calculated ones;	Change in risk attitudes	
A 'fix it straightaway' attitude mitigates the risks and this has a beneficial effect on Dynex		
Vertical integration allowing Dynex to do that because all being controlled by the same firm;		
£12 m new R&D centre;	Financial investment	Supporting measures
£12 m new IGBT fabrication lines.		
Have to build trust to see the benefit;	Trust building	
Senior managers helped employees to understand parent firm's strategies, capabilities and ambition;		
They run an outstanding employee of the year award where they send four winners to China and have all expenses paid;		
They have given us bonuses and presents at Christmas … the feeling is good;		
Key engineers (from Times Electric) were working here with me to understand the process;	Training/staff exchange	
We visit our parent firm a lot;		
We have put together a secondment programme to attract Dynex employees to go over to our parent firm;		
Yearly training programmes for CSR engineers in the UK;		
Employing a Chinese staff member in HR to facilitate communication;	Communication	
Becoming more open in information sharing;		
Encouraging acceptance of mistakes;		
Difficulty in communication. Doing it by email, conference calls and by visiting them a lot;		
Giving incentives to disclose problems;		
Social committee at Dynex … to arrange social activities for Chinese colleagues;		
Doing some team building exercises;		
Dynex trying to improve its Chinese menu so that Chinese employees will stay for lunch … to help integration;		
Among eight Board members, only four from Times Electric;	Light-touch management	
Dynex enjoying a high degree of autonomy;		
Times Electric taking a hands off approach;		
Little change in management structure		
The Director of the semiconductor business unit of Times Electric also being my boss and a Dynex Director, thus being sort of inside the business and able can help us;	Boundary spanners	
Dynex CEO, with a profound understanding of China, being a champion of and pivotal to the relationship;		
Having employed a Chinese staff member in Dynex's HR; her job being engagement and communication between the British and Chinese;		
Senior managers sent in by Times Electric seeing themselves as an integral part of the subsidiary		

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