IN SEARCH OF A THEORETICAL FRAMEWORK FOR REVERSE INNOVATIONS

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Abstract
Despite the increased strategic importance of reverse innovation, an inspection of the literature suggests that there is still some confusion as to what it is, how it is different from other types of innovation, and what factors are needed for it to be successful. Best practices and underlying conceptual frameworks appear to be lacking or somewhat scarce in both academic and practitioner literature. In this paper we propose that reverse innovation can be considered a form of global competence creation and as such we propose that reverse innovation shares some common underpinnings with the well-established concept of reverse knowledge transfer. An added benefit of this perspective is that it enhances the generalizability of research on reverse knowledge transfer. By connecting reverse knowledge transfer and reverse innovation under a general perspective of global competence creation, we believe we provide a framework that allows all firms to appreciate the global competence creation.

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ABSTRACT

Despite the increased strategic importance of reverse innovation, an inspection of the literature suggests that there is still some confusion as to what it is, how it is different from other types of innovation, and what factors are needed for it to be successful. Best practices and underlying conceptual frameworks appear to be lacking or somewhat scarce in both academic and practitioner literature. In this paper we propose that reverse innovation can be considered a form of global competence creation and as such we propose that reverse innovation shares some common underpinnings with the well-established concept of reverse knowledge transfer. An added benefit of this perspective is that it enhances the generalizability of research on reverse knowledge transfer. By connecting reverse knowledge transfer and reverse innovation under a general perspective of global competence creation, we believe we provide a framework that allows all firms to appreciate the global competence creation.
INTRODUCTION

The knowledge-based view (KBV) considers knowledge to be the most important resource in determining a firm’s sustainable competitive advantage (Grant, 1996; Kogut & Zander, 1992; Spender, 1996). In describing this perspective, Spender (1989:185) defines an organization as “a body of knowledge about the organization’s circumstances, resources, causal mechanisms, objectives, attitudes, policies, and so forth.” At the highest level, KBV argues that firm activities can be grouped under two high-level categories, namely the creation (i.e., generation or exploration) and application (i.e., implementation or exploitation) of organizational knowledge (Grant, 1996). It has been further claimed that “all new resources, including knowledge, are created through two generic processes: namely, combination and exchange” (Nahapiet & Ghoshal, 1998:247-248). (Re)combination of existing knowledge is considered the core of the production function for new knowledge (Weitzman, 1998) and in cases where “resources are held by different parties, exchange is a prerequisite for resource combination” (Nahapiet & Ghoshal, 1998: 248). Thus a great deal of KBV inspired research looks at knowledge transfer since it is so fundamental to knowledge creation and application as well as firm innovation (e.g., Ambos, Ambos, & Schlegelmilch, 2006; Tsai, 2001). Finally, KBV has also come to dominate international business literature by highlighting that knowledge creation and application is core to the strategy and competitive advantage of contemporary MNEs (Hitt, Li, & Worthington, 2005). Compared to other types of firms, MNEs are faced with a more complex challenge due to their distributed network of subsidiaries operating worldwide. In fact, this complexity becomes more salient as MNEs’ strategic emphasis shifts from exploitation to exploration as it has over the last few decades.
From a historical perspective, MNEs’ early motive for going global was exploitation of their home-country or headquarters-created knowledge, technology, and capabilities (Cantwell & Mudambi, 2005). However, a competence-based theory of the firm suggests that the firm is an institution that builds capabilities, competencies, and new knowledge through internal and external learning processes and suggests that firms should be able to establish a diffuse system for the creation of new competencies not just for the exploitation of them (Cantwell & Piscitello, 2000). This perspective views MNEs as a ‘differentiated network’, where knowledge is created in various parts of the MNE and transferred within the MNE, thereby diversifying the spectrum of competencies held in an MNE group (Cantwell & Piscitello, 2000). In simple terms this can be considered the ‘global competence creation imperative’— if firms want to live up to the full potential of being a multinational, they must look globally to consider what new knowledge can be created in various locations and applied throughout the MNE.

Recent years have witnessed a shift in the global innovation system’s center of gravity to emerging BRIC (Sarkar, 2011) or CIVETS countries. This shift has occurred because of a number of factors. First, as infrastructure and educational systems in these countries have improved, local technical and scientific expertise has increased rapidly (Kao, 2009) and has frequently been specialized in areas different than that which existed in so-called developed countries (Petrick, 2011). When coupled with the large, historically underutilized, and motivated labor pool, this has led MNEs to increasingly look to emerging markets for R&D capabilities. This has increased the knowledge creation in emerging market subsidiaries and has increased the need for reverse knowledge transfer. A second major trend that has increased the importance of emerging markets is the attractiveness of these markets,
particularly in light of the recent global recession. However, as emerging market firms and emerging market multinationals (EMNEs) have become more sophisticated, DMNEs have found that their traditional exports are relatively less attractive in these markets. Related to this, a relatively recent revelation is that bottom-of-the-pyramid markets (i.e., consumers that earn less than $1 per day) are a viable consumer population (Prahalad, 2010). Unfortunately, traditional products are not viable when targeting the specific needs of this cost-sensitive population (Tiwari & Herstatt, 2012). Thus it is critical that MNEs design and develop products or services specifically for emerging markets (Govindarajan, 2012). The concept of ‘frugal innovation’ (Radjou, Prabhu, & Ahuja, 2012) has been introduced to help explain innovation specifically for emerging markets. Finally, products or services developed specifically for these emerging markets are often substantially different than those that exist in developed markets and, consequently, sometimes offer potential value in developed markets. Thus the concept of reverse innovation (Immelt, Govindarajan, & Trimble, 2009) has been introduced to describe the consequent flow back to developed markets. Indeed the radically new perspectives inherent in emerging market innovations frequently offer the potential to disrupt existing developed markets (Assink, 2006) and thus these concepts have frequently been linked to disruptive innovation (Christensen, 1997).

In 2011, we started a research-on-research (ROR) project in partnership with the Industrial Research Institute (IRI), the nation’s leading association of companies and federal laboratories working together to improve their research and development capabilities, to look at various cutting edge phenomena related to Global R&D. Working with IRI member companies as well as leading international business scholars helped us identify some significant gaps between current research on reverse knowledge transfer, exploration-
exploitation, and reverse innovation and motivated us to develop the propositions outlined in
this paper.

In this paper we make a number of contributions related to global competence
creation, reverse knowledge transfer, and reverse innovation. First, despite the increased
strategic importance of reverse innovation, there is still some confusion as to what it is, how
it is different from other types of innovation, and what factors are needed for it to be
successful. Best practices and underlying conceptual frameworks appear to be lacking or
somewhat scarce in both academic and practitioner literature (Govindarajan & Ramamurti,
2011). Starting with the early work of Immelt et al. (2009), some researchers (e.g., Agarwal &
Brem, 2012) have initiated attempts to distinguish reverse innovation from other types of
innovations, however this effort is still in its infancy. This problem is further compounded by
the limited number of examples that scholars typically fall back on and which don’t fully
explore the conceptual space around these phenomenon. Second, reverse innovation has not
been positioned theoretically or practically in the broader context of global competence
creation. In this paper we propose that reverse innovation can be considered a form of global
competence creation—in order for the new innovative perspectives developed in emerging
markets to be available to the MNE, these products or services must reverse, or transfer back
to the MNE. In our view, innovation represents package of explicit as well as tacit knowledge.
In other words, it involves recognition of opportunities, customer needs, and technical
solutions on those needs. Therefore, reverse innovation inherently involves acceptance of
knowledge of innovation as valid and such knowledge has to be transferable. As such we
propose that reverse innovation shares some common underpinnings with the well-
established concept of reverse knowledge transfer. Third, despite the strategic importance of
reverse knowledge transfer and global competence creation, research in this space has frequently been built on implicit assumptions or made empirical choices that limit its generalizability to all companies and all industries. Although the theoretical perspective put forth in past work is broadly concerned with global competence creation as well as knowledge creation and transfer generally, the empirical models and assumptions tend to focus on technical, technological, or scientific competencies or knowledge. By connecting reverse knowledge transfer and reverse innovation under a general perspective of global competence creation, we believe we provide a framework that allows all firms to appreciate the global competence creation imperative.

This study is organized as follows. First, we begin by delineating how reverse innovation is different from but related to both frugal and disruptive innovation. Second, drawing on literature on MNEs, we highlight critical structural components for reverse innovation to work will be explained. Finally, in our discussion, we highlight some the implications of our global competence creation framework including industry differences that affect MNEs focus on reverse knowledge transfer and reverse innovation.

**WHAT IS REVERSE INNOVATION?**

Govindarajan and Ramamurti defined reverse innovation as “an innovation adopted first in a poor country before being adopted in rich countries” (2011: 191). As noted earlier, it is counterintuitive and relatively new innovation pattern and consequently there is still some ambiguity around terminology and definitions. In addition, past research and discussion has focused on the most extreme examples of reverse innovation that are both frugal and disruptive and we lack a comprehensive set of examples to help us clarify the boundaries and relationships between reverse innovation, frugal innovation, and disruptive innovation. While
we acknowledge that there is some overlap among the three concepts, fundamentally they are not the same and none of these concepts are necessary nor sufficient to explain or encompass any other concept. Ultimately, it behooves us as academics to clearly define the three concepts in such a way that we can comprehensively describe and distinguish the range of relevant real world phenomena.

The first term to explore is frugal innovation. Frugal innovation is also known as resource constraint innovation (Ray & Ray, 2010), in which the use of material and financial resources is minimized to reduce costs while fulfilling certain predefined criteria of acceptable quality standards (Yamin & Otto, 2004). Thus, frugal innovations are known as good-enough products that serve the bottom of the pyramid (BOP) (Prahalad, 2010). However, more recently, Bhatti (2012) defines frugal innovation as innovation that looks to create value for underserved, frugal markets. This conceptualization focuses not only on affordability, but also on need fulfillment in these markets. A prominent, award-winning example of frugal innovations would be ChotuKool, a battery-powered refrigerator (Tiwari & Herstatt, 2012). ChotuKool is equipped with a battery or an inverter to help deal with the erratic power supply in many parts of India. The manufacturer of ChotuKool, has reduced the number of product parts in order to increase reliability and simplify repairs and eliminated the freezer (Singh, Gambhir, & Dasgupta, 2011), in order to bring costs down to 50% of the next entry-level fridge (Tiwari & Herstatt, 2012). Another example would be Deer & Company’s tractor developed especially for the Indian market and described extensively in the book Reverse Innovation (Govindarajan & Trimble, 2012). When entering the Indian tractor market, Deer initially struggled mainly because it attempted to exploit existing products sold in the U.S. without understanding of specific local consumers’ needs. Deere radically
transformed their strategy by redesigning the tractor from scratch to meet the special needs of the Indian market. In this case, it was performance and not cost where Deere had fallen short—Indian consumers demanded more reliability and durability than western customers (frequent so called ‘hobby farmers’) who used the same sized tractors (Govindarajan & Trimble, 2012).

Conceptually frugal innovation and reverse innovation seem orthogonal, however, in many cases, frugal innovation is a precursor to reverse innovation and this fact has led to the confounding of terms. When an innovative product or service is developed specifically for emerging markets (frugal innovation) it is frequently different than any products that exist in developed markets. Thus, if a value proposition can be identified in developed markets for this frugal innovation then the innovation may flow back as a reverse innovation. However, in our discussions with R&D companies we also came across examples of reverse innovations that were not based on frugal innovations. One such example is Colgate Plax Fresh Tea which was originally developed to meet the taste preferences of Chinese consumers who did not like the spearmint burning sensation but instead preferred the flavor of tea. The product was later brought back to developed markets because similar preferences existed in the West. This product is not a frugal innovation—it was not developed to offer any value specific to frugal, emerging markets nor was it developed to reduce costs. Nevertheless, it was developed and first sold in an emerging market and consequently adopted in developed markets, thus making it a reverse innovation. In addition to examples of reverse innovation that are not frugal there are many examples of frugal innovations that do not reverse. Take for example the Chotukool refrigerator identified previously. It is unclear if that product will ever leave India and target developed markets. Indeed, we can reasonably
assume that most innovations developed specifically for emerging markets will never ‘reverse’ and flow back to the west simply based on the vast amount of these emerging market, frugal innovations that have been developed historically.

The second term to fully explore is disruptive innovation. Disruptive Innovation refers to “A successfully exploited product, service or business model that significantly transforms the demand and needs of an existing market and disrupts its former key players” (Thomond & Lettice, 2002:4). The term ‘disruptive innovation’ originally referred primarily to technological innovation but has since been more broadly applied to include products and business models (Markides, 2005). One of the classic examples of disruptive innovation would be a transistor radio. In 1955, Sony introduced the first battery-powered, pocket transistor radio (Chieh, Dan, & Hin, 2007). Although the earliest version of a transistor radio actually offered worse sound quality than existing tabletop radios, it was hit among teenagers who valued its portability (Yu & Hang, 2008). Over time the sound quality for transistor radios improved and they eventually displaced big furniture radios.

Again disruptive innovation seems conceptually distinct from both frugal innovation and reverse innovation. However, reverse innovation is frequently assumed to be disruptive (or potentially disruptive) and it is unclear if most scholars would acknowledge that many frugal innovations are only disruptive in local markets. Again although some of the most prevalent examples of frugal or reverse innovation are disruptive this does not always need to be the case. One of the most discussed cases of reverse innovation is GE’s portable ultrasound machine (e.g.,Immelt et al., 2009). In 2002 GE was losing market share to a Chinese competitor who marketed a lower-cost, software-based ultrasound machine. GE responded by turning its full attention to developing a software-based, cheap, portable, easy
to use machine which was more suitable for local demand. This now classic example fits into
the standard frugal to reverse to disruptive innovation paradigm—The GE ultrasound started
as a frugal innovation custom tailored to local market needs and low price demands, it’s
novel technology made it attractive in developed markets, and its radically lower price point
and portability allowed it to disrupt both the emerging market where it got its start as well as
the global markets it has now entered.

However, ultimately disruption is an outcome—it takes time for disruption to follow
the launch of innovations. We cannot assume that a product will be disruptive before it
proves itself to be. Take for example the invention of the MP3 player and digital music
store—in 1979 by UK inventor Kane Kramer (Samsonowa, 2012)—disruption was still
decades off when these radical concepts were patented. Thus, unlike the GE ultrasound case
many other examples of frugal or reverse innovation have not yet had a chance to disrupt
global markets (if indeed they ever will). A currently evolving example of this might be
Adlens, a company focused on creating variable focus eyewear. The idea originated as self-
adjusting eyewear that did not require a prescription or doctor visit and readily solved vision
problems in underserved populations like Africa. Only recently has Adlens started to look at
opportunities for variable focus lenses in developed markets. Although they envision that
these variable focus lenses will replace progressive lenses—a significant disruption—this has
not yet occurred. Looking back at a couple of our previous examples we see a similar
unanswered question. ChotuKool has dramatically transformed the price point for
refrigerators in India and thus can be considered disruptive. However, the Deere tractor,
although a competitive offering, did not truly transform the tractor landscape in India. Finally,
the green tea flavored mouthwash from Colgate—will it disrupt mouthwash markets in the
west? Unlikely. Based on the argument above, we propose:

*Propositions1: Frugal innovation is more likely to lead to reverse innovation, and reverse innovation is likely lead to disruptive innovation.*

The examples discussed are visualized in figure #1.

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Insert Figure 1 about here.

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**STRUCTURAL REQUIREMENT OF REVERSE INNOVATION**

As noted previously, there is very little theoretical rigor in the current discussion of this concept. Since we have virtually no theoretical frameworks to rely on in reverse innovation literature, we decided to look more broadly for other domains that we might draw knowledge from in order to understand reverse innovation. An important insight that guided us as we moved forward was the similarities between strategically mandated frugal or reverse innovation subsidiaries like the one at GE and a somewhat more familiar subsidiary form: the so-called Skunk Works (Wolff, 1987) or advanced R&D lab. In both cases, strategic mandates and support from top management created unique situations that enabled the groups to work autonomously and develop radically new technologies or products from a blank slate, free from excessive constraints. These technologies or products went on to become core competencies of MNE and thus, in both cases, represent a relatively rare example of non-HQ-based core competence creation. This led us down the path to consider the similarities between exploration or competence-creation focused R&D labs and subsidiaries successful at
frugal or reverse innovation. Obviously in the case of the advanced R&D lab the purpose is the creation of novel technologies while the goal of the frugal/reverse innovation centers are consumer products, however, we propose that the structural requirements for setting up successful versions of each subunit are very similar. Our ultimate goal in exploring the structural conditions of successful exploration is to understand more about the necessary conditions for reverse innovation. However, we believe that this also sheds light on more fundamental and generalizable structural requirements for global competence creation.

**Reverse Knowledge Flows & Reverse Innovation**

Literature suggests that subsidiary competence development is associated with competence development in the overarching MNE organization (Cantwell & Piscitello, 2000; Holm & Sharma, 2006) since competencies created and developed at subsidiaries contribute to the accumulation and extension of competencies of the MNE. Indeed, a substantial portion of the competitive advantage possessed by MNEs lies in reverse transfer of knowledge and other competencies from subsidiaries to MNE headquarters. In this perspective, subsidiaries develop and possess knowledge of their own by tapping into diverse local knowledge situated in regional knowledge clusters or host countries (Holm, Holmström, & Sharma, 2005). Thus, reverse knowledge transfer from a subsidiary to the parent is one of ways MNEs create and develop the foundations for their next generation of innovation. As Zhou and Frost (2003:4) puts it: reverse knowledge transfer is “a realistic and perhaps even necessary ‘stepping stone’ in the evolution of the multinational toward a true distributed innovation network.” Similarly, Subramaniam and Venkatraman (2001) argue that the capability to develop new transnational products has significant implications for the competitiveness of MNEs and depends on how proficient MNEs are in transferring and applying knowledge created in subsidiaries located
abroad.

If we conceptualize reverse innovation as an example of reverse knowledge transfer (Håkanson & Nobel, 2001), it has the benefits of placing both under the broader umbrella of MNEs global competence creation. At some level, it seems exceptionally obvious to connect these concepts; however, this has not been done before except in passing (Holm & Sharma, 2006) and so requires further discussion. In the following sections we discuss past frameworks for identifying subsidiary roles and use these frameworks to identify the structural requirements necessary to enable reverse knowledge flows and reverse innovation. We tie these concepts together via our review of past literature as well as examples from past publications and examples gleaned from our conversations with MNEs.

**Subsidiary Role Literature**

One of the classic articles on knowledge flows within the MNE is Gupta and Govindarajan (1991) work on subsidiary roles. They suggest that a subsidiary role in the MNE is reflected in the magnitude (i.e., the extent to which subsidiaries engage in knowledge transfer) and direction of knowledge flows (i.e., knowledge inflows from the parent/MNE HQ and knowledge outflows from a subsidiary to parent/MNE HQ or other subsidiaries) and propose four generic subsidiary roles: global innovators, integrated players, implementors and local innovators. Building on this research, a number of other researchers have provided similar typologies of subsidiaries; for instance, Birkinshaw and Morrison (1995) suggest a three-fold typology of subsidiary roles-i.e., world mandates, specialized contributors, and local implementers—again based in part on knowledge flows to and from parent. Another perspective has emerged as MNEs’ strategic emphasis shifts from exploitation to exploration. This perspective emphasizes the importance of a third type of knowledge flows-i.e.,
knowledge inflows from host country or regional cluster to a subsidiary (Mudambi, 2002). These inflows to the subsidiary are critical since they enable subsidiaries to import or create new knowledge or competencies and thus expand the capabilities of the MNE.

We consider these three types of knowledge flows as structural elements that affect the ability for a subsidiary to engage in reverse knowledge transfer, reverse innovation, and more generally global competence creation. Despite the prevalence of these various knowledge flows in subsidiary roles and global competence creation literatures, perspectives have rarely if ever integrated these three knowledge flows in a single model. For example, the earlier models of Gupta and Govindarajan (1991) and most follow-on research that has relied on their perspective implicitly assume that subsidiary knowledge creation (implicitly knowledge inflow from host country) and reverse knowledge transfer back to parent co-occur. However, there are ample examples in which subsidiaries create a great deal of new knowledge and this knowledge is blocked from being transferred back to the parent. For this reason, we discuss these three types of knowledge flows within MNEs and highlight the positive/enabling and negative/constraining aspects of each on reverse knowledge transfer and reverse innovation. A visual that combines these three types of knowledge flows and relevant subsidiary roles from past literature is provided in Figure 2 and is discussed in the following sections.

Insert Figure 2 about here.

Knowledge Inflows from MNE to Subsidiary
The first type of knowledge flow we will discuss is knowledge inflows from the parent. This is historically prevalent knowledge flow where the MNE exploits its valuable intangible assets and capabilities (Buckley & Casson, 1976)—for example, its knowledge (Mudambi, 2002)—into a host country using the subsidiary to gain access to local markets (Birkinshaw & Morrison, 1995). ‘Implementors’ or ‘specialized contributors’ are the labels used in various literature streams to represent this type of subsidiary; implementors are subsidiaries which engage in little knowledge creation of their own and rely on knowledge inflows from either the parent or peer subsidiaries (Gupta & Govindarajan, 1991:774). Similarly, specialized contributors are the ones which have considerable expertise in certain specific functions, but their activities are tightly coordinated with the activities of other subsidiaries (Birkinshaw & Morrison, 1995:734). These types of subsidiaries are important to MNEs achieving economies of scale since they help distribute MNE’s products globally. From the exploitation perspective, thus, high level of knowledge inflows from the parent to the subsidiary are critical since subsidiaries must be able to duplicate MNE technology, processes, or sales/marketing efforts in order to exploit relevant capabilities and knowledge in the local context. However, high level of knowledge flows from the parent can also substantially restrict the scope of subsidiaries value-creating activities by narrowing a subsidiary’s views and perspectives until they are very similar to the parent’s. The concept of “knowledge rigidity” seems relevant here. Knowledge rigidity refers to “unbalanced dependence on specific knowledge and an invisible force inducing the firm to hold and use specific knowledge for quite a long time” (Zhou & Chen, 2011:822). That is, a high dependence on specific knowledge may reinforce the rigid knowledge structure of the firm, thus making hard for such firm to conduct new knowledge generation activities. Being closely tied or sharing a great deal of knowledge with the parent thus is likely to reduce
autonomy and global competence creation potential for a subsidiary, limiting subsidiaries’ ability to explore or create new knowledge.

Looking back to the examples that we highlighted as motivation for our assessment—both skunk-works style advanced R&D labs and mandated reverse innovation subsidiaries are given substantial autonomy and approach problems from unconstrained/‘blank slate’ perspectives. Focusing on decision making process, subsidiary autonomy means freedom, self-determination, strategic independence, and minimal interventions from headquarters that collectively helps the subsidiary develop business initiatives in new, unconstrained directions. Ultimately, knowledge creation can only occur at a subsidiary if they are given some level of autonomy to explore new ideas. For example, Mudambi, Mudambi, and Navarra (2007), found that self-determination on outputs such as product development positively leads to knowledge generation in R&D subsidiaries. Thus, consistent with past literature, we propose:

*Proposition 2: Knowledge inflows from MNE/HQ will reduce the amount of subsidiary knowledge creation.*

It has been shown that higher levels of autonomy may be associated with higher levels of responsiveness, market, product and value-added scope by expanding subsidiaries’ flexibility (Taggart, 1997). Indeed autonomous subsidiaries are more likely to react appropriately to the pressures of local conditions when given the freedom to experiment with novel solutions and to develop them into marketable and effective innovations that leverage their own technical and managerial resources (Birkinshaw & Hood, 2000).

The examples we see of frugal innovation seem to tell a similar story. Frugal innovation can only arise when new products are created from blank slate in the subsidiary.
Creating such innovations lies at the heart of local subsidiary’s responsiveness to the unique opportunities in its operating environments. If a subsidiary is overly constrained by the perspectives of its headquarter regarding market needs or product features, it will never be able to develop truly new products that have the potential to flow back to the rest of the MNE as reverse innovations. For example, both Deere’s & GE’s earlier emerging market failures occurred at a time when the products marketed were constrained by the MNEs’ preconceived notions of what those products should look like. Following this, local subsidiaries were given autonomy to develop new products from scratch and came up with substantially different frugal innovation that, at least in the case of GE, represented a new, disruptive global paradigm for that product category.

The examples from reverse innovation help us consider a broader and more nuanced conceptualization of autonomy. It seems that subsidiaries can have either business autonomy or technological autonomy, or both. In a subsidiary context, business autonomy means that subsidiaries are able to develop their own products or services to respond to specific local market needs, while technological autonomy means that subsidiaries develop their own technological capacity through the interaction with local technological ecosystems (Adler, 1986). We argue that, in case of frugal innovation, business autonomy may be more salient for subsidiaries than technological autonomy on the grounds that reverse innovation requires the freedom to develop products from the scratch and not to be constrained in their conceptualization of customer needs or product features (Immelt et al., 2009). Taken together, the degree of such freedom possessed by any particular subsidiary would enhance possibilities of developing highly promising products and/or solutions for emerging-market consumers—i.e., frugal innovations. Thus we propose:
Proposition 3: Knowledge inflows from MNE/HQ (particularly market/product knowledge) will decrease the amount of subsidiary generated frugal innovations.

However, subsidiaries’ autonomy would reduce possibilities of reverse knowledge transfer and reverse innovation but increase disruptive innovation since it may increase a potential for so-called Schumpeterian novel combinations (Nootboon, 2000). Continuous experiments with new ideas increase the likelihood of generating radically new knowledge, products, or solutions to the MNE, which in turn increases the chance of disruptive innovation. However, such radically new knowledge or products may limit the chance of being transferred back to the parent due to the dominant logic of the MNEs, a tendency to stay within the trajectory of the current knowledge or competencies (Yamin & Andersson, 2011). In support, Mudambi (2011) argues that if subsidiaries’ innovation is too radical, it is less likely to be leveraged by the MNE. Conversely, significant amount of knowledge inflows from the parent may increase the chance of reverse knowledge transfer (Håkanson & Nobel, 2001), and reverse innovation. Thus, we propose:

Proposition 4: Knowledge inflows from MNE/HQ will decrease the amount of subsidiary generated disruptive innovations.

Proposition 5: Knowledge inflows from MNE/HQ will increase the amount of reverse knowledge transfers from the subsidiary (holding subsidiary knowledge creation constant).

Proposition 6: Knowledge inflows from MNE/HQ will increase the amount of subsidiary generated reverse innovation.
Knowledge Inflows from Host Country

The second type of knowledge flow we will discuss is knowledge inflows from the host country or local region in which subsidiary operates. Subsidiaries that exchange a great deal of knowledge with their local environment are said to be ‘externally’ or ‘locally embedded’ (Andersson, Björkman, & Forsgren, 2005). These subsidiaries work through close and extensive relationships with local market actors (Andersson, Forsgren, & Holm, 2002) and thus have a better chance to identify new knowledge in their local environment (Lane & Lubatkin, 1998), to absorb new locally available knowledge (Hansen, 1999), to identify new and useful knowledge combinations based on local knowledge (Cantwell & Mudambi, 2011), and to create new knowledge (Andersson et al., 2005).

One of the most well developed research streams in this space deals with the concepts of clusters. Since Marshall (1890), the concept of economic clusters has been one of the major topics in economic geography, urban studies, industrial economics, and international business. The fundamental driving forces for geographic agglomeration/collocation include shared infrastructure and resources, spillover effects through localized learning, knowledge sharing, vertical supply chain linkages, and spin-offs from successful firms as well as related local entrepreneurship (Glaeser, Kallal, Scheinkman, & Shleifer, 1992). Most recently, a large body of literature has focused more specifically on the knowledge aspects of agglomeration economies based on the recognition that learning and knowledge transfer is geographically localized (Storper & Venables, 2004) since tacit knowledge requires frequent rich communication and interactions in order to be transferred (Polanyi, 1997). This literature has highlighted the importance of knowledge externalities, spillovers, or exchange as a critical positive impact of agglomeration and locating in clusters (Autant-Bernard, 2001).
Thus consistent with past literature we propose:

*Proposition 7: Knowledge inflows from host country will increase the amount of subsidiary knowledge creation.*

Research on clusters is frequently predisposed to focus on technological knowledge and to implicitly base its arguments on the spillovers of technical knowledge. For example, R&D investment has been examined as a determinant of subsidiaries learning potential or absorptive capacity within local clusters (Cohen & Levinthal, 1990; Van Den Bosch, Volberda, & De Boer, 1999) and factors like technological advantage have been examined as determinants of clustering behavior (Alcácer & Chung, 2007). Indeed, past research has suggested that R&D, and to a lesser extent production, are more likely to benefit from knowledge spillovers and specialized labor pools while sales/marketing are more vulnerable to competitive pressures due to saturated markets (Alcácer, 2006). However, as we have highlighted reverse innovation is largely dependent on market knowledge and thus requires a somewhat different form of local embeddedness in the form of a deep understanding of the specific markets and customer needs. Subsidiaries that are deeply embedded in local markets have more chance to create innovation for the specific markets thanks to their enhanced ability to be locally responsive. In all the cases of reverse innovation we observed, local subsidiaries maintained close relationships with customers, suppliers, and distributors. To meet the specific local consumers’ needs, MNEs frequently created special cross-functional new product development teams which consisted mostly of local scientists, engineers, 

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1 Note that knowledge inflows from subsidiary to location is part of spillovers (Mudambi, 2002), representing the fourth type of knowledge flows. In fact, this is one of ways to evolve local knowledge ecosystem, thus important in its own, but we exclude this since our focus, in this paper, is MNE.
marketing personnel, and product designers. The utilization of local talent is important in order to effectively and efficiently translate local needs into final products. In addition, despite the natural embeddedness that local teams benefit from, these teams still spend significant time interacting with consumers during the design process. For instance, Phillips, a diversified Health and Well-being company, sought to understand how their products were actually used under specific local conditions in emerging markets. By observing local doctors at work, it found out that its bedside patient monitoring system was used not only as a display device but also as a writing pad that was carried around and even taken into operating rooms where it was exposed to sweat and blood, a scenario unimaginable in Western hospitals (Govindarajan & Trimble, 2012). As seen, the frequent interaction with consumers enhanced the chance for a subsidiary to develop high value-added products for local markets as consumers were actively involved in the product development process as co-designers. Thus we propose:

**Proposition 8:** Knowledge inflows from host country (particularly market/product knowledge) will increase the amount of subsidiary generated frugal innovations.

**Proposition 9:** Knowledge inflows from host country will increase the amount of subsidiary generated disruptive innovations.

Reflecting back on literatures about subsidiary roles, so-called ‘local innovators’, subsidiaries which have almost complete local responsibility for the creation of relevant know-how in all key functional areas (Gupta & Govindarajan, 1991:775), exhibit low levels of inflows from the MNE and high levels of inflows from the host country. They are tasked with developing products for local markets and are given a substantial amounts of autonomy
in doing so (Harzing, 2000). The lack of knowledge flows and consequent low level of interdependence with the MNE lead these subsidiaries to be relatively unconstrained which can lead to more new knowledge creation, frugal innovations, and disruptive innovations but also increased the chances of this knowledge being less relevant to the MNE (Schulz, 2003:442) and thus reduces the likelihood of reverse knowledge transfer and/or reverse innovation. Unlike the implementors we discussed previously, ‘local implementers’, whose role is to “adapt global products to the needs of the local market” (Birkinshaw & Morrison, 1995:734), on the other hand, require that the relevant technical knowledge be transferred from the MNE while at the same time the subsidiary needs to engage in local knowledge search, particularly regarding local markets and customer needs as well as about competitors’ offerings (Day, 1994). Despite the fact that these subsidiaries possess knowledge of local markets, they are likely more constrained in their thinking by the flow of knowledge from their parent. Indeed, the flow of knowledge from MNEs and the resultant constraint that limits the subsidiaries’ ability to fully extract and leverage local knowledge is likely one factor that makes it difficult for many MNEs to engage in frugal innovation. Thus we expect that local implementer type subsidiaries will be less likely to successfully develop frugal or disruptive innovations (see proposition 3 above). However, given the fact that there is some amount of knowledge flows from the MNE, any knowledge or innovations created are more likely to be relevant to the MNE and therefore these subsidiaries are likely to generate more reverse knowledge transfers and reverse innovations.

**Knowledge Outflows from Subsidiary to MNE**

The final type of knowledge flow we will discuss is knowledge outflows from a subsidiary to the MNE, known as reverse knowledge transfer. Past research has highlighted
the importance of internal integration of knowledge within the MNE’s networks (Subramaniam & Venkatraman, 2001). Ultimately, as we highlighted in the introduction, knowledge of innovations must flow back to the MNE in order to become an organizational capability or competence. A prototypical example of this can be found in ‘global innovators’, “fountainheads of knowledge for other units” (Gupta & Govindarajan, 1991:773) and they ordinarily act as a center-of-excellence for specific product lines (Bartlett & Goshal, 1989). These classic exploration focused subsidiaries are characterized by high levels of knowledge inflows from host country, low knowledge inflows from the parent, and high knowledge outflows to the MNE. Another type of competence-creating subsidiary is those identified as having ‘world mandates’. Such subsidiaries have worldwide or broad regional responsibility for an entire product line or business and typically have unconstrained product scope and broad value-added scope (White & Poynter, 1984). These types of subsidiaries exhibit high levels of all three types of knowledge flows. This is reflected the way world mandates achieve “decentralized centralization”—activities are centered on the subsidiary and integrated worldwide. Thus these world mandates become mini-HQs for relevant products, services, or businesses.

When it comes to knowledge flows back to the MNE, the most important factor to consider is the subsidiary’s mandate. In cases where MNEs have assigned a competence-creation mandate to a subsidiary they typically put in place the appropriate structures, including communication and reporting mechanisms (Cantwell & Mudambi, 2005) that enable reverse knowledge transfer. However, literature has shown that reverse knowledge flows can also arise as a result of subsidiary-driven entrepreneurial efforts and negotiation (Birkinshaw & Hood, 1998). In these cases subsidiaries may act outside of their mandated
roles to create valuable knowledge that they would like to share with the MNE. Past research on reverse knowledge transfer has shown that this process frequently involves a significant amount of persuasion due to the complex power dynamics and imperfect goal congruency between the parent and subsidiaries (Yang, Mudambi, & Meyer, 2008). These subsidiaries frequently engage in more informal networking efforts to increase the chance of knowledge transfer to the MNE. Indeed the strength of a subsidiary’s ties to headquarters (i.e., their internal embeddedness), or more specifically the strength of interpersonal ties to important corporate actors, is one of the most important facilitators of reverse knowledge transfer (Uzzi & Lancaster, 2003). Thus we propose (somewhat tautologically):

*Proposition 10: Knowledge outflows to the MNE will increase the amount of reverse knowledge transfer.*

Indeed literature shows that the transfer of subsidiary knowledge is often problematic due to the “core rigidities” of the parent, the rigidity tendency in core competence (Leonard-Barton, 1992). Due to core rigidities, firm’s ability is constrained from looking beyond the current competitive arena for future opportunities. Likewise, in MNE context, MNEs from developed countries are frequently entrenched in their preexisting paradigms and perspectives. They develop an organizational inertia over time as they build nearly impenetrable information filters: “Organizational attention is focused only on data deemed relevant by the dominant logic. Other data are largely ignored” (Bettis & Prahalad, 1995). As highlighted previously, frugal or reverse innovation frequently offers the potential for disruption which can require a repositioning or radical shift in product strategy for the MNE. Therefore, managers at headquarters may focus on reverse innovation’s potential to make current firm competencies and brands obsolete instead of on the potential opportunity presented by this
paradigm shift (Govindarajan & Ramamurti, 2011). We observe that organizations with successful reverse innovation examples had created mechanisms that allowed managers from across the MNE to increase the flow of knowledge from the subsidiary out to rest of the MNE. For instance, some MNEs highlighted expatriate programs, communities of practice, or other networking practices and events that bring together managers from across the MNE. In these examples, expatriates can act as boundary spanners who link groups across the global enterprise (Cross & Parker, 2004) while other types of activities that connect managers from across the enterprise can increase knowledge flows and reduce information asymmetry between subsidiaries and headquarter (Schotter & Beamish, 2011). Thus these practices increase the likelihood of recognition of opportunities for reverse innovation, build high levels of trust among relevant parties, and increase the acceptance of subsidiaries innovations (Govindarajan, 2012). A typical illustration of such mechanisms would be those of Colgate-Palmolive. With both strong global and local oriented culture, Colgate-Palmolive holds global leadership meetings on a regular basis in order to increase the visibility of R&D projects being undertaken in global subsidiaries. By slowly building shared understanding across its global R&D network they paved the way for Plax Fresh Tea to travel back to the headquarters and move to other developed markets as a reverse innovation.

Reflecting back on our discussion regarding subsidiary roles we can see that, unlike local innovators, ‘global innovators’ may be more likely to generate reverse innovation due to high, typically mandated, level of outflows to the MNE. It is also likely that these reverse innovations could be the result of frugal innovation developed for local markets if new product development is their focus instead of new technology development. On the other hand, subsidiaries with ‘world mandates’ are likely to have high levels of reverse innovation
due to their mandated role in the MNE ecosystem. However, these subsidiaries risk being constrained by high level of inflows from other parts of the MNE. If they can avoid being constrained and can approach opportunities from blank slate they can act as boundary spanners, leveraging knowledge created in the MNE and extracted from host countries, to create frugal innovations which have substantial impact in local markets as well as within the MNE as reverse innovations. Thus we propose:

*Proposition 11: Knowledge outflows to the MNE will increase the amount of subsidiary generated reverse innovations.*

**SUMMARY**

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Insert Figure 3 about here.

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Figure 3 summarizes our collective propositions. We see a number of apparent trade-offs (suppression effects) in Figure 1 and 2 which highlight potential relationships among different innovations and why frugal, reverse, disruptive innovation is so hard for MNEs to achieve respectively. What we have proposed thus far is intended to provide a foundation for additional theoretical discussion and empirical assessment. Although we have shed light on several of ‘black boxes’ relevant to these phenomenon we have effectively created a few more. The first of these involves the factors which make frugal innovation reverse and what makes frugal or reverse innovation disruptive. Fundamentally, this relates to the question of what factors lead to autonomy and unconstrained perspectives. Although we have argued that
knowledge inflows from the MNE can constrain subsidiaries perspectives and thus reduce the likelihood of generating frugal or disruptive innovation, we also argued that having these inflows might increase the likelihood of having reverse knowledge flows and reverse innovation in the future. It is quite difficult for us to argue how much constraint is optimal due to these tradeoffs/suppression effects. Further research is needed to look at factors that can create the blank slate mentality necessary while at the same time leveraging MNE capabilities in optimal ways. One example that should likely be examined are the principles of design thinking (Brown, 2008). Design thinking offers mechanisms for individuals to move beyond their own thinking to appreciate the perspectives of consumers. Another black box relates to what other factors that may lead to reverse and disruptive innovation. We here argue that knowledge flow patterns within the MNE affect the chance of reverse and disruptive innovation through different mechanisms. However, aside from such endogenous factors, we wonder what other exogenous factors would affect the likelihood of reverse and disruptive innovation. Conversations with leading MNEs reveal that they consider emerging market consumers as lead users. Lead users can serve as a need-forecasting laboratory by providing new product concepts suitable for consumers’ idiosyncratic needs in emerging markets, which in turn leads MNEs to more successfully generate reverse innovation and ultimately disruptive innovation. Furthermore, competitive pressure among MNEs in the industry can be a source of reverse and disruptive innovation. That is, if MNEs operate in highly competitive industry, they would demand more reverse innovation to engage in global competence creation. We believe these black boxes we highlighted are worthy of future study.

DISCUSSION

Global competence creation was the umbrella term that we subsumed both reverse
knowledge transfer and reverse innovation. As highlighted, reverse innovation is one form of reverse knowledge transfer, thus we discussed them in parallel in this paper. Even so, we should acknowledge that there is some dissimilarity between two. On the one hand, a great deal of work on reverse knowledge transfer almost exclusively focused on technological competence creation and transfer of technological knowledge (Aguilera, Filatotchev, Gospel, & Jackson, 2008). Few, if any, studies looked at a combination of technological knowledge and market knowledge (Frost & Zhou, 2005). Reverse innovation, on the other hand, places greater emphasis on market knowledge per se since as we can see reverse innovation is not just about tinkering with product design but about reinventing products from the ground up based on a local subsidiary’s deep understanding of the specific market and customer needs (Govindarajan, 2012). Indeed, market knowledge is critical since it can increase a firm’s ability to discover and exploit opportunities. Specifically, it helps firms to determine the market value of new scientific discoveries, technological change and the locus of innovation often lies with users of new technologies who cannot easily articulate their needs for not-yet-developed solutions to problems, and therefore the organization must share some of the same tacit knowledge as its users (Cohen & Levinthal, 1990). Indeed, research suggests that market knowledge competence, the process to generate market knowledge, as one of core organizational competencies (Hamel & Prahalad, 1994) which enhances firms’ new product advantage (Li & Calantone, 1998). Both types of knowledge seem to be important for firms whether they are technology-oriented or customer-oriented.

Discussion on two types of knowledge leads us to an unanswered question of whether clusters would facilitate the exchange of market knowledge. Our previous discussion showed that past research emphasized primarily economies of scale related to clustering as well as
technological knowledge spillovers and transfer. Indeed the primary discussion of sales/marketing parts of the value chain in past research has highlighted a crowding out effect of competition from collocation (e.g., Alcácer, 2006). However, conversations with companies reveal that market knowledge does transfer or spillover within clusters. An example of a chemical/material science MNE highlighted a number of manufacturing clusters in China which present important markets for this company and it was apparent from these discussions, that a more significant local presence would have enabled it to better track product trends and been more responsive and competitive.

Relatedly, although it is widely acknowledged that collocation is particularly relevant for tacit knowledge, international business literature has not sufficiently taken this into account when assessing the generalizability of our theory and empirical work. From the earliest phases of our IRI project it was obvious that technology development (i.e., upstream Big-R research) companies considered clusters and collocation with partners as critical aspects of their global R&D strategy. On the other hand, consumer products (i.e., downstream Little-r, Big-D, or little-d) companies simply licensed appropriate technology and had not historically taken into account clusters and regional technical centers of excellence—the technology they utilized seemed to have relatively simple interdependencies with their products and was more of a commodity and thus less tacit. Conversely, Big-R, upstream technology development companies seemed to have less to learn from discussions about reverse innovation since it was less impactful given their B2B business models and broadly applicable technologies.

Despite the similar strategic imperative and the similar structural requirements for global competence creation in general, as we have highlighted, open questions regarding
technology vs. market knowledge transfers and different implications of reverse innovation for firms in different industries or value-chains remain, hence need scholars’ attention to improve theoretical framework in the years to come.
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Figure 1. Examples of Frugal Innovation, Reverse Innovation and Disruptive Innovation
Figure 2. Knowledge Flows Patterns and Subsidiary Roles

Knowledge Inflows from the Parent
- Implementor
- The Specialized Contributor

Knowledge Outflows from a Subsidiary to MNE
- Integrated Player
- World Mandate
- Global Innovator
- Center of Excellence
- Local Implementer
- Local Innovator

Knowledge Inflows from Host Country
- ???
Figure 3. Conceptual Framework

Note: we did not include ‘constraint’ in the model for the sake of simplicity. However, some of the propositions such as P2, 3, 5, 6, 7, 8 are partially mediated by ‘constraint’.