



Affordability, sociability and the reverse knowledge flow from emerging markets

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In rapidly growing emerging markets that exhibit a significant amount of heterogeneity, innovation activities by multinational corporations undergo a substantial transformation. This phenomenon can be summarized by the appearance of frugal innovation (innovation for emerging markets) and reverse innovation (innovation from emerging markets to the rest of the world). Although each of them is discussed individually, a few studies have investigated what kind of innovation specific to emerging markets is transferred to the multinationals' headquarters. Using the communications theory, we explore the intrinsic value of the information as the main determinant of its transfer, and the aspect of frugal innovation that is valuable for multinational's headquarters. Our findings indicate that sociality determines the fundamental level of transfer, and affordability moderates it positively. We examined it with using data from innovation projects for emerging markets of Japanese multinationals.

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Introduction

This research is a study of the relationship between two trends characterizing multinational corporation's activities in emerging countries: Frugal innovation, and reverse innovation. Backed by recent rapid growth of emerging market, research attention has been focused on innovation activities in emerging countries. Furthermore, numerous researches have revealed that new types of innovation have occurred there for obtaining local markets. Those types are termed as frugal innovation (Bhatti 2013, Sharma & Iyer 2012, Zeschky et al. 2014), bricolage (Ernst et al. 2015), grassroots innovation (Brem & Wolfram, 2014), jugaad (Cappelli et al. 2010), etc. Here, we will simply coin those innovations for emerging markets as frugal innovation.

Scholars have also found that there is another characteristic of innovative activities in the emerging market. Innovation occurred at emerging markets have sometimes been transferred to the rest of the world to revolve or improve multinational corporation's strategy. Such an innovation from the emerging market is termed as reverse innovation (Govindarajan & Trimble 2013, Zedtwitz et al. 2015). Ideas from heterogeneous emerging countries would sometimes become a clue for strategic change.

Although there are many studies on both types of innovations, and sometimes scholars use these two concepts interchangeably and use them without distinction, these are different phenomena. One describes developing a new product/service for emerging markets whereas the other is the transfer of it to other areas. Furthermore, past studies haven't yet considered the relationship between them. Thus, in this study we try to make a bridge between the two concepts.

The value of our study lies in its clarification of what aspect of innovation for emerging markets can also be applicable to other regions. Here we identify two central features of innovation for emerging markets: Affordability, and sociality. We know both are important for the success in emerging markets, but we do not know which could be also important in other regions. Using the new product project data

of Japanese multinationals, this paper examines that sociality is the primary item that determines the degree of transfer, whereas the affordability is the secondary one that further enhances the impact of sociality.

Literature Review about Innovation in Emerging Markets

After recent rapid growth of emerging countries, much attention has been paid to emerging market research. Emerging markets are fundamentally different from developed markets in many respects. One of the central differences between these two markets lies in the income level (Prahalad 2005, Zeschky et al. 2014). Emerging markets are characterized by low-income, limited affordability, and strong cost-consciousness. The other typical characteristics of them is resource constraints, which means shortage and limited availability of resources (Baker & Nelson 2005). As is often the case, emerging market lacks basic facilities such as infrastructure and talented human resources. In these situations, it is difficult for MNCs to develop products which have deployed in their home developed market (Prahalad 2005). Further, emerging market are also known as institutional voids which mean the absence of specialized intermediaries, regulatory systems, and contract-enforcing mechanisms in emerging markets (Khanna et al. 2005).

As these characteristics are remarkable, not only practitioners but also scholars have started to pay attention to the product innovation that intends to adapt to emerging markets. It is no longer easy for MNCs to succeed in emerging market by simply importing their existent products or making copy of them in the emerging countries. They need to deal with it by changing the nature of their product. In fact, many MNCs have been struggling to change and localize their product development activities in the emerging market (Williamson 2010, Zeschky et al. 2014). And now both scholars and practitioners have recognized that they require significantly different nature of product innovation to capture the emerging market needs (Prahalad 2005, Sharma & Iyer 2012, Zeschky et al. 2014).

Innovation FOR Emerging Markets, Innovation FROM Emerging Markets

Reflecting those research progress, many innovation researchers seek to conceptualize these new types of innovation for obtaining emerging markets. Although there are many conceptualizations of innovation in emerging markets (Cappelli et al. 2010, Prahalad & Mashelkar 2010, Zeschky et al. 2011), we can summarize that such innovation can be characterized by affordability, sociality, and utilization of available technology (Pisoni et al. 2018).

The first character of the product innovation for emerging markets is the affordability for low-income customers (Brem & Wolfram 2014, Ernst et al. 2015). Thus, those innovations for emerging markets are often referred to as frugal innovation. The large portion of emerging markets is characterized as low income, which means customers feel difficulty in purchasing required products. Because their biggest issue is price, sometimes *good enough* innovation which means sufficiently low-cost and reliable would be effective (Ernst et al. 2015). To catch these segments, innovation needs to include a cost reduction aspect while also offering value to them (Anderson & Markides 2007, Dubiel & Ernst 2013).

The second character is social problem-solving. There are many institutional voids in emerging markets, and thus social problems often occur (Prahalad 2005). This is the reason why sometimes products which only reduce the cost of existing products tend to fail. These local specific needs are strongly related to the constraints emerging market have been confronting. As stated above, emerging countries often suffer from not only affordable constraints of customer, but also resource constraints and institutional constraints. Social innovation which provides solutions to these situations are one measure to satisfy their needs. Thus, frugal innovation has aspect of social innovation (Khanna & Palepu 2010).

The third is the utilization of existing technology. In the usual case of innovation in developed countries, technological novelty is regarded as one of the important factors to realize a valuable, unique

user experience (Eppinger & Ulrich 2015, Kahn 2012). However, in emerging markets, the use of available, existing technology by *bricolage* is rather effective in solving local problems (Ernst et al. 2015, Petrick & Juntiwassarakij 2011, Sharma & Iyer 2012). It takes less cost, less efforts, and less time than introducing sophisticated technology and it often make it easier to adapt to local situation of emerging markets.

Although these characteristics refer to the nature of innovation for capturing the emerging market, there are still other research streams which shed light on different aspect of innovation activity in emerging countries. That is called as *reverse innovation* which refers the reverse transfer of product and knowledge from emerging countries to developed market (Govindarajan & Ramamurti 2011). Ideas generated in emerging markets are often novel for developed-country multinationals, and they are sometimes applicable to other regions too (Huang & Li 2019). Thus, many MNCs now started to try to utilize innovation spawn from emerging countries to overall global operations (Malodia et al. 2020).

Although past studies have investigated more in-depth about those two features of innovation in emerging markets, there exists an important research gap: few studies have considered the relationships between frugal innovation and reverse knowledge flow (Kolk et al. 2014, Pisoni et al. 2018). As past studies indicated, because innovation FOR emerging markets has several specificities like affordability and sociality that are new for developed country multinationals, it can become the innovation FROM emerging markets that make changes in their global operation (Govindarajan & Trimble 2013, Malodia et al. 2020). Thus, we think it is quite valuable to investigate which character of innovation for emerging markets facilitates the transfer and utilization of it within the multinationals. If we can specify the nature of innovation in emerging markets that is likely to be transferred, it can result in the specification of the nature of innovation that contributes to the development of both emerging markets and developed markets in the end, which is the ultimate goal of innovation at/from emerging markets (Leliveld & Knorringa 2018). In this sense, to investigate the relationships between the nature of innovation for emerging markets and the transfer of that innovation to other areas are worth tackling for both academia and business practice.

Theory and Hypotheses

Conceptual Framework: Communications Theory

To consider the impact of affordability and sociality on the degree of knowledge transfer, we use communication theory as the theoretical framework. Communication theory regards knowledge transfer as information flow from sender to receiver (Gibson & Williams 1990, Gupta & Govindarajan 2000, Krone et al. 1987, Szulanski 1996). According to this theory, communication process is composed from mainly two different elements: the content, and the sender-receiver relation. The content of information is the chief element of communication and the value of the content for the receiver firstly determines the degree of knowledge flow from the sender to him/her. When the receiver recognizes that the information is quite important for him/her, he/she makes more effort to obtain it correctly from the sender. The sender-receiver relationship is the secondary determinant of the knowledge flow; its conditions facilitate or inhibit the transfer. When the sender and the receiver have a friendly relationship, a well-developed communication channel, or a shared value and norms, they can exchange their knowledge smoothly (Gupta & Govindarajan 2000, Tsai & Ghoshal 1998). This communication perspective of knowledge transfer is useful for our analysis. We can put the nature of innovation in emerging markets as the content of information, and the local subsidiary and its headquarter as a sender and a receiver. Then, by considering the value of the innovation for the headquarters, we can examine the impact of the nature of innovation on the degree of transfer after controlling the relationship between the local subsidiary and the headquarters.

Drawing on the communication theory, we develop a model that the nature of innovation in emerging markets determines the level of transfer from emerging market. As explained above, we can

define the characters of innovation in emerging markets by three items: sociality, affordability, and the utilization of available technology as depicted in Figure 1.

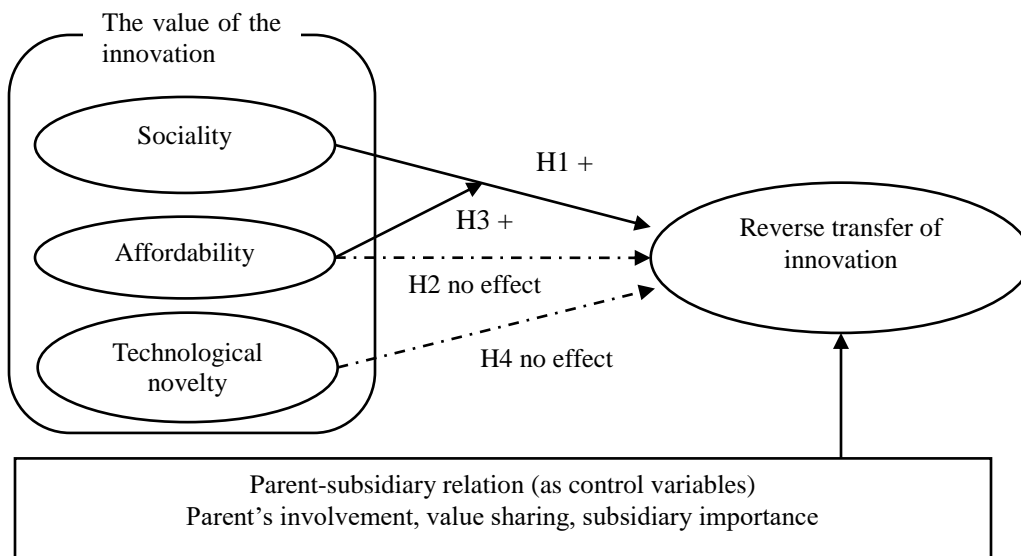


Figure 1. Hypothesized Model of the Frugality and Reverse Transfer of Innovation

We consider the effect of chief characteristics of innovation in emerging markets - affordability and sociality. As explained above, both features enhance the possibility of successful innovation in emerging markets. Affordability helps the product to reach a large number of customers (Anderson & Markides 2007, Dubiel & Ernst 2013, Lee et al. 2011) and sociality captures the essential needs of people: it contributes to solving local social problems that people face (Prahalad 2005). Both are effective from the viewpoint of marketing for emerging markets, but given a good thought, there is a decisive difference between the two. That is, the sociality, social problem-solving is the essential value for the customers, and the affordability is the means to make that value reachable to more customers.

We assume that the sociality is the chief value of the innovation in emerging markets. Fundamentally, innovation is the problem-solving for the customer (Eppinger & Ulrich 2015). In that sense, the product that improves the situation of the customer who faces the serious social constraints or problems should be inherently the central activities of the company located in emerging markets. Further, if the company tries to apply that innovation to other markets than the original one, the key issue must become the value for the customer of that area. Whether the product can be accepted or not is determined by the level of problem-solving for the customer. In fact, some researchers strongly claimed that these social aspects of innovation, providing radical solutions to pressing needs of society, is critically important for frugal innovation (Brem & Wolfram 2014, Prahalad & Mashelkar 2010).

Social innovation would be also important for enhancing reverse activity from emerging countries to developed countries. As London & Hart (2004) points out that it is not a rare occasion that social and environmental issues are common in both emergent and developed counties. The commonality of the social problem is not the only reason for the importance of emerging market in sociality of innovation. Emerging market, especially bottom pf the pyramid (BOP) segment is a source of breakthrough (Prahalad 2012). As this segment confronts the pressing social needs, it provides abundant opportunities for experimentation. If the innovation meets the requirement of base of pyramid in emerging counties, it is possible for MNCs to provide solutions to some of the developed countries' most pressing social and environmental problems. According to these arguments, if the product innovation entails social nature,

the value of it would increase for MNCs to introduce it to the developed market. Thus, we can hypothesize as follows:

H1. The level of sociality of a new product have positive association with the degree of reverse knowledge flow toward the headquarters.

Next, affordability is not the central value of the innovation but the supplemental element that makes customers accessible to the product. Because the emerging markets are characterized by low-income, the affordability of the product often becomes important factor of success (Anderson & Markides 2007, Dubiel & Ernst 2013, Lee et al. 2011). But in terms of the possibility of reverse transfer to headquarters, we can assume that the affordability itself does not heighten it. This is because the affordable innovation is not always valuable for the developed market. One reason for this is related to sources of affordability. The nature of low cost is sometimes rooted on locally-embedded sources such as low cost of resources and workforce in emerging market. In these situations, the reproduction of these low cost is difficult in developed countries. Similarly, Arslan et al. (2016) proposed that locally-embedded knowledge is difficult for reverse knowledge transfer because of its relevance and stickiness. These low-cost sources are stick to local context and sometimes irrelevant to developed markets. Thus, affordability of innovation itself would not be valuable for headquarter of MNCs. This leads to decreasing the possibility of reverse transfer. Thus,

H2. The level of affordability of a new product is not associated with the degree of reverse knowledge flow toward the headquarters.

Even while affordability singly cannot be regarded as valuable to transfer to headquarters in the developed country, we can assume that affordability enhances the value of social product, and thus it acts as a positive moderator between sociality and the level of transfer to headquarters. If the product that tackles the social problem becomes more inexpensive, the more customers can enjoy that benefit (Bhatti 2013). In other words, cheaper social innovation is more likely to be accepted and adopted in more places. As a result, it can be more powerful in solving social issues in the world (Cappelli et al. 2010, Govindarajan & Ramamurti 2011). Although affordable products can be just cheap goods in developed market, the affordable and social products do provide smart solutions to social problems. Thus, we can assume that the headquarters of multinational corporations recognize the affordable social products and transfer them to several markets because it has greater potential to solve social issues. Based on above discussion, we can be hypothesized as follows:

H3. The interaction of the level of affordability and the sociality has positive association with the degree of reverse knowledge flow toward the headquarters.

Finally, we consider the technological aspect. A quite wide range of technology is available in product innovation in emerging markets, from bricolage to a very sophisticated one. A bricolage often brings a good result because it can solving problem in an inexpensive way (Cappelli et al. 2010, Ernst et al. 2015). On the other hand, novel technology sometimes can also achieve low cost solution even in poverty areas. As Zeschky et al. (2014) show, innovations that introduce new technology, new product architecture, or novel use of existent technology sometimes enable entirely new applications at much lower price points than existing solutions. To summarize, both obsolete and novel technology can be valuable for emerging markets as long as it improves the customer's quality of life. In other words, the essential value of the new product developed in emerging markets does not lie in the way of problem-solving (technology), but the outcome of it (sociality).

From the headquarters' point of view, if a new technology is successfully introduced into the market, they are likely to have a motivation to expand it to other countries. However, it is equally meaningful for headquarters to be able to meet new market needs with existing technology. Given these aspects, it can be said that the both advanced technology products and the obsolete technology ones are meaningful to transfer; however, it is not clear which one should be given a priority. Thus, we can hypothesize as follow:

H4. The level of technological novelty of a new product is not associated with the degree of reverse knowledge flow toward the headquarters.

Methodology

Sample and Procedure

We collected data through a questionnaire survey mailed during January-September 2017. We chose Japanese overseas subsidiaries located in emerging markets as defined and listed in both International Monetary Fund (2016) and Standard & Poor (2017). Among the countries corresponding to this IMF's and S&P's classification, we did a random sampling from the *Toyo Keizai* Overseas Japanese company database 2016 (Toyo Keizai 2016) to develop a mailing list, which is often used for surveys of Japanese companies (Delios & Henisz 2000, Nakagawa et al. 2017, Nakamura et al. 1996). We focused on the manufacturing sector because some of our questions about the development project can be applied only to manufacturing like production cost or product engineering (Eppinger & Ulrich 2015).

Our unit of analysis is the new product development project held in that subsidiaries that targeted its local market. Following Ernst et al. (2015), we adopted a two-stage sampling procedure to measure the performance and project management approach correctly to avoid the risk of common method variances (Podsakoff et al. 2003). We made two questionnaires, one for senior managers who can assess the consequences of the new product, and another for project managers who know the actual situation of the development project.

Table 1. Sample Characteristics

Company Profile				Project Profile			
Country	Industry	Established Year	Project Duration (Months)				
Thailand	10	Chemical	13	1960s	1	1 - 6	17
China	7	Electronics	13	1970s	7	7 - 12	15
Indonesia	6	Machinery	10	1980s	5	13 - 18	4
Vietnam	6	Automotive	8	1990s	25	19 - 24	10
Brazil	5	Metal	4	2000s	14	25 - 36	5
Taiwan	5	Daily Consumer	4			37 - 48	1
Malaysia	4	Goods		Employees			
India	2			30 - 99	9	Project Participants	
Mexico	2			100 - 299	14	1 - 4	17
Philippines	2			300 - 499	9	5 - 9	12
Czech	1			500 - 999	13	10 - 19	15
Hungary	1			1000 - 1999	5	20 - 49	5
Pakistan	1			2000 - 4000	2	50 - 200	3

n=52

At first, we mailed questionnaires to 1159 subsidiaries of Japanese corporations in emerging markets as defined above. They were written in three languages: Japanese, Chinese and English and were sent to the presidents or other top-level representatives of the foreign subsidiaries. Strict confidentiality was enforced

to minimize the pressure for providing correct answers. After sending several reminders, we received responses from 167 (14%) companies and 155 (13%) out of them were available. The net response rate of 13% is considered excellent compared to the usual response rates of from 6% to 16% in international surveys (Harzing 1997). Among available 155 responses, 52 companies answered that they did at least one new product project in the past five years. Thus we used those 52 responses as our sample. As past studies reported (Anderson & Markides 2007, Brem & Wolfman 2014, Laperche & Lefebvre 2012, Zedtwitz et al. 2015). Many MNCs from developed countries still did not place a new product development function in emerging markets (now they were starting). Based on those reports, the result that about one third of all responses carried out new product development seemed reasonable. Table 1 reports sample characteristics.

Measures

Dependent Variable

Reverse knowledge flow. Based on the past studies (Brem & Wolfman 2014, Govindarajan & Trimble 2013, Gupta & Govindarajan 2000), we developed a measure for *reverse knowledge flow* that consists of three items: (1) transfer of the product itself to the parent company, (2) transfer of some technologies or partial design to the parent company, and (3) transfer of know-how to realize new product effectively. We asked those questions to the subsidiary top managers and they answered on a seven-point scale ranging from 1 being *not at all* to 7 being *a very great deal*. The scale has a Cronbach's alpha 0.78, indicating a reliable internal consistency.

Independent Variables

The nature of a new product. As we discussed before, the features of innovation for emerging markets could be described by three dimensions: Affordability, sociality, and technological novelty (Brem & Wolfman 2014, Hossain 2016). Although there is no established scale for them, we originally developed it based on the existing conceptual, case-based and statistical studies. We asked project managers to rate the project's objectives on six questions: (1) To decrease manufacturing cost, (2) to lower product price compared to the competitor's product, (3) to solve local social problems, (4) to respond to local societal need, (5) to introduce sophisticated technology, and (6) to improve product technical specifications.

The first and second questions are about the *affordability*. Based on Govindarajan & Trimble (2013)'s case-based discussion and Ernst et al (2015)'s statistical operationalization, we asked how the project targeted to lower the cost to make it affordable and beneficial to the lower-income segment. The third and fourth questions are for estimating the degree of *sociality*. Drawing on the conceptual works of Brem & Wolfman (2014) and Bhatti (2013), project managers were asked to provide to what extent his/her project targeted local societal problem or specific need. Finally, in the fifth and sixth questions, we asked the degree of *technological novelty* because it represents a style of problem solving ranging from bricolage or jugaad to newly-developed technology-based solution (Brem & Wolfman 2014, Ernst et al. 2015). We used the average number of correspondent items as the score of *affordability*, *sociality*, and *technological novelty* to zero. All variables are mean-centered to avoid the occurrence of multicollinearity in investigating interaction terms.

In order to check the discriminant validity of those constructs, we executed confirmatory factor analysis (CFA) for all six items of project objective questions. As a result, we obtained satisfactory model fit: $\chi^2/df=7.61/6$ ($p=.26$), RMSEA=.07, and CFI=.97. Furthermore, as for internal consistency, the values of Cronbach's alpha were .68 for frugality, .75 for sociality, and .71 for technology. Hence we confirmed our measures can properly grasp the three dimensions of a new product project objective.

Control Variables

Following communications theory (Krone et al. 1987), the content of knowledge and the condition of

channel are the key determinants of knowledge flow between a sender and a receiver. Thus, to estimate the influence of the types of product innovation on the degree of transfer, we need to control the condition of the channel.

Parent company involvement (parent involvement). We assume that the critical determinant of the communication channel condition is the direct linkage between sender and receiver (Krone et al. 1987). Regarding the new product project held in the foreign subsidiaries, it can be captured by the extent of collaboration in development process with its parent company. Thus we measured the degree of parent involvement in that project as the indicator of the direct channel condition. Drawing on the standard process of new product project in manufacturing sector (Eppinger & Ulrich 2015), we asked project managers in local subsidiaries about the degree of participation of parent company in each project phase: (1) concept development, (2) determining product features, (3) product engineering, (4) manufacturing engineering and preparation and (5) market launch strategy. Responses were received on a five point Likert scale ranging from (1) Not at all (subsidiary developed solely) to (5) parent company developed alone, based on the past studies (Nohria & Ghoshal 1994, Roth & Morrison 1992). A Cronbach's alpha of .91 is obtained for this scale.

Socialization. Sharing the same organizational culture between parent company and its subsidiaries, namely organizational socialization improves the quality and quantities of communications (Gupta & Govindarajan 2000). When people share the same culture, they feel a sense of unity and it fosters reciprocal communication and knowledge flows (Li 2005, Tsai & Ghoshal 1998). Following those previous studies, a five-item construct was formulated to capture the degree of socialization. The items were: (1) shared mission and vision; (2) the same organizational culture as the parent corporation; (3) the same business practices as the parent corporation; (4) the similar way of doing business to the parent corporation; and (5) the same rule and policies as the parent corporation. These items were assessed on a seven-point Likert scale (1=strongly disagree, 4=Neither agree nor disagree, 7=strongly agree). A high score means that the focal subsidiary has the same organizational culture as the parent corporation. A Cronbach's alpha value of .91 was obtained for this scale.

Subsidiary importance. The quality of communication was determined by the cognitive importance of the counterpart. If a person recognizes his/her counterpart has an important information for his/her own success, he/she carefully listen to what that counterpart says (Krone et al. 1987). Thus, we operationalized subsidiary importance as recognized by its parent company by five items: Sales, profit and loss, future business expansion, capability building and president's overall evaluation, following Rugman and Verbeke (1992). They assessed overall multinational corporation management on a five-point Likert scale (1=Not important at all, 5=Very important). A Cronbach's alpha value of .82 was obtained for this scale.

To calculate the effects of those variables based on communications theory, we controlled the effect of *subsidiary age, size, and industrial area* since the subsidiary's local experiences and its competitive environment are fundamental determinants of its behavioral pattern (Paterson & Brock 2002). We measured subsidiary size as the number of employees in thousands and age as the number of years since the subsidiary was established. As for industrial category, we used Japanese industrial classification code to classify the subsidiary's business domain (The numbers of observations are: Chemical=13, electronics=13, machinery=10, automotive=8, metal=4, daily consumer goods=4).

Measurement Assessment

We investigate common method variance issue in the questionnaire survey. Therefore, we employed two-stage sampling in which the performance indices and some control items were asked to the subsidiary president at first, then the independent variables regarding the project objective, organization and

procedure were discussed with the product project managers. In addition, within questionnaire, we introduced some inverted variables to prevent a respondent from giving answers in the unchanged atmosphere. Thus we believe common method variance is seldom likely to occur. Further, we can confirm that there is no serious risk of common method variance as evident by the Harman's single factor test suggested by Podsakoff et al. (2003). We performed exploratory factor analysis including all items of reverse knowledge flow, affordability, sociality and technological novelty. The factor analysis showed four factors with Eigen-values greater than one, and the first factor accounts for 21 percent of the total variance. That is, there is no evidence of unidimensionality in our data.

We also examine non-response bias as our response rate is relatively low though it falls into allowance range (Harzing 1999). In addition, we felt risk that poorly-performed companies tended to deny responses. To avoid that problem, we consciously emphasized that our survey was to capture the whole situation of emerging market business and new product for it, and strict confidentiality of private information while explaining our survey's objective. Further, we checked some statistics to test the bias. We collected not only product development performance data but also the company's financial performance data in order to check whether the good performer tended to respond or not. Both were asked to evaluate the three items (revenue, profit and manager's overall evaluation) on seven-point Likert scale ranging from (1=Performed very poorly, 7=Performed very well). Their averages/standard-deviation were 4.77/1.15 for newly developed products and 4.78/1.47 for the subsidiary. They show that observations do not concentrate on high performance area, and rather scattered around an average of the moderate number. In addition, we checked the sample's representativeness by comparing the value of the descriptive statistics with those of non-respondents from the population (listed in Toyo Keizai 2016), and found no significant differences among them.

Table 2. Descriptive Statistics and Correlations for Dependent and Independent Variables

Variables	Mean	SD	1	2	3	4	5	6	7	8
1. <i>Rev Knowledge Flow</i>	2.50	1.28	1							
2. <i>Affordability</i>	0	1.37	.17	1						
3. <i>Sociality</i>	0	1.60	.22	.23	1					
4. <i>Tech. Novelty</i>	0	1.18	.18	.22	.34	1				
5. <i>Parent involvement</i>	3.08	1.20	.32	.34	-.08	.12	1			
6. <i>Socialization</i>	4.55	1.22	.18	.13	.09	.33	.36	1		
7. <i>Sub. Importance</i>	4.01	.75	.27	.20	-.15	.05	.06	-.04	1	
8. <i>Sub. Age</i>	22.01	10.65	.24	.22	-.04	.04	.30	.42	.32	1
9. <i>Sub. Size ('1000)</i>	.54	.68	.14	-.08	-.01	-.01	.16	.15	.16	.14

n=52. *Frugality*, *Sociality* and *Technological sophistication* are mean centered to zero

Finally, we checked the averages, standard deviations, and correlations for all variables to confirm whether they have reasonable number or not. The results are shown in Table 2. Each variable has moderate level of averages and enough variations. The correlations also show that there is no serious collinearity among the independent variables. None correlation surpasses .5.

Results

We employed hierarchical OLS regression analysis to estimate the influences of the independent and control variables on reverse knowledge flow. The results are shown in Table 3. At first, let us look at single effect of independent variables. As for *affordability*, we cannot say that it has any significant impact on *reverse knowledge flow* ($p > .1$ both in Model 2 and 5). On the other hand, *sociality* has significantly positive

impact on it (Beta=.23, $p < .05$ in Model 3, and Beta=.24, $p < .05$ in Model 5). Regarding the degree of *technological novelty*, we cannot find any significant impact on reverse knowledge flow ($p > .1$ both in Model 4 and 5). Thus, we can say that our Hypotheses 1, 2 and 4 are supported. In terms of interaction effects, we found that *affordability * sociality* had significantly positive influence on *reverse knowledge flow* (Beta=.15, $p < .05$ in Model 6). Hence, we can say that *H3* is supported. That is, frugality of innovation promotes the transfer of social products to the parent company.

Table 3. Results of the Hierarchical OLS Regression Analysis for Reverse Knowledge Flow

Dependent Variable: Reverse Knowledge flow												
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE	Beta	SE
Intercept	-1.37	1.21	-1.32	1.30	-1.31	1.17	-1.15	1.24	-1.45	1.30	-1.55	1.27
<i>Sociality</i>					.23*	.10			.24*	.11	.28*	.11
<i>Affordability</i>			-.10	.14					-.14	.14	-.18	.13
<i>Technological Novelty</i>							.12	.15	.01	.16	.04	.15
<i>Sociality * Affordability</i>											.15*	.07
<i>Parent Involvement</i>	.28+	.15	.33+	.16	.32*	.15	.27+	.15	.39*	.16	.37*	.16
<i>Socialization</i>	.06	.16	.06	.16	-.00	.15	.01	.17	-.02	.17	.02	.16
<i>Subsidiary Importance</i>	.46+	.25	.50+	.25	.41+	.24	.44+	.25	.46+	.25	.49*	.24
<i>Sub. Age</i>	-.01	.01	.01	.01	-.01	.01	-.01	.01	-.02	.01	-.01	.01
<i>Sub. Size (Thousands)</i>	.03	.26	.00	.26	.04	.25	.05	.26	.00	.26	.05	.25
<i>Industry Dummy</i>	No		No		No		No		No		No	
Model statistics												
Adjusted R ²	.10		.09		.17		.09		.15		.22	
Adjusted R ² from Model 1			-.01		.07		.00		.05		.06	
F-statistic	.10		.13		.03		.13		.06		.02	

n=52 All two-tailed tests. * $p < .05$, ** $p < .01$, *** $p < .001$. SE=Standard Error

To observe those interaction effects in more detail, we carried out a cross-tabulation analysis. The results are shown in Table 4.

Table 4. Cross Tabulation of Reverse Knowledge Flow by Sociality and Affordability

		<i>Affordability</i>	
		High	Low
<i>Sociality</i>	High	2.87 (n=13)	2.48 (n=6)
	Low	2.29 (n=5)	2.38 (n=8)

N=52 The number is the mean value of *reverse knowledge flow* of the subsample.

First, we categorized the sample into high versus low *affordability* based on whether they were above or below the mean value of it for the entire sample. We applied the same method to evaluate *sociality*. As shown in Table 4, we can confirm affordability and sociality jointly facilitated the reverse knowledge flow.

Discussion

Contributions

Looking at the results, we can say that all our hypotheses were supported. Affordability itself had no influence on the level of reverse flow of the innovation, but it fostered reverse transfer when the innovation possessed sociality nature. Therefore, here we can emphasize on the importance of sociality. It is important for developed country-based MNCs because in terms of ethics as well as business expansion. We can see the similar social problem like healthy, pollution or natural resource shortage in several areas in the world, so the frugal solution for it becomes worth transferring from one emerging country to the other countries. Similarly, the frugal application of the sophisticated technology was also worth transferring because it is a good way to diffuse that technology.

Those findings may contribute to the academy of innovation management in emerging markets. Although past studies have investigated and emphasized on both reverse innovation and frugal innovation, scarce number of studies mainly considered the relationship between them (Brem & Wolfram 2014, Zedtwitz et al. 2015). Thus, we analyzed it theoretically and empirically. Drawing on our results, we can say that sociality plays a key role of mediating frugality and reverse flow of the innovation. Although past studies have found that the sociality of the product innovation improved its market performance, differentiated competency and sustainability (Kanter 1998, Mulgan et al. 2007, Yunus, Moingeon & Lehmann-Ortega 2010), our study discovered a new effect of sociality on knowledge flow toward the parent company in the developed country.

Implications for Managers

Our findings also suggest some practical implications for MNCs that challenge in emerging markets. As we discussed above, sociality may play the key role in diffusing innovation from one emerging area to the other world. When the innovation possesses social problem-solving nature, it would be valuable for those who suffer from that social problem, wherever they live. That's why MNCs tended to transfer it from one emerging country to the other areas. Affordability, the other character of frugal innovation does not have such a power to improve quality of life of those who face social difficulties in itself, while the affordable product that incorporate sociality performs best. As past studies told, the value of innovation rose when it was utilized by more people (Rogers 2003). In this sense, sociality can be considered as one of the most important characteristics of frugal innovation.

We could also suggest to managers that information channels between headquarters and emerging market subsidiary are quite important in transferring new product ideas. The results suggested that not only the content of information (the nature of the innovation) but also the information channels have strong influence on the degree of the knowledge transfer. In other words, managers should understand that overseas knowledge transfer is like a human communication (Gupta & Govindarajan 2000, Krone et al. 1987). People under different cultural settings are likely to have different ideas, and thus worth communicating to make changes in our lives. It is true even in case of the business entities. Headquarters can make changes in business when it obtains new idea of business from emerging market subsidiary, which faces totally different business environment from headquarters (Govindarajan & Trimble 2013, Zedtwitz et al. 2015). In this sense, we can say that the headquarters should also take much care of the information channel with emerging market subsidiary.

Limitation and Future Research

Our findings have limitations, and thus we should refrain from overgeneralizing the conclusion. First, we have to mention our limited amount of sample. While we sent more than one thousand questionnaires and collected more than two hundred responses, we finally found that only one fourth of all responses carried out the project. As a result, our sample became quite limited in number. We thought that it was because not many MNCs challenged new product development in emerging countries yet.

Further, our sample only consisted of Japanese MNCs. Even in that sense, we must not overgeneralize our results. Meanwhile, our results can be considered valid from communication theory's viewpoint. To take account of those things altogether, we can conclude that this study examined theoretically predicted relationships with limited Japanese sample. Further studies should be commissioned to reconfirm our results in the future. Not only quantitative but also qualitative study would be valuable to understand what really happens in realizing reverse flow of the product innovation in emerging markets.

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