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EXPLORING HETEROGENEITY OF DISTRIBUTION INTENSITY: EVIDENCE FROM EMERGING MARKET ENTRY EXPERIENCE WITH BENCHMARK BRANDS IN CHINA

Shun-Chuan Chang
Assistant Professor; Holistic Education Center, Mackay Medical College No.46, Sec. 3, Hongzheng Rd., Sanzhi Dist., New Taipei City 252, Taiwan

Ying-Chan Tang
Associate Dean and Professor; College of Management, National Chiao Tung University No.118, Sec. 1, Chung-Hsiao W. Rd., Taipei City, Taiwan

Abstract

As most mature markets enter the fray, emerging markets in Asia offer an opportunity for global brands to embrace. One of the critical decisions for these firms is how many intermediaries should be used in emerging markets. Although determinants affecting market entry and distribution intensity have been proposed by the literature, emerging market background and channel setting context could be drastically different. This study empirically examines four benchmark brands, Nokia, HP, Haier, and Lenovo in China's 3Cs (computer, communication, and consumer electronics) distributors. Our research contributes to summarize important findings for the radically competitive market. First, several concentration measures reveal unobserved nature of heterogeneous distribution intensity. Second, the interaction of CDI (category development index) and BDI (brand development index) in representing development of distribution channels is clarified. Third, linking the unobserved heterogeneity of distribution intensity, the Gamma-Poisson mixture, NBD regression modeling covariate effects on market growth, distribution capability, and brand power based on CDI and BDI could be investigated. The results contribute to a gear drive mechanism applicable for generating distribution intensities among different cities in emerging markets.

Keywords: China, BDI, CDI, distribution intensity, emerging market

1. INTRODUCTION

Commitment to new distribution channel in emerging markets is an adamant investment since it is very difficult to repudiate a distributor even though it has been not very productive. From the prolific sides, distribution channel is a strategic asset for a firm that would attain sustainable competitive advantages over competitors in strategic matching, such as replicating product designs, underselling in price, and counterfeiting advertising and promotional strategies. Distribution intensity, commonly defined as the number of intermediaries at various distribution channel levels, is critical in channel structure to implement these activities (Frazier *et al.*, 1990; Hardy and Magrath, 1988; Onkvisit and Shaw, 1990; Rosenbloom, 1995). In addition, it represents the market outgrowth stake invested by the manufacturer to defend its trading territories (Bonoma and Kosnik, 1990; Corey *et al.*, 1989; Coughlan *et al.*, 2001; Lassar and Kerr, 1996).

Corresponding author's
Name: Shun-Chuan Chang
Email address: zhang@mmc.edu.tw

Past literature had attempted to explain why firms in similar product category differed in distribution intensity. Frazier and Lassar (1996) proposed several theoretical constructs, such as manufacturer's brand strategy and channel practices, and the moderating effect of retailer requirements that had impacts on distribution intensity. Jain (1993) and Mallen (1996) argued that distribution intensity and the underlying channel structures co-evolved with the host country's economic development stages, while Li (2003) argued that distribution intensity was the trade-off among customer expectations, company strategy and many other uncontrollable factors including country's political and legal environment.

For emerging markets in Asia, like China and India, the development of the economy in the early 21st century is still unstable. For these potentially largest markets in the world, market structural ambivalence, such as trading territorial scope, income inequality, and diversified cultures, abounds in its complicated channel market structure. Distribution of channel intensity is influenced not only by industrial development (Frazier and Lassar, 1996), but also by economic performance (Ellis *et al.*, 2011). Another possible explanation is that some predominant factors might have influence on distribution intensity. For instance, Li (2003) in his inductive study attempted to identify the determinants of export distribution intensity in emerging markets. Johnson and Tellis (2008) also tried to indicate drivers for market entry into China and India.

All the above studies took a deterministic view to investigate distribution intensity. In practical regression modeling consideration, even if many researchers attempted to describe or predict distribution intensity by observed heterogeneity, namely determinants, they rely on random components to recognize not all factors were included. Furthermore, since the underlying distribution intensity mechanism might be very different in contingent emerging markets to mature markets, it is even more difficult to gauge what elements should be involved. Therefore, for accuracy of prediction and explanation, characterizing the real distribution patterns to various channel intensities is more crucial than rashly jumping to import any observed determinant, which is often greatly exaggerated while the distribution intensity patterns is subtle.

Krugman (1991) presented an economic and geographic framework, showing that the prime impact of most economic activity might be concentrated in one or a few regions. Similar to the existence of heterogeneous economic performance among cities, in China, huge population resides in a few clusters of metropolitan areas. Meanwhile, in channel management practice, besides solving the ideal number's problem of intermediaries, another critical question that marketer may ask is: Should distribution intensity be concentrated only in a few regions? More interesting research questions are scrutinized toward whether the concentration of the distribution intensity patterns on specific site needs to dispose the same way among different products, and whether few vital parameters could account for such spread patterns. Nevertheless, the importance of this study is to take a new perspective to re-examine the distribution intensity issue in an emerging market context. Since the underlying distribution intensity rates might not be normally distributed among all the cities, in particular, we take unobserved nature of heterogeneous distribution intensity rates among 200 cities in China by imposing a probability distribution of counting events into consideration (Winkelmann, 2008), to describe prolific insights of the inherent characteristics of distribution channel structures in these cities. Application of transforming market entry strategies for practically allocated distribution channels from market leader experience as benchmark learning is also discussed.

This empirical study subsumes four products (PC, printer, TV, and mobile phone) to represent 3C (computers, communications, and consumer electronics) category that are widespread in 200 distributed cities in China. The database consists of the number of their intermediaries among 200 distributed cities in a 2004 national survey. The survey includes four benchmark brands, PC from Lenovo, printer from HP, mobile phone from Nokia, and TV from Haier. In brief, not only is this paper an initially retrospective study of 3C benchmark brands market entry experience in China, but also confers the distribution intensity patterns in a generalized manner with application to other developing countries in Asia. This quantitative research approach provides a new perspective of 3C channel structures in emerging China just after WTO accession, to explore the underlying

distribution intensity mechanism for both unobserved heterogeneity and observed heterogeneity that account for the way they are structured, as well as evidence of how investment on channel contributes to devise an applicable mechanism in generating channel intensities among different cities in emerging markets.

2. LITERATURE REVIEW

Distribution intensity strategy is referred to as the degree to which a manufacturer limits the number of intermediaries, which ranges from a single distributor (exclusive distribution) to an unrestricted number of distributors (intensive distribution) operating within a specific trade area (Fein and Anderson, 1997). Distribution intensity has been commonly defined as the number of intermediaries used by a manufacturer within its trade areas (Bonoma and Kosnik, 1990; Corey *et al*., 1989; Coughlan *et al*., 2001). In particular, Frazier and Lassar (1996) defined it as the extent to which a manufacturer relied on numerous retailers in each trade area to carry its brand. To make the product be accessible and available, companies have to decide the ideal role of their intermediaries. The traditional channel distribution theory links product class and consumer buying behavior to distribution intensity. The optimal distribution intensity could supply a suitable amount of products available to target customers without exceeding their needs. In contrast, over-saturated status of distribution intensity would still increase costs, which may be worse than unmet need for lower distribution intensity.

In comparison with mature markets, emerging markets may provide global marketers with some more attractive market opportunities; yet it will expose global marketers to the high risks associated with uncertainties (Johansson, 2000). Entry into new environments requires substantial investments, including customer education, distribution channel establishment, and product adaptation (Coughlan *et al*., 2001). At this point, a large amount of financial investments is required to cover the establishment of channel marketing infrastructures and the development of market-specific knowledge (Porter, 1990). In other words, investors have to be more careful in emerging markets (Czinkota and Ronkainen, 2001). The fact that China market is growing fast does not mean that investors will be allowed to share the spoils.

Li (2003) claimed that in emerging markets, the faster the market grew, the more likely that exporting manufactures preferred high distribution intensity. In contrast, the larger the gap between distributors in terms of distinctive and sustainable capabilities is, the more likely that exporting manufactures will accept lower distribution intensity. Although Li (2003) had attempted to identify the determinants of export distribution intensity in emerging markets. His inductive study, including interviews and field observation, concerned 18 British manufacturers and their Chinese intermediaries. Five determinants were collected to show a great impact on distribution intensity in emerging markets: behavioral uncertainties, market growth, gray marketing and fake products, distribution capabilities, and transaction-specific investments. There are still very few quantitative research approaches to evaluate these propositions from qualitative points of view.

Access to distribution channels is often blocked by first mover or early market entrants in emerging markets. Barriers to entry also make China 3C market environment uncertain for foreign enterprises, and lead to concentrated channel structures that result in reducing competition and raising profits for incumbents (Robertson and Gatignon, 1991). Alternatively, the concept of sunk costs interprets the potential barrier entrant's face when entering in an industry if they must incur costs that incumbents can somehow avoid (Stigler, 1968). As in Sutton (1991), advertising consists of a fixed and sunk investment. The theory predicts a competitive escalation in advertising levels in larger markets and economics of scale, which limits the extent of entry, and hence bounds the level of concentration away from zero. Industries in which there are endogenous sunk costs (ESC) incurred will have a concentrated structure even if there is a great deal of demand (Sutton, 1991). In Sutton (1991; 1998) empirical study, ESC refers to the expenditures undertaken by sellers to improve their products for users, including advertising, R&D, and other brand-enhancing expenditures in consumer goods industries. Expenditures can be considered as ESC only if sunk cost must be irreversible and it is

possible to spend more to attract customers, in other words, a large fraction of potential customers must respond to the ESC.

Based on the ESC theory, build-up of a new distributor also requires big sunk costs, such as inventory, warehousing, logistics, IT networking, financial capital, HRM, and etc. In emerging markets, the market growth will be accompanied by a competitive escalation in distributors' features, so the number of distributors delivered in the specific cities for some brands may change dramatically. Investment in 3C channel may constitute an important part as essential as sunk cost for generating brand sales. The causal relationship between brand share and distribution (Reibstein and Farris, 1995; Wilbur and Farris, 2014) could shed light on our following statistical model building. While modeling distribution intensity, market entry strategies should be referred to as both geographic penetration and market concentration in channel market structure. As far as the penetration of brand levels is concerned, we do not only focus on whether the extent of a large portion of the unit sales volume is created by a small portion of channels, but also propose that the concentration of distribution intensity involved in a product category, which is to measure whether the higher the magnitude of distribution intensity becomes distributed-clustering intermediaries in the specific sites.

3. METHODS

Quer *et al.* (2007) reviewed the empirical articles focusing on the Chinese context published in 12 leading international academic journals between 2000 and 2005. The quantitative approach was used in 148 of the 180 studies (82.2%). They also argued that due to the restrictions imposed by the Chinese authorities on the collection of information, foreign researchers frequently had to seek the support of the National Bureau of Statistics of China, or of Chinese enterprises specialized in market research.

3.1. Data

The data used in the study also utilized more reliable information, the primary data source collected by a Chinese leading 3C distributor specialized in 3C channel market research, consists of four leading brands in different product categories within 3C industry in the end of 2004 (after China became a member of the World Trade Organization (WTO)), including PC from Lenovo, printer from HP, mobile phone from Nokia, and TV from Haier. These four product categories are generally classified as 3C products, but, in fact, they all have different characteristics and belong to different product life cycles. In these companies, HP and Nokia are foreign companies, and Lenovo and Haier are not only local enterprises but also the flagship Chinese brands.

The number of intermediaries, product category sales in volume units, and brand sales in volume units of these brands in 200 cities in China are included in the database. These cities (shown in Appendix 1) are not chosen randomly, but chosen by city-tier levels from other auxiliary database in China City Statistical Yearbook which indicates economic infrastructure and development data among these cities. As a result, the two hundred cities in the database are relatively representative among all of the cities in China.

3.2. Measures

As an emerging market grow fast, the volume and the frequency of transactions through the channels will be increased. Consequently, companies have to resort to high distribution intensity to suppress channel conflicts and reduce dependence on individual distributors. In this paper, the main criterion by which one can represent market growth is category development index (CDI), being referred to as fair share indexes. CDI is an efficient tool used to measure the market development of a specific product category in specific regions. The definition shown in the AMA (American Marketing Association) Dictionary could be calculated as a market's category sales percentage divided by the total population percentage of that market.

$$CDI = \frac{Percentage\ of\ \ product\ catgory\ total\ sales\ in\ market}{Percentage\ of\ \ total\ \ population\ in\ market} \qquad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

CDI is commonly used in category management to measure the performance of category sales of retailers (Dhar *et al.*, 2001), but it can also be used to evaluate market size of a category in a particular geographic area. Companies can use CDI to understand the development situation in a specific market compared to all markets in order to help make go-to-market decisions. On the contrary, manufacturers usually do not accept exclusive agency unless distributors are exceptionally brilliant. Li (2003) stated that some of the manufacturers indicated that the appointment of exclusive agent would be detrimental to their market coverage but they had to accept it. Brand development index (BDI) is the counterpart index for a particular brand. BDI, which helps marketers make decisions, is calculated as a market's brand sales percentage divided by the total population percentage of that market:

$$BDI = \frac{Percentage\ of\ brand\ to\ total\ sales\ in\ market}{Percentage\ of\ total\ population\ in\ market} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The BDI can determine the sales potential for a brand in a specific market area. It can also help marketers understand their current product's performance and penetration situation to deal with brand management. We have the real data on sales volume in each city the local Chinese intermediaries can generate. However, the scales of resellers are greatly varied; there are also limited spaces to carry only larger share brands. Therefore, distribution causes market share, and market share may lead to distribution (Reibestein and Farris, 1995). Li (2003) identified one possible negative effect on distribution intensity in emerging markets, distribution capabilities, as a major influential covariate. In our study, the ratio of the BDI divided by the corresponding number of resident intermediaries indicates their management capability in that city. It can be viewed as distribution capabilities, a proxy measure representing the actual performance of local channels. CDI and BDI can describe market entry strategies with a 2 x 2 matrix, which separates the markets (Belch and Belch, 2004) as shown in Table 1.

Table 1: CDI/BDI matrix

	Low CDI	**High CDI**
High BDI	C High market share monitor sales decline	A High market share good market potential
Low BDI	D Low market share poor market potential	B Low market share good market potential

Source: Belch and Belch, 2004

These various segments have different market potential. The market with high CDI and BDI (A), represents good sales potential for both the product category and the brand itself. Otherwise, the one with high CDI but low BDI (B), shows that customers appreciate this product category but are not willing to purchase the specific brand. While a market has low CDI but high BDI (C), the sales amount of the brand is performing better than that of the same kind of product category. That is, the customers seem to like the brand even if it is just a burgeoning product category within the market. Besides, the market with both low CDI and low BDI (D), represents that neither the product category nor the brand has been performing well. It is not a good target market for further investment.

4. MODELS

4.1. Poisson model for distribution intensity

At first, we assume distribution intensity is distributed across 200 cities with an appropriate mechanism responsible for event count data which are distinguished by being a positive integer. Poisson distribution (Winkelmann, 2008) is potentially efficient in describing this phenomenon. Given one product category such as mobile phone, Y_i is the number of distribution intensity at city i

where consumers can access and purchase it. Assume Y_i is distributed as a Poisson random variable with the same mean λ at all cities. The simple Poisson model is:

$$P(Y_i = y|\lambda) = \frac{\lambda^y e^{-\lambda}}{y!}, \qquad i = 1, 2, ..., 200. \qquad \text{..... (3)}$$

This is a simple Poisson "counting" process which represents Y_i, the exact number of distributors in city i carry the mobile phone products. It's worth noting that the Poisson distribution is homogeneous, meaning that every city has the same chance of being selected. It also implies that the probability of Y_i in a city depends only on the occurrence counts λ, not on intensity-induced characters such as population size or resident income. We then extend the simple Poisson process to the finite mixture model (FMM) by incorporating the concept of heterogeneity of distribution intensity to the model. The FMM has the ability to distinguish distinct classes of markets, for instance, the cities can be classified by intensity-induced characters such as city-tier level, geographic region, gross domestic products (GDP) of the city, population size, retail activity and so on. Classification of cities into distinguished groups may offer a number of advantages over the simple Poisson model. It provides more accurate predictions for each subgroup and the stringent market penetration information for manufacturers to better gauge potential channel distribution entries.

4.2. Gamma-Poisson mixture model for distribution intensity

While modeling distribution intensity data, Poisson model is often the first candidate model. Recall the strong assumption of the simple Poisson model, where the number of distribution intensity delivered in each city has a Poisson distribution with equal rate λ. In addition, the FMM allows for multiple but discrete subgroups, each with a different distribution intensity rate. As we move from a finite number of subgroups to an infinite number of subgroups, we propose unobserved heterogeneities that across all different cities, i.e., by assuming distribution intensity rate λ has a gamma distribution, a two-parameter family of continuous probability distributions (Winkelmann, 2008). It has a shape parameter α and a scale parameter β shown as follows:

$$g(\lambda|\alpha,\beta) = \frac{\beta^\alpha}{\Gamma(\alpha)}\lambda^{\alpha-1}e^{-\beta\lambda}, \quad \lambda > 0 \text{ and } \alpha,\beta > 0. \qquad \text{..... (4)}$$

At the aggregated level, Gamma-Poisson mixture model of distribution intensity is equivalent to negative binomial distribution (NBD) (Schmittlein *et al.*, 1993). The negative binomial distribution model has the following formula. $\Gamma(.)$ Denotes the gamma function:

$$f(y) = \frac{\Gamma(\alpha+y)}{\Gamma(\alpha)y!}\left(\frac{\beta}{\beta+1}\right)^\alpha\left(\frac{1}{1+\beta}\right)^y, \ \alpha,\beta > 0. \qquad \text{..... (5)}$$

The parameters α and β of this distribution are viewed as latent characteristics of individual-level channel market at cities. NBD provides useful information, including not only the average distribution intensity across cities, but also the heterogeneity of distribution for assuming distribution intensity rates from an infinite number of subgroups by gamma distribution.

4.3. NBD Regression Model for distribution intensity

In NBD (negative binomial distribution) model, we assume Y_i is distributed as a Poisson random variable with mean λ_i. Furthermore, we suppose each individual's mean λ_i is related to their observed explanatory characteristics. That is, via regression modeling, we can add deterministic heterogeneity to NBD model. The regression model would be of great benefit in improving the fit over simple probability model without covariates, and in testing determinants influencing distribution intensity. The negative binomial regression model arises if this heterogeneity is modeled by the gamma probability distribution. The density of the negative binomial is derived by adding an error term to the conditional mean of the Poisson distribution (Cameron and Trivedi, 1998):

$$l_i = e^{g' x_i + e} \quad \text{or} \quad \ln(l) = g' x_i + e, \qquad \text{..... (6)}$$

Where exp (ε) follows a gamma distribution with mean one and variance 1/α. Substituting Equation (6) into Equation (4), and integrating ε out of the expression yields the density.

$$P(Y_i = y) = \frac{\Gamma(\alpha + y)}{\Gamma(\alpha)\, y!} \left(\frac{\beta}{\beta + e^{\gamma' x_i}}\right)^{\alpha} \left(\frac{e^{\gamma' x_i}}{\beta + e^{\gamma' x_i}}\right)^{y} \cdot \text{.....(7)}$$

The density will reduce to original NBD model when γ =0, showing no determinants influencing distribution intensity. Theoretically, the coefficient of variation (CV) (Schmittlein *et al.*, 1993) of λ in NBD model is also applied here:

$$\frac{\sqrt{Var(\lambda)}}{E(\lambda)} = \frac{\sqrt{\alpha/\beta^2}}{\alpha/\beta} = \frac{1}{\sqrt{\alpha}}. \qquad \text{..... (8)}$$

That is, the larger the value of α is, the more homogeneous intensity of the channel market in all cities is. In brief, the advantage of reporting coefficient of variation can also be used to represent the concentration of different products concisely to compare with each other, and $\sqrt{\alpha}$ derived from the key shape parameter, α in NBD model, is inversely proportional to the coefficient of variation.

In summary, the Poisson distribution of channel density may come with some limitations, including the inability to modeling under dispersed count data for extremely low and extremely high cases. Gamma-Poisson distribution is used in this paper where the Gamma distribution retains two parameters α (the shape parameter) and β (the scale parameter) to accommodate the heterogeneity of distribution density across cities.

5. RESULTS

5.1. Descriptive statistics

Table 2 reports summary statistics of the distribution intensity for these four leading brands. Since many PC owners did not buy any printer in the emerging market, the printer penetration rate in China was low at that time. Except for HP, the total number and the average of distribution intensity in different brands are similar. The fact of skewness shows that its distribution is not symmetric like the bell-shaped normal curve, especially in Nokia and HP (Skewness = 6.2 and 5.2 respectively). In both Chinese brands, the distribution intensity of Lenovo averages slightly less than that of Haier, but the variation in distribution intensity of Lenovo is larger.

Table 2: Summary statistics of distribution intensity across 200 cities in China

Statistics	**Channel intensity**			
	Nokia	HP	Lenovo	Haier
Mean	18.8	4.2	19.9	22.1
S.D.	32.1	10.3	42.6	29.1
Skewness	6.2	5.2	5.0	3.7
Minimum	2	0	2	2
25%	6	0	5	6.5
50%	11	1	9	12.5
75%	19	3	15.5	25
90%	34.5	10	36.5	50.5
95%	45.5	22.5	77.5	75.5
Maximum	275	92	315	217
City-tier (I)	20.2%	25.8%	21.9%	11.4%

(Ⅱ)	28.0%	47.2%	41.2%	33.2%
(Ⅲ)	34.2%	24.1%	25.7%	39.8%
(Ⅳ)	17.6%	3.0%	11.3%	15.6%
Total	3751	831	3975	4416

Table 2 also provides summary statistics for the city-tier classification. As shown in Table 2, the most common resource (distributors) allocation is setting in city-tier (I), and city-tier (II), followed by city-tier (I) were only three metro cities, Shanghai, Beijing, and Guangzhou in the samples.

The complementary effect could reveal different companies' strategies. As the printer is complementary to the PC, the consumer who owns a printer must also own a PC. This is the reason why the similar distribution intensity patterns by city-tier both in HP and Lenovo among larger cities (city-tier (I), (II), and (III)). Moreover, because of the low penetration rate of the printer at that time, HP had cautiously selected its resellers. As shown in Table 2, HP's distribution intensity in city-tier (IV) is less than that of any other brand in the dataset.

5.2. Modeling unobserved heterogeneity of distribution intensity

In Figure 1, the fitting of the distribution is a matter of determining which two parameters create the shape and scale of the NBD that most closely fits the observed data. The observed and theoretically expected distributions for each category are plotted on the same set of axes in order to visualize these 3C benchmarks' channel structures and gain a "picture" of the channel allocation behavior.

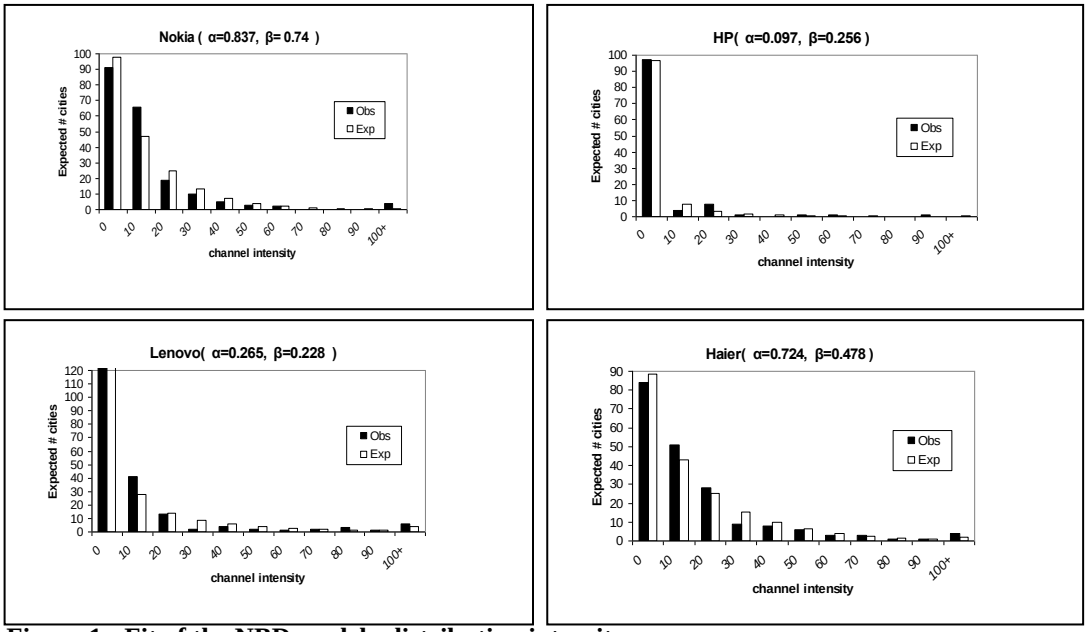

Figure 1: Fit of the NBD model_ distribution intensity

In order for transforming go-to-market strategies from the inference in NBD model-based analysis, the concentration statistics based on latent market concentration structure can provide insight into a company's long-range planning for resource allocation.

Figure 1 shows that light bars and dark bars denote closely with each other to indicate goodness-of-fit. By further calculation of the differences between light bars and dark bars in each part of Figure 1, aside from the best fit of the NBD distribution model in Haier (p-value of Chi-Square Goodness-of-Fit Test = 0.76), the least fit of the NBD distribution model in Lenovo is also reliable (p-value of Chi-Square Goodness-of-Fit Test = 0.09). We further check that approximate numbers of channel

intensity in more or less than 100 are not over 10 cities, and that only small parts of cities are over 30, especially for HP.

5.3. Incorporating BDI and CDI

Many interesting patterns will be geared down with traditional application to BDI and CDI. For instance, BDI/CDI represents the visibility (distribution efficiency) of a brand. If this ratio is higher, the number of distributors should also be higher. The logic is that if the BDI is high, then the firm has put many efforts in the city. Therefore, if the ratio is greater than one (i.e., BDI > CDI), then the company might waste some resource to distribute to that city. The reason why a company makes such decision might be due to the intense competition, or, the expectation of the future growth potential of that city. The upper part of Figure 2 shows that Nokia's and Lenovo's CDI vs. BDI distribution patterns among 200 cities. The upper half of scatter plot obviously indicates that the distribution pattern nearly follows a straight line.

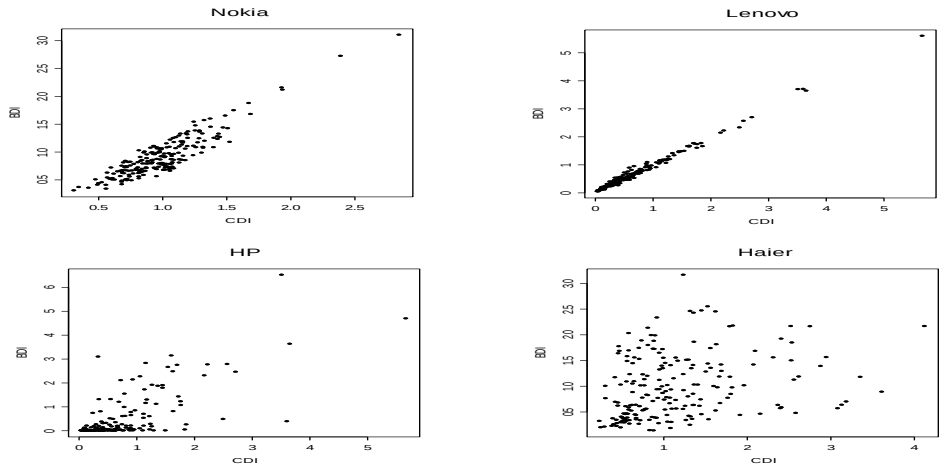

Figure 2: 3C CDI/BDI scattergrams in China

As a contrast to Nokia's scatter plot, Lenovo's pattern is much relatively closed along the 45 degree line, indicating that the market entry pattern for Lenovo is "to dance to the other PC companies' tune" and thus close to the path of total development of PC products in the markets. Lenovo has aggressively distributed its products; therefore, the resource (distributors) allocation does not seem to be efficient, i.e., it has distributed many small (market potential) cities where both CDI <1 and BDI<1.

On the other hand, many PC owners do not buy printers, because of the low penetration rate of this kind of product. As a result, HP has cautiously selected its resellers, and its decision is more fitting with westerner's thinking, i.e., it focuses on the cities where BDI >1 and CDI > 1. Figure 2 also shows HP's distribution pattern, which is totally different from the patterns in the upper part of Figure 2. The pattern of HP's market development seems to have a random shape, but most points of the cities are distributed as BDI and CDI are greater than one. The lower half of Figure 2 also illustrates Haier's pattern. Distinct pattern from other companies, Haier's channel market penetration pattern is not followed by another Chinese brand, Lenovo. It is filled with "full coverage market" consideration.

Despite these market leaders' products are all categorized into 3C products, their market penetration strategies seem to be quite different. We can further divide these cities into four city groups, A, B, C, and D, according to CDI and BDI. In this study, we use the averages of CDI and BDI as the threshold to divide the markets to match the classification A, B, C, and D, in Table 1. An important and obvious step in the examination of bivariate data, such as CDI and BDI in Figure 2, is to examine their scatter plots. These can give evidence of outliers, clusters, as well as indicating the

strength and type of relationship between variables.

The CDI/BDI strategies discussed above identify market structures for four categories of 3C industry in China, i.e., TV, mobile phone, PC, and printer. These might match slightly with four stages of product life cycle (PLC), such as saturation stage, mature stage, growth stage, and introduction stage. In marketing application, the PLC may be useful as a description. Namely, the PLC is a dependent variable, which is determined by market actions (Dhalla and Yuspeh, 1976). Accordingly, the most important issue here is to evaluate the heterogeneity in distribution intensity. That is, managers would like to know whether the degree of distribution intensity is related to some market characteristics, observed or even unobserved, to adapt their marketing programs. In the next section, linking the unobserved heterogeneity of distribution intensity, the extended Gamma-Poisson mixture, NBD regression procedure modeling covariate effects of market growth, distribution capability, and brands power, based on CDI and BDI could be investigated.

5.4. Application to NBD regression

The degree of distribution intensity is the realized result the companies decide to create, so do BDI. That is why some argue that they cannot use BDI as a determinant for distribution intensity directly, but Reibestein and Farris (1995) indicate several reasons that brand share may lead to distribution.

As shown in equation (7), the negative binomial regression model (NBRM) incorporates observed and unobserved heterogeneity into the conditional mean. In this section, we assume two predictors for distribution intensity in emerging China. CDI is used to evaluate market growth of a product category in a particular market. On the other hand, the ratio of the BDI divided by the corresponding number of resident intermediaries indicates their management capability in that city. This will be the one for representing the distribution capabilities.

In NBD regression model, we assume distribution intensity is distributed as a Poisson random variable with mean λ, which has a gamma distribution across all cities and test whether λ is related to these two predictors .On the other hand, the Poisson regression model (PRM) has the same conditional mean and variance (equidispersion). When it is invalid, the conditional variance of y becomes larger than its conditional mean; thus, we are said to have over dispersion data (Long, 1997). Considering two regression models, the likelihood ratio test, $2\left(LL_{NBD}-LL_{poisson}\right)$ is developed to examine the null hypothesis of no over dispersion. If the null hypothesis is rejected, the NBRM is in favor of the PRM, that is, shape parameter $\alpha \neq 0$. In fact, PRM rarely fits in practice due to over dispersion. As shown in Table 3, all shape parameter α_s in different models are significant from 0. At the bottom of Table 3, we also run a restricted model without regressors in order to conduct the likelihood ratio test for improvement for the explaining power of covariates (all p-values < 0.01).

Table 3: NBD regression estimates of distribution intensity

3C leader	Haier (TV)		Nokia (Mobile phone)		Lenovo (PC)	
Parameters	Coefficient	Std error	Coefficient	Std error	Coefficient	Std error
Shape parameter α	0.515***	-0.055	0.190***	-0.026	0.214 ***	-0.026
Intercept	3.447***	-0.115	2.445***	-0.133	2.259 ***	-0.074
CDI	0.07	-0.083	1.155***	-0.121	1.254 ***	-0.071
BDI per channel members	-7.086***	-0.636	-10.855***	-0.696	-11.311***	-0.821
Log likelihood (unrestricted)	11270.59		9273.78		11361.68	
Log likelihood (restricted)	11216.87		9146.62		11183.19	
Likelihood ratio for covariates	107.44***		254.32***		356.98***	

*at 0.1 level of significance, ** at 0.05 level of significance, *** at 0.01 level of significance

Table 3 also provides NBD regression estimates of distribution intensity of 3C leaders. Since HP

does not fully enter into all the markets, we will further discuss its details in Table 4. In Table 3, although most parameters are significant among brands, we still discover some interesting patterns from the results. One is the variable representing the distribution capability that shows a negative impact on distribution intensity among different models, which can reconfirm the proposition that Li (2003) mentioned in his inductive study. The other one is the variable CDI, which is not significant in the model of Haier only. This phenomenon might result from TV in its saturation stage of product life cycle. From the results, we can conclude that distribution capability is more likely an important covariate when making distribution strategies, even in different 3C products. Besides, CDI is still one of the criteria for brands except for Haier. This result shows that when the industry is still in the growth stage at that time, like Lenovo (PC), it is better for companies to put their marketing channel resources into the market where industry and brand are well developed. But, when the category is now on saturation stage or even decline, it is better to put the resources into the market according to capable distributors.

As shown in Table 4, we conduct NBD regression to examine the distribution intensity of printer for HP among different city-tier city samples, and ask a key question, "While introducing a new product, such as printer, how to decide market entry strategy among different city-tier markets?" It is apparent that excluding trivial cases in the first city-tier cities, HP decides to enter cities with different market-penetration level. Some interesting patterns from Table 4 will be revealed. One is the variable, BDI per channel members representing the distribution capability that shows a negative impact on distribution intensity only in the second city-tier city model. But it is not significant on the condition of four-tier markets due to many non-entry data over there. More interestingly, distribution capability has positive impacts on distribution intensity in the third-tier city model, since very few distributors are in third-tier cities. Hence, distribution capability should be approximated to BDI. It is shown that BDI is positively correlated to the number of local distributors. HP in third-tier markets tends to allocate more marketing channel resources in the cities where the brand has already been appreciated by the residences. In contrast, CDI plays a role in the introduction stage of 3C product life cycle, such as printer for HP. As shown in Table 4, CDI has a significantly positive influence on distribution intensity across different models.

Table 4: NBD regression estimates of distribution intensity in different city-tier samples HP

3C leader	**HP (Printer)**					
City-tier	(II)		(III)		(IV)	
Parameters	Coefficient	Std error	Coefficient	Std error	Coefficient	Std error
Shape parameter α	0.286***	-0.097	0.644***	-0.177	1.930***	-1.064
Intercept	2.235***	-0.259	-0.297***	-0.206	-3.416***	-0.833
CDI	0.475***	-0.148	0.963***	-0.22	4.507***	-1.632
BDI per channel members	-3.145**	-1.439	1.933**	-0.933	3.877	-3.59
Log likelihood (unrestricted)	675.74		-0.99		-12.48	
Log likelihood (restricted)	669.4		-16.87		-34.62	
Likelihood ratio for covariates	12.68***		31.76***		44.28***	

*at 0.1 level of significance, ** at 0.05 level of significance, *** at 0.01 level of significance

To sum up, all of the shape parameter α_s in different models are significant from 0. In addition, we observe that in saturated markets, like Haier (TV), and reluctant markets in introduction stage, like HP (Printer), their shape parameter α_s are bigger than those in other products. It means less concentrated distribution intensity in the whole markets of these brands after being adjusted for market growth and distribution capability.

Substituting NBD regression estimates into Equation (7), and yields the expected distribution

intensity. We can further infer that the negative residuals (observed minus expected), another source of unobserved heterogeneity in the fitting NBD regression model, will indicate where the cities are unmet distribution intensity areas for these 3C benchmark brands. For instance, the corresponding top three cites priorities for market entry connected with significantly negative residuals for analysis of Nokia, such as Shenzhen, Zhuhai and Fuzhou, indicating that each of Nokia's channel intensities among these three cities is much lower than the expected numbers of intermediaries in our model. It may be just due to too much gray marketing and rampant fake products of mobile phone in these cities at that time, or mobile phone manufacturers believed the market in these cities was unstable and hoped Chinese intermediaries could share investments to protect their brands, As a result, they were prepared to offer exclusive distribution.

6. CONCLUSION

The main objective of this study is to explore the heterogeneity of distribution intensity on 3C products and identifies its major influence on distribution intensity under the context of emerging China. We collect four 3C benchmark brands in China, such as Nokia, Haier, Lenovo, and HP, and try to describe their channel marketing strategies then, especially in concentration and penetration of their channel distribution. As a scientific approach to marketing involves gathering observations about marketing phenomena and then attempting to develop generalized explanatory statements (Bass, 1993), this study takes a new, large-scale survey based, quantitative research approach instead of traditional inductive survey in the literatures to enrich our understanding on distribution intensity.

Findings from this study offer following theoretical implications. First, using a variety of statistical counting event modeling strategies, we conclude that NBD regression does provide a better fit of distribution intensity data for modeling unobserved heterogeneity of skewed distribution. Second, we suggest that the parameters, α and β in NBD, can generate the coefficient of variation, which indicates the concentration statistics based on the latent market concentration structure. In other words, the shape parameter α can be regarded as a simple concentration measure of how dependent a brand (in the case of 3C categories) is to their distribution of channel markets. Third, this study highlights several persistent concentration patterns in the 3C market structures in China. We organize our findings around the notion that firms can improve brand perceptions through channel investments and can result in concentration patterns, as described in Sutton's endogenous sunk cost theory. Channel intensity distribution for different brands could be accompanied by an escalation in distributors' features as the market grows. In addition, as distribution-intensive brands, especially their product sales were in full swing, their channel market concentration levels should be bounded away from zero.

According as Li (2003), propositions in emerging markets, the faster the markets grow, the more likely that exporting manufacturers prefer high channel intensity. In contrast, the more distinctive the distributor capabilities are, the more likely that exporting manufacturers will accept low channel intensity. In this study, we also verify the validity of these propositions in different brands and cities, and conclude that distribution capability is more likely a consistently important covariate. Besides, for instance, with application to residual analysis of Nokia, we explain that there might be negative results from residuals including country's legal environment, as well as gray marketing and fake products.

The study offers following managerial implications, in the current marketing knowledge, CDI/BDI matrix (Belch and Belch, 2004) is considered as a marketing investigation tool for investors to evaluate market potential and to help make marketing resource allocation decision. Current marketing knowledge concerns about the place with high CDI and high BDI, which is more likely the first-tier city to be entered into and to be allocated most resources. Followed by the second-tier market, which is the one with high CDI and low BDI, and then the market with low CDI and high BDI is the third-tier market. Finally, when the market's CDI and BDI are both low, this market will be the worst place to enter into and investors should put the least resources in this market.

However, our research shows that CDI/BDI matrix will be quite different when focusing on emerging market where the economic status is not stable, especially in emerging China market. Because 3C distribution intensity in China is quite different from the common CDI/BDI matrix in developed country markets, BDP>1 and CDI<1 will be viewed as the first candidate to implement market entry strategy. In our results, BDI positively correlates with the distribution intensity in BDP>1 and CDI<1, because investors there will pay more attention to distribution capabilities. We also find that two brands, Nokia and Haier, choose to allocate most of their marketing channel resources in the market with high BDI and low CDI (city group C), and the others choose to enter into the market most with both high BDI and CDI (city group A).

There are some reasons that cause this difference. We propose that the possible reasons should be based on product life cycle in emerging market. From the report of International Telecommunication Union (2005), Mobile phone and TV are already in the saturation or mature stage. In the cases of Nokia and Haier, entering into the markets where categories are still not well developed, but brands can be popular. However, PC and printer are still in the growth or introduction stage, so Lenovo and HP still put most of distribution intensity on the market with high CDI and BDI because this kind of markets is not saturated.

The product life cycle might not be proper since the Chinese emergent market is still growing, and our research did not have longitudinal time frames. Another explanation might replace PLC with market penetration levels from low to high after product launch in Chinese domestic market.

Above all, we collect four leading brands' distribution intensity data, which is costly and not easy to obtain for business research. However, because we only got data for 2005, we cannot see the dynamic activities of these brands on the current situation. If the longitudinal data could be obtained, it could be used to observe the patterns of channel market entry of these brands, and it would be useful to understand the spatial diffusion in China's 3C products market. A cross sectional data set always has its limitations, as does the collection period of one year, which does not allow for the observed/theoretical comparisons over different periods of observation. This paper has taken a single time period of observation to generalize into other emerging markets. There is needed other empirical verification tests of this extrapolation. Findings may or may not apply to export channels in other emerging markets. Further research could include other time periods of observation or other emerging economies. We've studied the past, but we see this paper as having useful relevance for exploring heterogeneity of distribution intensity in the emerging market in Asia, and for gleaning the general principles from thriving firm experience in such business environments.

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Appendix 1: 200 selected sample cities in China

NO.	City	City Tier	NO.	City	City Tier	NO.	City	City Tier	NO.	City	City Tier
1	ShangHai	1	51	LuoYang	3	101	HuaiNan	3	151	JiaoZuo	4
2	BeiJing	1	52	ChangZhou	3	102	PingDingShan	3	152	YingKou	4
3	GuangZhou	1	53	BaoTou	3	103	HuLuDao	3	153	QinZhou	4
4	ShenZhen	2	54	LinYi	3	104	PanZhiHua	3	154	XiNing	4
5	TianJin	2	55	WeiFang	3	105	ZhangZhou	3	155	LeShan	4
6	WuHan	2	56	HuZhou	3	106	ShiYan	3	156	KaiFeng	4
7	DaQing	2	57	FuShun	3	107	YiChang	3	157	BingZhou	4
8	ShenYang	2	58	HanDan	3	108	JiuJiang	3	158	CangZhou	4
9	DaLian	2	59	QuanZhou	3	109	ZiGun	3	159	TongLing	4
10	ChongQing	2	60	NanTong	3	110	EZhou	3	160	DeYang	4
11	NanJing	2	61	YueYang	3	111	JiNing	3	161	TongLiao	4
12	HangZhou	2	62	TaiAn	3	112	XiangFan	3	162	SuZhou	4
13	ChengDu	2	63	FoShan	3	113	JinZhou	3	163	PuTian	4
14	JiNan	2	64	QinHuangDac	3	114	DeZhou	3	164	NanPing	4
15	QingDao	2	65	ZhuZhou	3	115	LiaoYang	3	165	JinHua	4
16	ChangChun	2	66	JiangMen	3	116	MuDanJiang	3	166	ChaoHu	4
17	Xi'An	2	67	WeiHai	3	117	ZhaoQing	3	167	SanMing	4
18	HaErBing	2	68	ZhenJiang	3	118	SuiZhou	3	168	ChengDe	4
19	ZiBo	2	69	LiuZhou	3	119	DanDong	3	169	NeiJiang	4
20	XiaMen	2	70	MianYang	3	120	HengYan	3	170	XuanCheng	4
21	DongGuan	2	71	KeLaMaYi	3	121	LuZhou	3	171	XinYu	4
22	KunMing	2	72	ZaoZhuang	3	122	ShaoGuan	3	172	LiaoCheng	4
23	FuZhou	2	73	HuiZhou	3	123	ChangZhi	3	173	XieTai	4
24	NingBo	2	74	DaTong	3	124	LongYan	3	174	BaiYin	4
25	WuXi	2	75	YangZhou	3	125	JingZhou	3	175	HengShui	4
26	ShiJiaZhuang	2	76	BaoDing	3	126	ZhouShan	3	176	BoZhou	4
27	ChangSha	2	77	HaiKou	3	127	YongZhou	3	177	WuZhou	4
28	DongYing	2	78	NanYang	3	128	XinXiang	3	178	SongYuan	4
29	ZhengZhou	2	79	ChangDe	3	129	YinChuan	3	179	SuiNing	4
30	SuZhou	2	80	HuHeHaoTe	3	130	QuJing	3	180	YiChun	4
31	WenZhou	2	81	JiaXing	3	131	BengBu	3	181	FuXin	4
32	AnShan	2	82	QiQiHaEr	3	132	LangFang	3	182	JingDeZher	4
33	ZhongShan	2	83	BenXi	3	133	PingXiang	3	183	ChuZhou	4
34	NanChang	3	84	ShaoXing	3	134	YiBin	4	184	GanZhou	4
35	YanTai	3	85	XiangTan	3	135	ShangQiu	4	185	ChaoZhou	4
36	TangShan	3	86	XianYang	3	136	XinYang	4	186	BeiHai	4
37	TaiYuan	3	87	ZhangJiaKou	3	137	AnQing	4	187	SuZhou	4
38	XuZhou	3	88	MaoMing	3	138	ChiFeng	4	188	XuChang	4
39	ZhuHai	3	89	RiZhao	3	139	YangQuan	4	189	JiXi	4
40	LanZhou	3	90	QinChuan	3	140	JieYang	4	190	JinCheng	4
41	WuLuMuQi	3	91	WuFu	3	141	HuaiAn	4	191	YuLin	4
42	TaiZhou	3	92	LaiWu	3	142	YanCheng	4	192	WuWei	4
43	PanJin	3	93	JingMen	3	143	BingZhou	4	193	ZiYang	4
44	JiLin	3	94	HuangShi	3	144	HuaiBei	4	194	TongHua	4
45	HeFei	3	95	LianYunGang	3	145	ZunYi	4	195	TianShui	4
46	ShanTou	3	96	PuYang	3	146	NanChong	4	196	LinFen	4
47	GuiYang	3	97	BaoJi	3	147	YangJiang	4	197	HeBi	4
48	NanNing	3	98	AnYang	3	148	YiYang	4	198	QiTaiHe	4
49	YuXi	3	99	GuiZhou	3	149	JiaMuSi	4	199	LuoHe	4
50	ZhanJiang	3	100	MaAnShan	3	150	FuYang	4	200	ZhaoTong	4