

## Country-of-Manufacture Effects on Consumer Choice

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**Abstract.** In modern market, consumer choice behavior attracts attention from researchers and manufacturers for its importance and unpredictability; assessing what makes a consumer buy a product is critical for an enterprise. When considering a multinational product, literature proves that country-of-manufacture (COM) image does affect consumer choice behavior, but few explore how deep COO image may go in consumers' mind. Brand choice models represent the underlying process by which an individual consumer integrates information to select a brand from a set of competing brands, they are used to evaluate a consumer's choice probability of a product among competing products. This study aims at evaluating female consumer choice probabilities of lady's underwear products from different COMs; the evaluation result reveals competitiveness of these COMs in Taiwan. Brand choice models are selected as analysis tool in this study, and seven countries of A1, A2, A3, A4, A5, E1, and E2 are selected for implementation based on an official statistic report. The results show that lady's underwear products from E2, E1, and A2 are the most popular ones in Taiwan, the choice probability values they obtained are 0.226, 0.224, and 0.174, accordingly. Furthermore, quality is the most important product attribute, COM, design, price go next, followed by awareness. This may provide manufacturers in these COMs relative information, and help promote competitiveness.

**Keywords:** Country-of-origin, country-of-manufacture, brand choice models

### 1. Introduction

In modern market, international trade has been thriving owing to globalization of economic processes, which makes an international product be no longer manufactured or designed by its brand-origin (BO) country. Triumph-international, for example, was founded in Germany in 1886, and its multinational manufacturing and marketing organization operates in more than 120 countries around the world. Due to the complexity of source information, consumers are confused about their perception of the quality or other attributes of an international product. In this case, country-of-origin (COO) image is critical when consumers decide whether to buy the product or not. Furthermore, country-of-manufacture (COM) images exert an impact on brand quality, not brand image (Insch & McBride, 2004; Hamzaoui, Merunka, & Bartikowski, 2011), while COO image moderates the impact of BO on brand equity, such that the effects of BO on brand equity are stronger when the brand is more typical (Hamzaoui, et al., 2011).

Dichter (1962, in Verlegh & Steenkamp, 1999) was the first to contend a product's COO may have an influence on the acceptance of products. Since then, researches on COO had flourished from 70's to 90's. In literature review by Verlegh and Steenkamp (1999), most researches identified that COO does have an effect on consumers' purchase decision, it acts as the 'signal' for product quality. Chao (1993, in Verlegh & Steenkamp, 1999) distinguished hybrid and non-hybrid products, but argued that separating COO into COD (country of design) and COM may result in a decrease of the meaning that consumers attach to these constructs, so he concluded it's worthwhile to explore how COO effect sizes are affected by multinational production. However, successive researchers tend to separate and compare the effects between BO, COM, and COD. Some of them contend COD, COA (country of assembly) and COM do have different effects on

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product evaluations with the COM exhibiting the strongest influence (Insch & McBride, 2004), others extend this research and found that consumers are more sensitive to COD for symbolic meanings products than for private goods for which COM is important (Hamzaoui & Merunka, 2006). From this point of view, COM is more important than BO and COD for private goods such as lady's underwear products.

Lady's underwear products are highly associated with consumer preference, manufacturers need to know what influence consumers' choice among such products, and to what extent they will buy. Stochastic economic models are used for analyzing consumer choice behavior because of its uncertainty; such models are called brand choice models. The following section describes different branches of brand choice models and research methods, Section 3 illustrates implementation results, and Section 4 concludes the research.

## **2. Evaluating consumer choice**

Consumer choice behavior always obtains manufacturers' attention for its unpredictability, evaluating consumer choice behavior thus becomes challenging and critical; brand choice models has been developed for this sake for decades. Manrai (1995) had reviewed the development of brand choice models and illustrated their definition, branches and evolution, his work is abbreviated in Section 2.1.

### **2.1. Review of Brand choice models**

Brand choice models represent the underlying process by which an individual consumer integrates information to select a brand from a set of competing brands. With varying assumptions and purposes, they differ in underlying logic structure that drives them. There are three categories of these models, namely, (1) multi-attribute choice models, (2) preference and choice mapping models, and (3) conjoint analysis. Among these three categories, the multi-attribute models play an important role in marketing applications. They have been used for determination of market structure, demand forecasting, product positioning, buyer segmentation, and prediction of consumer choice. These models are driven by two fundamental principles, namely, (1) the principle of utility maximization (brand-based processing), and (2) the psychological principle of attribute-based sequential elimination (attribute-based processing). The difference lies in the assumptions about the way consumers process information.

The principle of utility maximization postulates that a consumer uses all relevant information and selects the brand that maximizes his/her utility. The basic choice process assumes that all of the attributes are considered in a simultaneous compensatory structure, thus assigning a utility value to each brand. Luce's (1959, in Manrai, 1995) model is the earliest brand-based processing model; McFadden (1976) extended and revised his model as the classical independent multinomial logit (MNL) model. Following brand-based processing models include Nested Multinomial Logit (NMNL) model (McFadden, 1981, in Manrai, 1995), Multinomial Probit (MNP) model (Currim, 1982, in Manrai, 1995), Generalized Logit Model (GLM) (Dalal & Klein, 1988, in Manrai, 1995), Multiplicative Competitive Interaction (MCI) model (Cooper & Nakanishi, 1988, in Manrai, 1995) etc.

The principle of attribute-based processing suggests that a consumer makes a selection through a simplified heuristic and may not use all the relevant information available at the time of choice. The choice is made by comparing brands on attribute-by-attribute basis. The assumption is that there is a random or hierarchical sequence in which the attributes are considered. Elimination-By-Aspects (EBA) Model (Tversky, 1972, in Manrai, 1995) is a prime example of these models. Other models in this category include Elimination-by-Cutoffs (EBC) model (Manrai & Sinha, 1989, in Manrai, 1995), Elimination-by-Dimensions (EBD) model (Gensch & Ghose, 1992, in Manrai, 1995), and other EBA-like models.

### **2.2. Methods**

The various brand choice models are based on different assumptions and purposes, selecting an appropriate model among them now has been more difficult than before. Matsatsinis and Samaras (2000) presented a process of brand choice model selection, which refers to transformation of preference table, estimation of parameters such as skewness and kurtosis, selection of an appropriate brand choice model, and assessment of choice probability. Other researches concern about complexity-induced choice inconsistency in choice set (DeShazo, 2002), or the factors affecting consumers' purchase decision. Most of these

researches conclude that price and quality have long-term effect on consumers' decision (Pauwels, Hanssens, & Siddarth, 2002; Chib, Seetharaman, & Strijnev, 2004; Erdem, Keane, & Sun, 2007).

According to COO literature, country image affects consumers' perception of product quality, so this study chooses seven countries for implementation based on an official statistic report. Two of them are European countries, namely E1, E2, the rest are Asian countries, namely A1, A2, A3, A4, and A5. The choice set is simple, and an appropriate choice model is needed to evaluate consumers' choice behavior, so the process presented by Matsatsinis and Samaras (2000) is employed in this study. The process involves the following steps:

- Obtain preference tables from consumers.
- Decide utility function  $u_i(g_i)$  and transfer values  $a_{ij}$  on the preference table into utility value  $U_i$ , where  $U_i = u_i(g_i) = \sum_j \beta_j a_{ij}$ ,  $i=1,2,\dots,n$ ,  $0 < U_i < 1$ .
- Find maximum utility value  $U_{\max}$  and minimum utility value  $U_{\min}$ .  $R = U_{\max} - U_{\min}$ ,  $\delta = 1$  if  $0 \leq R \leq 0.1$ ,  $\delta = 2$  if  $0.1 < R \leq 0.3$ ,  $\delta = 3$  if  $0.3 < R \leq 0.6$ ,  $\delta = 3$  if  $0.6 < R \leq 1$ .
- Calculate  $\varepsilon$  and  $x_i$ ,  $\varepsilon = \delta^i / (n-1)$ ,  $x_i = U_{\min} + (2i-1)\varepsilon/2$ ,  $i=1,2,3,\dots,n-1$ .
- Calculate  $\mu$ ,  $\mu = \sum_{i=1}^{n-1} f_i x_i / \sum_{i=1}^{n-1} f_i$ ; estimate  $r^{th}$  moment  $m_r$ ,  $m_r = \sum_{i=1}^{n-1} f_i (x_i - \mu)^r / \sum_{i=1}^{n-1} f_i$
- Estimate skewness  $\alpha_3$ ,  $\alpha_3 = m_3 / \sqrt{m_2^3}$  and kurtosis  $\alpha_4$ ,  $\alpha_4 = m_4 / m_2^2 - 3$
- Find a match in the rule base presented by Matsatsinis and Samaras (2000). If a match is found, a selected model number is returned.
- Estimate choice probability with the selected choice model in Tab. 1.

Tab. 1 Brand choice models

| No. | Name                                | Model  | No. | Name                 | Model  |
|-----|-------------------------------------|--|-----|----------------------|--|
| 1   | Luce                                | $P_{ij}(C) = \frac{U_{ij}}{\sum_{k \in C} U_{ik}}$   | 2   | Lesourne             | $P_{ij}(C) = \frac{U_{ij}^2}{\sum_{k \in C} U_{ik}^2}$   |
| 3   | Multinomial Logit Model(McFadden-1) | $P_{ij}(C) = \frac{e^{U_{ij}}}{\sum_{k \in C} e^{U_{ik}}}$   | 4   | McFadden-2           | $P_{ij}(C) = \frac{e^{2U_{ij}}}{\sum_{k \in C} e^{2U_{ik}}}$                                     |
| 5   | Width of Utilities-1                | $P_{ij}(C) = \frac{U_{ij}^{U_{\max}-U_{\min}}}{\sum_{k \in C} U_{ik}^{U_{\max}-U_{\min}}}$   | 6   | Width of Utilities-2 | $P_{ij}(C) = \frac{e^{(U_{\max}-U_{\min})U_{ij}}}{\sum_{k \in C} e^{(U_{\max}-U_{\min})U_{ik}}}$ |
| 7   | Maximum of utilities                | $P_{ij}(C) = \begin{cases} \frac{1}{m} & \text{if } U_{\max} \geq U_j \geq U_{\max} - \varepsilon_i, \text{ where } \varepsilon_i = \frac{U_{\max} - U_{\min}}{n-1} \\ 0 & \text{otherwise} \end{cases}$ |     |                      |  |
| 8   | Equal probabilities                 | $P_j = \frac{1}{m}$ , where $U_{\max} - U_{\min} \leq 0.1$   |     |                      |  |

\*Source: Matsatsinis and Samaras (2000)

### 3. Results and discussion

#### 3.1. Data

Questionnaire with four parts are tested and analyzed. Part I contains demographic variables, Part II provides questions of most and least favorite COMs; Part III states five product attributes, namely Quality, COM, Design, Price, and Awareness. Part IV is a preference table, with dimension of 7 \* 4 (COM \* attributes). 60 copies of pretested questionnaire are collected and analyzed with SPSS for adjustment. 300 copies of questionnaire are collected from female consumers by face-to-face interviewing in shopping malls, rail stations, night markets in Tainan and Kaohsiung. 263 out of 300 copies are effective, the statistic of demographic variables shows that students take 68.1% share in Profession, age group between 21 and 30 takes 66.9% share in Age, and store type of exclusive agency takes 43.3% share in Distribution variable.

#### 3.2. Preference analysis

Part II and Part III are analyzed with Likert 5-point Scale. In Part II, the averaged scores of the most favorite COMs, E1, E2, A2, are 4.29, 4.07, 3.82, while those of the least favorite COMs, A1, A3, A4, are

4.07, 3.94, and 3.87, respectively. Tab. 2 illustrates the T-test results of the most favorite COMs, and Tab. 3 shows those of the least favorite ones. In Tab. 2, all differences between E1-E2, E1-A2, and E2-A2 pairs are significant; however, the COMs in Tab. 3 are not significantly different.

Tab. 2 T-test for difference between the most favorite COMs

| Most favorite | E1 | E2    | A2      |
|---------------|----|-------|---------|
| E1            | 0  | 0.22* | 0.47*** |
| E2            |    | 0     | 0.25*** |
| A2            |    |       | 0       |

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.005

Tab. 3 T-test for difference between the least favorite COMs

| Least favorite | A1 | A3   | A4   |
|----------------|----|------|------|
| A1             | 0  | 0.13 | 0.2  |
| A3             |    | 0    | 0.07 |
| A4             |    |      | 0    |

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.005

In Part III, the averaged values of consumers' assessment of product attributes Quality, COM, Design, Price, and Awareness are 4.319, 4.068, 4.042, 3.97, and 3.669, accordingly. These values are tested by pair T-test to see if the difference between pairs is significant. Tab. 4 shows the result of T-test.

Tab. 4 T-test for difference between product attributes

| Attribute | Quality | COM      | Design | Price | Awareness |
|-----------|---------|----------|--------|-------|-----------|
| Quality   | 0       | 0.251*** |        |       |           |
| COM       |         | 0        | 0.027  | 0.099 |           |
| Design    |         |          | 0      | 0.072 |           |
| Price     |         |          |        | 0     | 0.300***  |
| Awareness |         |          |        |       | 0         |

\*\*\* p < 0.005

It is shown in Tab. 4 that Quality is at the first priority of consideration when consumers purchase lady's underwear products. COM, Design, and Price go next; none of the difference between each pair of them is significant, so they are granted the same important in consumers' mind. Followed is Awareness, indicating that for a multinational product, BO does not stand for quality, COM does; so COM is prior to Awareness.

### 3.3. Choice probability evaluation

A preference table contains  $a_{ij}$ ,  $i=1, 2, \dots, 7, j=1, 2, 3, 4$ , which is transferred into utility values with utility function. Tab. 5 is a real example showing the process of evaluation. In this table, values of Price, Quality, and Awareness are extracted from questionnaire; Design is associated with brand strategy instead of COM, so it is not accommodated in preference table. On the other hand, product safety has been a hot issue recently, so Safety is accommodated to realize how consumers grant it.

Tab. 5 A real example and final result of choice probability evaluation

| Attribute<br>COM | Price | Quality | Awareness | Safety | Utility | Example<br>Probability | Overall<br>Probability | MNL<br>Probability |
|------------------|-------|---------|-----------|--------|---------|------------------------|------------------------|--------------------|
| A1               | 1     | 1       | 2         | 1      | 0.119   | 0.082                  | 0.068                  | 0.087              |
| A2               | 3     | 5       | 4         | 4      | 0.862   | 0.173                  | 0.174                  | 0.162              |
| A3               | 1     | 3       | 2         | 2      | 0.420   | 0.111                  | 0.071                  | 0.124              |
| A4               | 1     | 3       | 2         | 2      | 0.420   | 0.111                  | 0.072                  | 0.127              |
| A5               | 1     | 3       | 3         | 3      | 0.549   | 0.127                  | 0.165                  | 0.178              |
| E1               | 5     | 5       | 5         | 5      | 0.994   | 0.198                  | 0.224                  | 0.179              |
| E2               | 5     | 5       | 5         | 5      | 0.994   | 0.198                  | 0.226                  | 0.143              |

The parameters of this example are as follows:  $U_{max}$  is 0.994,  $U_{min}$  is 0.119,  $R$  is 0.875,  $\delta$  is 4,  $\epsilon$  is 0.146,  $\alpha_3$  is -0.123, and  $\alpha_4$  is -1.329. Searching in rule base presented by Matsatsinis and Samaras (2000) with  $\delta$ ,  $\alpha_3$  and  $\alpha_4$  will get a returned model number, which corresponds to choice model in Tab. 1. The choice probability is estimated, and the evaluation process for one preference table is done. The averaged overall choice probability is the ultimate result from all preference tables. The overall result of MNL model alone is also presented for comparison with that of evaluation process. According to Tab. 2 and Tab. 3, valuation process outperforms MNL model alone by reflecting the share of each COMs more pertinently.

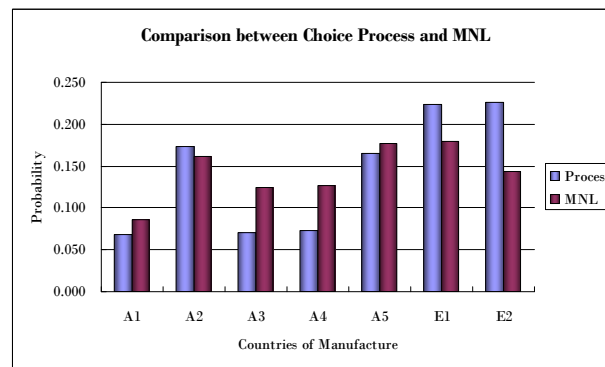


Fig. 1 Comparison between evaluation process and MNL model

## 4. Conclusion

In modern market, when consumers are making their choice among multinational products, they are often confused about the complex source information. Researches validate COM image affects the perception of quality in consumers' mind, so this study explores how deep COM image effect may go. The final results reveal two aspects: (1) quality is at the first priority of consumers' purchase consideration, COM, design, price go next, followed by awareness. This means manufacturers are competitive if they focus on quality. (2) the overall choice probability indicates competitiveness share of each COM from a forward view. These countries of manufacture may predict their future share and make resource allocation in response. COM is the only variable employed for choice probability evaluation in this study; more variables such as price may be used to explore choice probability evaluation in future research.

## 5. References

- [1] A. K. Manrai. Mathematical models of brand choice behavior. *European Journal of Operational Research*, 1995, 82(1): 1-17
- [2] D. McFadden. Quantal choice analysis: A survey. *Annals of Economics and Social Measurement*, 1976, 5: 363-390.
- [3] G. S. Insch and J. B. McBride. The impact of country-of-origin cues on consumer perceptions of product quality: a binational test of the decomposed country-of-origin construct. *Journal of Business Research*, 2004, 57 (3): 256-265.
- [4] J. R. DeShazo. Designing choice sets for stated preference methods: the effects of complexity on choice consistency. *Journal of Environmental Economics and Management*, 2002, 44: 123-143.
- [5] K. Pauwels, D. M. Hanssens, and S. Siddarth. The long-term effects of price promotions on category incidence, brand choice, and purchase quantity. *Journal of Marketing Research*, 2002, 39 (4): 421-439.
- [6] L. H. Hamzaoui, D. Merunka, and B. Bartikowski. Brand origin and country of manufacture influences on brand equity and the moderating role of brand typicality. *Journal of Business Research*, 2011, 64 (9): 973-978.
- [7] L. Hamzaoui and D. Merunka. The impact of country of design and country of manufacture on consumer perceptions of bi-national products' quality: an empirical model based on the concept of fit, *Journal of Consumer Marketing*, 2006, 23 (3): 145-155.
- [8] N. F. Matsatsinis and A. P. Samaras. Brand choice model selection based on consumers' multicriteria preferences and experts' knowledge. *Computer & Operations Research*, 2000, 27 (7-8): 689-707.
- [9] P. W. J. Verlegh and J. B. E. M. Steenkamp. A review and meta-analysis of country-of-origin research. *Journal of Economic Psychology*, 1999, 20 (5): 521-546.
- [10] S. Chib, P. B. Seetharaman, and A. Strijnev. Model of brand choice with a no-purchase option calibrated to scanner-panel data. *Journal of Marketing Research*, 2004, XLI: 184-196.
- [11] T. Erdem, M. P. Keane, and B. Sun. A dynamic model of brand choice when price and advertising signal product quality. Available at SSRN: <http://ssrn.com/abstract=965473>, 2007.