茨城キリスト教大学紀要第53号　161
社会科学　p. 161～171

# MNEs' Foreign Subsidiary Localization and Demand Creation

Hitoshi FURUI

## I. Introduction

With growing consumption levels as a result of increasing wages in emerging countries, multinational enterprises (MNEs) that have expanded into those countries place relatively greater emphasis on capturing local markets[i] than on reducing costs. This paper presents localization where the functions of marketing and product development are shifted to local subsidiaries to create differentiated products (i.e. varieties) required for market share expansion and demand creation using a market capture-type fragmentation model and to derive the economic conditions under which the model can be executed. The paper also analyzes conditions for market equilibrium and trade profits with this fragmentation.

Contrary to the analytical emphasis on supply in traditional cost reduction, the market-capture-type fragmentation discussed in this paper focuses on the aspects of demand expansion and demand creation[ii]. To create a model from the standpoint of splitting production processes and capturing markets, we regard it as "the movement of management resources accompanying the deployment and expansion of production processes that were split for the purpose of capturing local markets," in line with existing research[iii].

This paper is structured as follows. Section II elucidates a market capture-type fragmentation model, clarifying the mechanism through which demand and market share are expanded by changing the combinations of product price and quality to meet consumer needs in local markets. Section III deals with market equilibrium conditions when differentiated products (i.e., varieties) are supplied. Section IV analyzes the impact of trade that is started under such conditions, and Section V summarizes the paper and provides future prospects.

## II. Localization: A Market-Capture-Type Fragmentation Approach

This section focuses on the product price-quality curve as a basis for localization to improve the circumstances that local subsidiaries of MNEs face as described below. We present a market capture-type fragmentation model that includes market variables such as demand, market share, profit, and expenses and derive the economic

conditions under which the model succeeds.

Here, we assume that a local subsidiary supplies products of a level of quality that is too high for local consumers and that the local subsidiary has not succeeded in capturing the local market. We assume that local consumers prefer low-priced products even if the quality is low. The parent company (i.e., the MNE headquarters) ascertains the ideal price points and performs fragmentation to optimize product price and quality.

Moreover, price and quality optimization in this study means setting prices sa as to maximize the price elasticity of demand. In simple words, quality is defined by price. In the case of fragmentation, it is assumed that marketing and product development functions are transferred to the local subsidiary or that locally made parts and intermediate goods are to be used.

**1. Price and Quality Optimization**

Figure 1 shows how fragmentation and market capture are linked in this case. In one quadrant of the figure, with the horizontal axis on the right being quality μ and on the left being price P and the upper vertical axis being price and the lower one being demand D, the relation between price and quality is shown as a line moving upward and to the right, with high quality leading to high prices. We now assume that the equilibrium point prior to fragmentation is $\tau_2$. Because quality is high with $\mu_2$, the price $P_2$ is also high. In this case, the demand curve point defined by $\mu_2$ in the four quadrants is $e_2$.

This demand curve is posited as follows. Local consumers acknowledge that quality is poor until $\mu_1$ is reached and emphasize high quality over low price. Accordingly, demand increases along with quality. However, when the quality of $\mu_1$ is exceeded, consumers conversely assess quality as being excessively high. In other words, consumers prioritize low prices over high quality. Therefore, as quality increases, demand drops. Based on these demand-curve-related assumptions, the price elasticity of demand is maximized when the price is $P_1$ in correspondence to $\mu_1$. Demand corresponding to $e_1$ is $x_2$, and in this case, total revenue is expressed as $P_1x_1(0P_1d_2x_2)$.

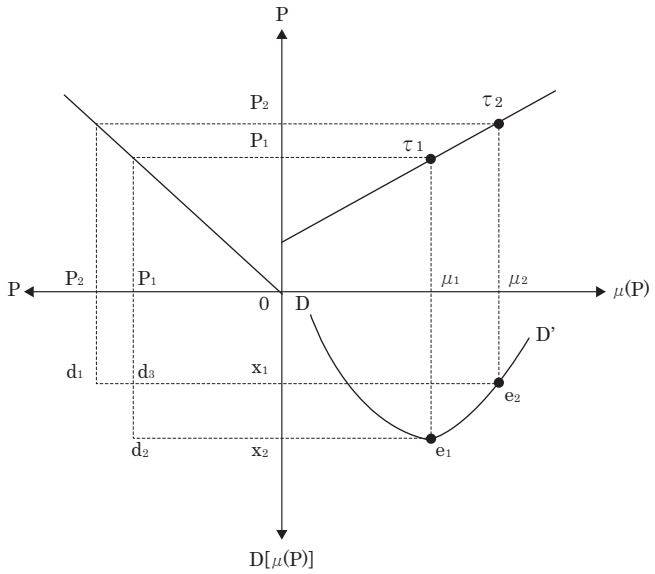


Figure 1 Price and quality optimization, and demand expansion

Next, let us examine the effect of fragmentation (i.e., transfer of marketing and product development functions) by MNEs on achieving product quality optimization under these conditions. Here, it is assumed that the post-fragmentation equilibrium point moves from $\tau_2$ to $\tau_1$. When doing so, demand increases from $x_1$ to $x_2$, and total revenue changes from $P_2x_1(0P_2d_1x_1)$ to $P_1x_2(0P_1d_2x_2)$. Accordingly, if $x_1d_3d_2x_2 > P_1P_2d_1d_3$ is realized, the objective of capturing the market is achieved.

We will derive the conditions[iv] for capturing profit in this case. Prior to fragmentation, the cost function[v] $TC_1$ is set to $TC_1 = c_1(x_1) = a_1 + b_1x_1$, Here, $a_1$ represents a constant term, and $b_1$ represents the marginal cost. The post-fragmentation cost function, $TC_2$, when compared to $TC_1$, shows an increase in fixed costs unrelated to production volume such as marketing, product development, and service link cost related to these functions, and marginal cost drops with quality optimization. Thus, $TC_2 = c_2(x_2) = a_1 + a_2 + (b_1 - b_2)x_2$, with $a_2$ representing the increase in fixed costs and $b_2$ representing the reduction in marginal cost. Accordingly, when the condition $P_2x_2 - a_1 - a_2 - (b_1 - b_2)x_2 > P_1x_1 - a_1 - b_1x_1$ is satisfied, post-fragmentation profit increases.

If, prior to fragmentation, a state of long-term equilibrium exists, where the entry or exit of the firm is halted and the profit is zero, the conditions for capturing profit after fragmentation are simplified to $P_2x_2 > a_1 + a_2 + (b_1 - b_2)x_2$. If this condition is satisfied, firms execute fragmentation. Further, if both sides of the formula are divided by $x_2$, it can be rewritten as $P_2 > (a_1 + a_2) / x_2 + (b_1 - b_2)$. Accordingly, the

setting of prices can be understood as being impacted by economies of scale and a reduction in marginal cost. The market capture-type fragmentation model also has economies of scale, but their effect is inferior to that of the cost reduction model.

**2. The Effect of Quality Conversion**

The emphasis on quality differs between the MNE's home country and local markets. It is assumed here that the local subsidiary is not successful in capturing the local market, either because the quality emphasized by the local market cannot be determined or the products made to home country specifications are sold as is locally. The parent company executes fragmentation similar to the previous case, so that it can increase locally emphasized quality and develop products with lower, unemphasized quality.

Figure 2 explains how fragmentation and market capture in this case are linked. Both the horizontal and vertical axes in the figure show product quality ($\mu_a$, $\mu_b$). As a combination of quality, $\mu_b$ is relatively emphasized by local markets in the model, and the slope of the relative quality line for the local market is steeper than for the home country market. The equilibrium point prior to fragmentation is $\tau_1$. In other words, products made to home country specifications are supplied as is to local markets. When doing so, the local market demand function is shown as $D_f(\mu_{ah}\ \mu_{bh})$ in the figure on the right, with price determined by $P_2$, and demand by $x_1$. Total revenue corresponding to these is $P_2x_1$.

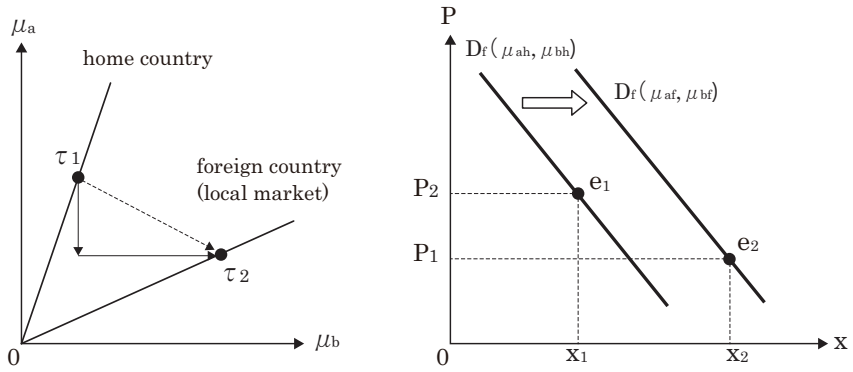


Figure 2 The impact of quality conversion and demand creation

A quality conversion occurs with fragmentation; $\mu_b$, which is emphasized in local markets, rises, and $\mu_a$, which is not emphasized so much, drops; in conjunction with this, the point of equilibrium in the figure on the left shifts to $\tau_2$. A change in product price depends on the amount of increase and decrease in product quality, and herein we deal with cases of price decreases. Through the aforementioned quality conversion,

the demand function[vi] is assumed to have taken on the shape of $D_f(\mu_{af}, \mu_{bf})$ in the figure on the right. In this case, the point of equilibrium changes from $e_1$ to $e_2$, and total revenue corresponding to $e_2$ is expressed as $P_1x_2$.

The conditions under which this fragmentation can be achieved are derived using the same procedure as in the previous case. Post-fragmentation cost $TC_2$ can be expressed as $a_1 + a_2 + (b_1 - b_2)x_2$ and revenue as $P_1x_2$. Here, $a_2$ is the increase in fixed costs, and $b_2$ is the decrease in marginal costs due to a quality conversion. Accordingly, the condition under which fragmentation can be achieved is derived as $P_1x_2 - a_1 + a_2 + (b_1 - b_2)x_2$[vii]. Additionally, when comparing the quantity ratio before and after fragmentation with factors impacting profit for each relative cost, it is $x_2 / x_1 > P_2 / P_1$. Thus, we can see that it is important for the quantity ratio to exceed the price ratio.

In this section, we describe a market capture-type fragmentation model focusing on increasing demand through optimized quality, as well as conditions that support the model. The results of our analysis reconfirmed the need to expand sales or production to cover fixed costs and the need for localization that takes into account price elasticity of demand, which impacts by sales volume. In the next section, we shift the perspective of the analysis from individual firms to an overall market and analyze market equilibriums and trade profits after fragmentation.

## III. Market Equilibrium

This section examines market equilibriums when the aforementioned fragmentation is executed, assuming a monopolistic competition model[viii] with product differentiation based on a diversity preference approach, and adding the element of trade[ix] into the model.

### 1. Households

Each household has one unit of work force and α units of homogeneous numéraires. Assuming that the amount of numéraires consumed by each household is $x_0$, the consumption of i varieties of differentiated goods is xi(i = 1, 2, …, n), the wage rate measured in numéraires is w, the price of varieties is $p_i$, and the equation for constrained household budgets is expressed as $w \times 1 + \alpha = x_0 + \sum_{i=1}^{n} p_i x_i^{\,x} \cdot w + \alpha$ on the left side represents the unit of work force held by the household and the income captured by supplying α units of numéraires to the market, and the right side represents expenditures needed to consume numéraires $x_0$ and each variety $x_i$.

Each household determines the amount of each good and variety to consume so as to maximize utility as expressed by the utility function $U(x_0, x_1, x_2, \ldots, x_n) = x_0 + \sum_{i=1}^{n} v(x_i)$, which introduces numéraires (the 0th good) produced and consumed under the budget constraints of the above formula. Here, $x_0$ represents the number of numéraires consumed, v represents the sub-utility function, and $x_i$ represents the

amount of each variety of differentiated good consumed. At this time, the inverse demand function for each variety is represented as function $p_i = P(x_i)$ only for the price of each variety.

**2. Firm Profit Maximization**

Producing each variety requires the fixed costs mentioned in the previous section. Here, it is assumed that there is a work force f that is used for aspects such as marketing, product development, and advertising of the differentiated varieties. Further, suppose that only the work force c is required to increase production by one unit for each variety. Accordingly, producing $y_i$ units of the i variety requires a work force of $cy_i + f$ units[xi]. If the wage rate is w, the cost of producing $y_i$ units of i variety is represented as $C(y_i) = wcy_i + wf$. Here, the coefficient wc of production volume $y_i$ represents marginal cost, while wf represents fixed costs. The average cost is $C(y_i) / y_i = wc + wf / y_i$, which decreases as production increases[xii].

Firms that produce differentiated products are exclusive with regard to the variety they produce, and the reverse demand curve $p_i = P(x_i)$ for each variety is well known. If the number of consumers L and the demand of i variety per household is $x_i$, then $x_iL = y_i$. In this case, the profit $\pi_i$ of firms producing i variety is represented as $\pi_i(x_i) = p_iy_i - C(y_i) = \{ P(x_i)x_i - wcx_i \}L - wf$.

From this assumption, choosing a supply volume such that the marginal revenue and marginal cost match is a condition for maximizing profit for the firms producing each variety. If the volume supplied here per household is known, we can also determine the total volume supplied, and each firm can determine $x_i$ instead of $y_i$.

In this case, marginal revenue and marginal cost are expressed as $P(x_i)[1 - 1/\varepsilon(x_i)] = wc$. The price elasticity of demand for i variety is represented here by $\varepsilon(x_i)$. The above conditions are common across all varieties. The supply volume $x_i$ and price $p_i$ both per household are represented by x and p, respectively, and are common across all varieties. If the real wage rate is w = W/P, then the above formula can be rewritten as $w = 1 / c[1 - 1 / \varepsilon(x_i)]$.

It is assumed that the price elasticity ε of demand for each variety decreases as demand x increases. In this case, the relation between the condition for maximizing profits of production firms for each variety, the comprehensive real wage w, and the supply volume x per household is represented as a curve that slopes downward and to the right. One such curve is curve A in one quadrant of Figure 3. When the real wage rate w rises, the firms that produce in variety reduce supply such that y = xL.

Figure 3 shows the demand per household on the right side of the horizontal axis, production volume per firm on the left side, the real wage rate on the upper side of the vertical axis, and the number of varieties on the lower side. In the middle of the figure is curve A, which represents the condition $w = [1 - 1 / \varepsilon(x_i)] / c$ for maximizing the

profit of firms that produce varieties; curve B represents the condition w＝xL/[cxL+f] for zero profit of firms that produce varieties; curve C represents the condition for zero profit as seen in the relation between production volume per firm and the real wage rate; and curve D shows the condition for the labor market equilibrium as seen in the relation between production volume per firm and the number of varieties[xiii].

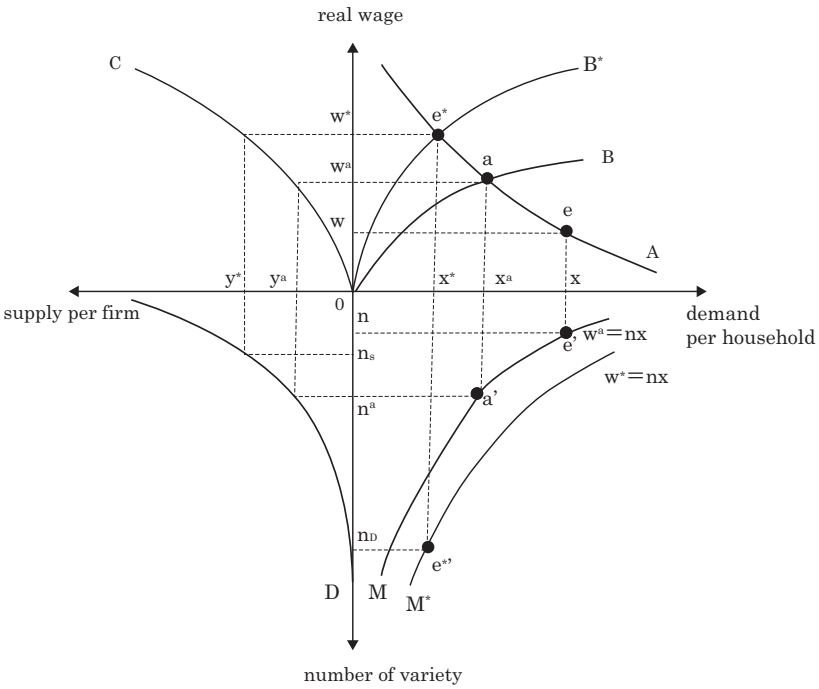


Figure 3 Product differentiation, market equilibrium, and trade profits

### 3. Long-Term Equilibrium in the Local Market

Assume that the number of varieties is given as shown by n in Figure 3. As we have already seen, the labor market equilibrium, supply volume per integrated household, and real wage rate are represented by the e points in the top part of the figure. The e points are located below curve B; thus, the existing firm has captured positive profits.

Positive profits encourage potential firms to enter the market and to increase the number of varieties supplied to the market, thus creating excess demand in response to labor. This results in a long-term equilibrium that brings market entry and exit to a halt. As this occurs, the equilibrium establishes the number of varieties when the condition for maximizing profit, the labor market equilibrium condition, and the zero profit condition are all satisfied.

In this figure, $w^a$, $x^a$, and $n^a$ represent the real wage rate, the supply per household, and the number of varieties, respectively, in the long-term equilibrium. The domestic market equilibrium is represented by point a. At this point in time, the real wage rate is $w^a$, the supply volume per household is $x^a$, the supply volume per firm is $y^a$, and the number of varieties is $n^a$.

## IV. The Impact of Trade

Implementing trade means that the number of consumers L increases for the firms that produce each variety. If so, curve B moves upward and becomes curve B*. Point a of the domestic market equilibrium lies below curve B in the new situation, and the existing firms are able to capture positive profits. Trade increases and profit opportunities expand as a result. However, because of circumstances explained below, not all existing firms are impacted in the same way.

Excess demand for labor is caused by existing firms expanding production in response to growing demand, and thus, the real wage rate increases. The increase in labor demand and real wage rate accompanying the increased production of each firm causes low productivity firms to exit the market. This, in turn, results in a decrease in the number of varieties produced domestically. The long-term equilibrium after trade is represented by e*. At that point in time, the real wage rate is w*, supply volume per household is x*, production volume per firm is y*, and number of varieties produced domestically is $n_s$.

### 1. Profits from Trade

In the aforementioned long-term equilibrium, the profits of firms are zero. Thus, profit from trade only occurs in terms of household consumption. The start of trade, from the perspective of each household, allows for the consumption of varieties produced overseas in addition to those produced domestically. Numéraires are supplied in the same quantities from each household, and $x_0 = \alpha$ then becomes established. Accordingly, the household budget constraints presented in Section III are simplified as $w = nx$. $w^a = n^a x^a$ is established in a domestic market equilibrium.

In the four quadrants of Figure 3, curve M represents the relation between the number of varieties that satisfy the budget constraint under real wage rate $w^a$ in the local domestic market equilibrium and consumption per household, as well as curve M* for the budget constraint $w^* = nx$ subsequent to trade. $w^* > w^a$ is established for real income. Thus, curve M* is located below curve M. Accordingly, the number of varieties consumed by households after trade is $n_D \equiv w^* / x^*$, and we can see that this increases more than $n^a$ in a domestic market equilibrium. Through trade, each household is able to consume more varieties $n_D$ than the number of varieties $n_s$ produced domestically ($n_D - n_s$ corresponds to the amount imported). Through the

increase in real wages and the number of varieties available for consumption because of trade, we observe that household utility rises.

## V. Conclusion

This paper presents the localization of MNEs in terms of transferring marketing and product development functions to local subsidiaries. By using a market-capture-type fragmentation model, it derives the economic conditions in which the model can be executed and then analyzes conditions for market equilibriums subsequent to fragmentation along with trade profits. The analysis points out the need for the expansion of the quantity covered by fixed costs. It also indicates the necessity for localization that takes into account the price elasticity of demand influencing quantity. A further finding from the results of the analysis on market equilibriums is that fragmented firms that produce varieties will decrease supply when the real wage rate increases if the local labor supply does not increase.

A weakness in the market-capture-type model compared to a cost-reduction model is that economies of scale lose their effect as the quantity of differentiated products for local markets increase. Incorporating trade into the analysis to solve the problem reveals that the demand for variety-producing firms expands as a result. This causes an increase in the number of consumers and opportunities for profit. However, a similar impact does not extend to all existing companies. Rather, it was found that an increase in labor demand and real wage rate accompanying an increase in production volumes for each firm causes firms with low productivity to exit the market. This, in turn, causes a decrease in the number of varieties produced domestically. With respect to recommendations for future study, a potential topic is the analysis of the effect of improvements to labor productivity with a constant supply of local labor on the number of varieties.

**Footnotes**

i They target local wealthy or middle-class people to supply high quality, high-priced products or international products. However, local subsidiaries struggle to capture local markets due to the consumers being unaware of the difference between high quality, high-priced products and low quality, low-priced products and companies not being provided products accepted by local consumers (as shown in existing studies).

ii The market-capture-fragmentation model in this paper deals with movements in demand curves and demand curve shifts, i.e., the securing of existing markets and expansion of market shares.

iii See Govindarajan and Trimble (2012), Fujimoto and Shintaku (2019).

vi In addition to optimizing product quality, it is also possible to create demand by changing consumer awareness when quality is constant. The relationship between quality and demand in this case is shown as in the four quadrants of Figure 1 as a shift in the demand curve. In actuality, the production promotion activities in which a firm is engaged result in consumers being able to correctly recognize product quality, and if price and quality in this

case are in a linear relationship, the price and quality curve in a quadrant may move to the right. In conjunction with this, the demand curve itself shifts downward, which results in demand creation and an increase in total revenue.

v Cost structure assumes a structure similar to cost-reducing fragmentation.

vi Price and marginal costs increase when b2 is replaced with –b2. A case where price and marginal costs are unchanged can be found by deleting b2.

vii The price elasticity of demand before and after fragmentation is assumed to be different.

viii Continuing from the previous section, production activities of individual firms are analyzed, and a monopolistic competition model is hypothesized, assuming a state of realistic market competition (with differentiated products supplied by firms). See Dixit and Stiglitz (1977) regarding a theory of demand that establishes product differentiation.

ix See Krugman (1980), Feenstra (2004), and others regarding trade models under monopolistic competition.

x For budget constraints in each household in equilibrium, the households' behavior is exactly the same because all households are completely symmetric.

xi Here, we posit that c and f are common to all firms or, in other words, that there is symmetry among firms.

xii Economies of scale in firms are assumed.

xiii Curve B is the only curve that is impacted by the number of consumers L.

**References**

Deartdorff, Alan. V. (2001), "Fragmentation in simple Trade Models," *North American Journal of Economics and Finance*, Vol.12, pp.121-131.

Dixit Avinash, K. and Joseph E. Stiglitz (1977), Monopolistic competition and optimum product diversity, *American Economic Review*, Vol.67, pp.297-308.

Feenstra, Robert, C. (2004), *Advanced International Trade*: Theory and Evidence, United Kingdom: Princeton University Press.

Helpman, Elhanan, Marc J. Melitz and Stephen R. Yeaple (2004), "Export Versus FDI with Heterogeneous Firms," *American Economic Review*, Vol.94, No.1, pp.300-316.

Jones, Ronald, W. and Kierzkowski, Henayk. (2000), "Framework For Fragmentation", *Fragmentation and Interntional Trade*, Oxford: Oxford University Press.

Govindarajan, V. and Trimble, C. (2012), *Reverse innovation : Create far from home, win everywhere,* Harvard Business Review Press: Massachusetts

Krugman, Paul, R. (1980), Scale economies, product differentiation, and the pattern of trade, *American Economic Review,* Vol.70, pp.950-59.

METI, *Survey on Overseas Business Activities.*

Stiglitz, Joseph E. and Carl E. Walsh (2002), *Principles of microeconomics* 3rd ed., New York:W.W. Norton.

Fujimoto, Takahiro and Shintaku, Junjirou (2019), *Globalization and Japanese Manufacturing,* Tokyo:Foundation for the Promotion of The Open University of Japan.

Toyo Keizai, *Kaigai shinshutsu kigyo soran*.

# 多国籍企業の現地化と需要創造

古井　仁

本稿は，新興国で事業を行う先進国多国籍企業が，現地市場開拓のために，現地で差別化製品（バラエティ）の開発に乗り出す場合に必要となる需要獲得型の投資（フラグメンテーション）に成功する経済学的な条件を提示し，このタイプの投資が実行された後の，閉鎖経済下での市場均衡，および貿易を考慮に入れた場合の効果を分析している。フラグメンテーションの成功条件として，現地向けの製品開発にかかる固定的な費用を分散化させる数量拡大効果，需要の価格弾力性を考慮した価格・品質適正化（製品多様化）の重要性を，模式図等を用いて示した。市場均衡分析の結果からは，現地国の実質賃金率が上昇すると，労働供給が増えない場合，バラエティ生産企業は供給量を減少させることを確認した。需要獲得型の投資の場合，規模の経済が働きにくくなる。貿易を入れたモデル分析からは，需要者の数が増加することでバラエティ生産企業への需要が拡大し，利潤機会も拡大し既存企業は生産規模を拡大するが，労働に対する超過需要による実質賃金の上昇をともなうと，一部の企業を市場から退出させ，その結果国内で生産されるバラエティ数は減少という結果を示した。