

Competition between firms in developing and developed countries

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Abstract

We analyze competition in emerging markets between firms in developing and developed countries from the viewpoint of the boundaries of the firm. Although indigenous firms generally face a disadvantage in technology compared with foreign firms, they have an advantage in marketing as local firms. Moreover, they have opportunities to leave weaker fields to independent specialized firms and use lower wages. On the other hand, foreign firms also have their own advantages and disadvantages for growth. Therefore, entry conditions for indigenous firms can vary greatly depending on the situation. We classify these conditions into eight cases by developing a model and showing each boundary choice for indigenous firms.

Keywords: the boundaries of the firm; indigenous firms; foreign firms; developing countries; developed countries

JEL classification: F23; L22; O12

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1. Introduction

Indigenous firms in developing countries are, for better or worse, significantly influenced by foreign-affiliated firms (foreign firms) in developed countries.¹ Since a substantial technology gap generally exists between them, indigenous firms have the potential to receive technologies from foreign firms through diffusion via international trade and foreign direct investment (FDI). Otherwise, they face the risk of losing fast-growing domestic markets by the entry of productive and competitive foreign firms if technological diffusion does not occur. If indigenous firms can enjoy the former positive effect, the so-called technology spillover effect, then the issue of how to build sufficient technology absorptive capability to realize the effect would become a major issue for indigenous firms' growth. On the other hand, if they suffer from the latter negative effect, the so-called market stealing effect, then do they have no hope to attain growth?

When indigenous and foreign firms strive for growth in emerging markets, they will naturally consider the contrasting advantages and disadvantages facing each other. Indigenous firms in developing countries often have an advantage in marketing because they know the local business environment well, including factors such as local consumer tastes, reliable distributors, and common business practices and customs. Inversely, foreign firms in developed countries often face a disadvantage in marketing for their lack of knowledge in these areas. However, foreign firms can hire independent specialized firms to conduct marketing services if distributors have been well developed. On the other hand, foreign firms often enjoy an advantage in technology, because they have accumulated research and development (R&D) capabilities for designing new, attractive products and skills for production as first movers. Indigenous firms, as latecomers, often face a disadvantage in technology for the opposite reasons. However, they also can leave independent specialized firms with technology services, if the modularization of product structures and vertical specialization in the technology field have both been well developed. Consequently, the advantages of indigenous firms in developing countries are in strong contrast to those of foreign firms in developed countries.

¹ Since we investigate competition between firms in developing and developed countries in emerging markets, in this study, indigenous and foreign firms mean firms in developing and developed countries, respectively.

Many indigenous and foreign firms have attained growth in emerging markets by exhibiting marketing and technology advantages. For example, in China's electrical and electronics markets covering products such as refrigerators, washing machines, air conditioners, television sets, personal computers (PCs), and mobile and smart phones, many indigenous firms have effectively organized nationwide sales and after-sale service networks and expanded their market shares against foreign firms (Kimura, 2011a). As a result, we can find many major Chinese manufacturers in these sectors, such as Haier, Hisense, Changhong, Lenovo, Konka, TCL, Changhong, Huawei, and ZTE. On the other hand, since they did not have sufficient R&D capabilities, they could not effectively develop new models that had not been previously technologically matured, e.g., mobile phones in the 1990s (Xinxi Chanye Bu Jingji Tizhi Gaige yu Jingji Yunxing Si, 2003). However, because they have been able to buy core components and designs for new models from component suppliers and independent design houses, respectively, they have been able to mitigate the related technological disadvantage.

In addition to these examples from China, we can find many indigenous electrical and electronics manufacturers in emerging markets, such as Indonesia's Polytron, India's Videocon, Mexico's MABE, Peru's Advance, and South Africa's Defy (Kimura, 2011b; 2013). Although indigenous firms may face difficulties in expanding sales beyond domestic and neighboring markets to the global market due to lack of sufficient technological capabilities, they retain a certain share in domestic markets. Consequently, the balance between advantages in marketing and disadvantages in technology is important for indigenous firms in emerging markets. Similarly, the balance between advantages in technology and disadvantages in marketing is also essential for foreign firms.

However, the influence of foreign firms on the growth of indigenous firms has not been explicitly examined, despite being partially shown. First, the technological disparity between indigenous and foreign firms has been examined in researches on the positive or negative influences of globalization on the growth of indigenous firms (Rivera-Batiz and Romer, 1991; Young, 1991). In this field, as previously discussed, indigenous firm growth depends on the possibility of technology diffusion. Second, vertical specialization and modularization have been demonstrated in research examining their influences on the growth of indigenous

firms (Baldwin and Clark, 2000; Fujimoto and Shintaku, 2005; Kimura, 2011a; Marukawa, 1996, 2007; Ohara, 1998, 2000). Other research in the field have shown that the industrial changes have benefited the entry and growth of indigenous firms by mitigating technological difficulties they face in producing final goods. However, because the influence of industrial changes on indigenous firm growth has not been explicitly examined in the context of competition with foreign firms, the optimal balance of make-or-buy for indigenous and foreign firms has not yet been determined.

In this study, we develop a simple model for the influence of contrasting advantages enjoyed by indigenous and foreign firms on their growth processes. Specifically, we suppose a situation such that indigenous firms in developing countries compete with foreign firms in developed countries in domestic markets. Indigenous firms that have an advantage in marketing but face a disadvantage in technology choose whether they perform the technology service in-house or buy from outside firms. Correspondingly, foreign firms that have an advantage in technology but face a disadvantage in marketing also choose whether they perform in-house or buy their marketing service. We develop the model on the basis of that in Kimura (2012), which, although developed to analyze the make-or-buy choice of indigenous firms, did not entirely consider the choice of foreign firms. The model in Kimura (2012) was analyzed based on those in Antràs and Helpman (2004) and Antràs (2005) (AH model). The AH model applied the concept of the boundaries of the firm developed by Grossman and Hart (1986) and Hart and Moore (1990) and focused on a make-or-buy choice in the context of internationalization of firms.² Although the AH model depicted the concept of the boundaries of the firm very well, it was not considered in context of the relationship to competitors. By adding some characteristics of competition between indigenous and foreign firms to the AH model, we develop a model of the boundary choices made by indigenous firms in developing countries competing with foreign firms in developed countries. Consequently, we analyze the behaviors of firms that exhibit their inherent advantages and compensate for their inherent disadvantages under competition with other firms.

The remainder of this article is organized as follows. In the next section, the model is developed. In Sections 3 and 4, entry conditions are shown. Findings are

² Grossman, Hart, and Moore developed the model that firms decide their boundaries in order to minimize the hold-up problem brought by incomplete contracts.

presented in the concluding section.

2. Model

Our model supposes that, in an economy, there exists a developing country (South) and a developed country (North). In addition, there exists a South firm, S , and a North one, N , in each country.³ Both firms are competing in the South market. We suppose that both firms use labor and produce final goods, y . We assume that the wage in the South, w_S , is lower than that in the North, w_N . Consumers' demand function is as follows:

$$y = \lambda p^{-1/(1-\alpha)}, \quad 0 < \alpha < 1, \quad (1)$$

where $\lambda > 0$ is a coefficient given exogenously. p is the price of the final goods and $1/(1-\alpha)$ is price elasticity of demand.

Both firms produce their final goods by combining a marketing service, x_m , and a technology service, x_t , on the basis of a Cobb-Douglas production function. The marketing service indicates various activities for selling final goods and researching markets. The technology service indicates various activities for developing the final goods and manufacturing core components. Therefore the production function is as follows:

$$y = \sigma x_m^{1-z} x_t^z, \quad 0 < z < 1, \quad (2)$$

where $\sigma_z = z^{-z} (1-z)^{-(1-z)}$ and z is elasticity of production for the technology service. We define that the final goods industry is a technology service-intensive (T-intensive) industry when $z > 1/2$; on the other hand, a marketing service-intensive (M-intensive) emerges when $z < 1/2$.⁴

To make the final goods by combining technology and marketing services, both South and North firms make a decision of boundary choice, $k \in (M, B)$,

³ The model setting in this section is partially based on that in Kimura (2012).

⁴ Because an optimal choice between making and buying cannot exist when $z = 1/2$, we do not define $z = 1/2$.

regarding whether the firm makes M , or buys B . Suppose that the South firm has an advantage in terms of making the marketing service in-house compared with the North firm because it is indigenous in the South market. Conversely, suppose that the North firm enjoys an advantage to make the technology service in-house compared with the South firm because it is a technological first mover. Since the South firm has an advantage in making the marketing service, it makes this service itself in the South, but faces a decision regarding whether it should make the technology service itself in the South or buy the service from an outside firm in the North. On the other hand, since the North firm has an advantage in making the technology service, it makes the service in-house in the North, but faces a decision regarding whether to make the marketing service itself in the South or buy the service from an outside firm in the South. Given these assumptions, the following section will analyze the optimal boundary choices for both South and North firms under various conditions.

Before proceeding with the analysis, however, we first introduce a share, $\beta(k) \in (0, 1)$, of gains between the decision maker, D , that is, the South and North firms in our context, and the outside firm, O . The gains from production of the final goods consist of the productions from both technology and marketing services. Therefore, when the decision maker integrates the outside firm as a department of the decision maker's firm, the share, $\beta(M)$, for the decision maker can become bigger than the share, $\beta(B)$, that results when the decision maker buys a service from the outside firm:⁵

$$\beta(M) > \beta(B).$$

From the above settings and Equations (1) and (2), we can set the following revenue functions of the South firm (decision maker), R_S^D , and outside firm for the technology service, R_S^O :

$$\begin{aligned} R_S^D &= \beta_S(k) \lambda^{1-\alpha} \sigma^\alpha x_m^{\alpha(1-z)} x_t^{\alpha z} \\ R_S^O &= [1 - \beta_S(k)] \lambda^{1-\alpha} \sigma^\alpha x_m^{\alpha(1-z)} x_t^{\alpha z} \end{aligned}$$

Based on the revenue functions, we can set the following profit functions of the South

⁵ See Kimura (2012) for the size difference between $\beta(M)$ and $\beta(B)$.

firm, π_S^D , and the outside firm, π_S^O .

$$\begin{aligned}\pi_S^D &= \beta_S(k) \lambda^{1-\alpha} \sigma^\alpha x_m^{\alpha(1-z)} x_t^{\alpha z} - w_S x_m \\ \pi_S^O &= [1 - \beta_S(k)] \lambda^{1-\alpha} \sigma^\alpha x_m^{\alpha(1-z)} x_t^{\alpha z} - a(k) w_{A(k)} x_t\end{aligned}\quad (3)$$

Since the South firm faces the disadvantage in making the technology service, when it makes the service itself in the South, it has to accept an increase in average cost, $a(M) > 1$, because of its lower productivity but can use the lower wage, $w_S = w_{A(M)}$. On the other hand, when the South firm buys the service from the outside firm in the North, it does not face this burden, that is, $a(B) = 1$, but does face having to pay the higher wage, $w_N = w_{A(B)}$, to buy the service produced in the North.

Correspondingly, the revenue functions of the North firm (the decision maker), R_N^D , and the outside firm for the marketing service, R_N^O are as follows:

$$\begin{aligned}R_N^D &= \beta_N(k) \lambda^{1-\alpha} \sigma^\alpha x_m^{\alpha(1-z)} x_t^{\alpha z} \\ R_N^O &= [1 - \beta_N(k)] \lambda^{1-\alpha} \sigma^\alpha x_m^{\alpha(1-z)} x_t^{\alpha z}\end{aligned}$$

The profit functions of the North firm, π_N^D , and the outside firm, π_N^O , are as follows:

$$\begin{aligned}\pi_N^D &= \beta_N(k) \lambda^{1-\alpha} \sigma^\alpha x_m^{\alpha(1-z)} x_t^{\alpha z} - w_N x_t \\ \pi_N^O &= [1 - \beta_N(k)] \lambda^{1-\alpha} \sigma^\alpha x_m^{\alpha(1-z)} x_t^{\alpha z} - b(k) w_S x_m\end{aligned}\quad (4)$$

As contrasted with the situation faced by the South firm, since the North firm faces the disadvantage in making the marketing service in-house in the South, it has to accept the increase of average cost, $b(M) > 1$. On the other hand, when the North firm buys the service from the outside firm in the South, it avoids the burden, that is, $b(B) = 1$. Both South and North firms make optimal choices regarding whether they make or buy the technology and marketing services, respectively, after considering the burdens and wage difference between South and North.

3. Equilibrium

In this section, we derive the marginal costs of both the North and South firms, and consider the entry conditions for the South firm. By maximizing Equation (3), the optimal price for the South firm can be derived as follows:

$$p_S(k) = \frac{a(k)^z w_S^{1-z} w_{A(k)}^z}{\beta_S(k)^{1-z} [1 - \beta_S(k)]^z \Phi} \quad (5)$$

where $\Phi = \alpha(\alpha z - 1)^{(1-z)(\alpha z - 1)}(\alpha - \alpha z - 1)^{z(\alpha - \alpha z - 1)}$. The price depends on the South firm's boundary choice. Similarly, by maximizing Equation (4), the optimal price for the North firm can be derived as follows:

$$p_N(k) = \frac{b(k)^z w_S^{1-z} w_N^z}{\beta_N(k)^z [1 - \beta_N(k)]^{1-z} \Phi} \quad (6)$$

The price also depends on the North firm's boundary choice.

First, consider the influence of z on boundary choice, k . As mentioned above, both South and North firms choose $\beta(k)$ to minimize the optimal price under a certain value of z . In the case of the T-intensive industry ($z > 1/2$), the significance of the technology service to the final goods' value would be much higher. Therefore, the outside firm for the technology service has incentive to invest money in human capital to increasing its value. Consequently, the South firm can minimize Equation (5) when it chooses the smaller $\beta(k)$, that is, $\beta(B)$. Conversely, the North firm can minimize the price it needs to pay when it chooses the bigger $\beta(k)$, that is, $\beta(M)$. On the other hand, in the case of the M-intensive industry ($z < 1/2$), the marketing service would have greater significance for the final goods' value. Therefore, the outside firm for the marketing service has incentive to invest money in human capital for increasing its value. Consequently, the South firm can minimize Equation (6) when it chooses the bigger $\beta(k)$, that is, $\beta(M)$. Conversely, the North firm can minimize the price it pays when it chooses the smaller $\beta(k)$, that is, $\beta(B)$.

Next, we set an entry condition for the South firm to face. We assume here that a South firm tries to enter the South market in which two homogeneous North

firms have been competing under a Bertrand competition. Therefore, the South firm's marginal cost (MC) should be lower than that of the North firm in order to be chosen by rational consumers who never buy homogenous goods at higher prices. Since there are two North firms in the market, therefore the optimal price can become equal to the marginal cost.

Using these assumptions, we compare marginal costs (MC) of both the South and North firms as the entry condition for the South firm. In our model, the marginal cost equal the monopoly price multiplied by α . Therefore, the marginal costs of South and North firms are as follows:

$$MC_S(k) = \frac{a(k)^z w_S^{1-z} w_{A(k)}^z}{\beta_S(k)^{1-z} [1 - \beta_S(k)]^z \Phi'}$$

$$MC_N(k) = \frac{b(k)^z w_S^{1-z} w_N^z}{\beta_N(k)^z [1 - \beta_N(k)]^{1-z} \Phi'}$$

where $\Phi' = (\alpha z - 1)^{(1-z)(\alpha z - 1)} (\alpha - \alpha z - 1)^{z(\alpha - \alpha z - 1)}$. Consequently, the entry condition for the South firm is $MC_S(k) \leq MC_N(k)$, and specifically

$$\frac{a(k)^z w_S^{1-z} w_{A(k)}^z}{\beta_S(k)^{1-z} [1 - \beta_S(k)]^z} \leq \frac{b(k)^z w_S^{1-z} w_N^z}{\beta_N(k)^z [1 - \beta_N(k)]^{1-z}} \quad (7)$$

Based on Equation (7), South and North firms make optimal decisions for their respective boundaries.

4. Classification

Boundary choices of South and North firms can be classified into eight cases (Table 1) depending on specific conditions. First, the cases can be divided into two groups by industry type, that is, T- and M-intensive industries. Moreover, both South and North firms make a choice of make-or-buy in each industry. In this section, we discuss each case from T1 to M4.

Table 1: Classification of Choices

<i>Firm</i>	<i>T-intensive Industry</i>		<i>M-intensive Industry</i>		
	<i>N</i>		<i>N</i>		
	<i>Choice</i>	<i>M</i>	<i>B</i>	<i>M</i>	<i>B</i>
<i>S</i>	<i>M</i>	<i>T3</i>	<i>T4</i>	<i>M2</i>	<i>M1</i>
	<i>B</i>	<i>T1</i>	<i>T2</i>	<i>M4</i>	<i>M3</i>

Source: Compiled by the author based on study data.

4.1 Case of the Technology Service-intensive Industry

In the T-intensive industry, buying the technology service is optimal for the South firm, whereas making the marketing service is optimal for the North firm. However, the firms' actual choices depend upon availability of outside firms to conduct the technology and marketing services, the burdens of $a(M)$ and $b(M)$, and the wage differential between South and North.

T1: *S* buys *T*, but *N* makes *M*

The first case examined in the T-intensive industry is that in which the South firm buys the technology service from the outside firm, but the North firm either does not or cannot buy the marketing service. In this case, the South firm has an advantage to enter the market because the North firm must bear the burden of $b(M)$.

$$\frac{1}{\beta_S(B)^{1-z} [1 - \beta_S(B)]^z} \leq \frac{b(M)^z}{\beta_N(M)^z [1 - \beta_N(M)]^{1-z}}$$

T2: *S* buys *T*, and *N* also buys *M*

The second case is that in which both the South and North firms buy the technology and marketing services, respectively, from outside firms. The North firm compromises to buy the marketing service from the outside firm in the South when the burden of $b(M)$ is significant, although buying the marketing service is not optimal for the North firm. In this case, the South firm still has an advantage to enter the market because the North firm's choice cannot maximize the denominator of its marginal cost although the firm can make the numerator one by choosing to buy.

$$\frac{1}{\beta_S(B)^{1-z} [1 - \beta_S(B)]^z} \leq \frac{1}{\beta_N(B)^z [1 - \beta_N(B)]^{1-z}}$$

T3: *S* makes *T*, and *N* also makes *M*

The third case is that in which the South firm cannot buy the technology service from the outside firm, and the North firm also does not or cannot buy the marketing service. In this case, the South firm faces a disadvantage to enter the market because making the technology service is not its optimal choice, and it must therefore bear the burden of $a(M)$. If the technology service does not have well-developed vertical specialization even in the T-intensive industry, the South firm faces a significant disadvantage. However, the South firm can use the South's lower wages because it makes the technology service in the South. Furthermore, the North firm also bears the burden of $b(M)$ by making the marketing service itself. Consequently, the South firm's possibility of market entry depends on the burden difference between $a(M)$ and $b(M)$ and the wage differential between South and North.

$$\frac{a(M)^z w_S^z}{\beta_S(M)^{1-z} [1 - \beta_S(M)]^z} \leq \frac{b(M)^z w_N^z}{\beta_N(M)^z [1 - \beta_N(M)]^{1-z}}$$

T4: *S* makes *T*, but *N* buys *M*

The fourth case is that in which the South firm does not buy the technology service, but the North firm buys the marketing service. Comparing this case with T3, the North firm chooses to buy if the burden and/or wage differentials are significantly greater although buying the marketing service is not its optimal choice.

$$\frac{a(M)^z w_S^z}{\beta_S(M)^{1-z} [1 - \beta_S(M)]^z} \leq \frac{w_N^z}{\beta_N(B)^z [1 - \beta_N(B)]^{1-z}}$$

In sum, the South firm would have the advantage to enter the T-intensive industry if the following conditions can be upheld:

1. The South firm can buy the technology service from the outside firm,
2. Even if the South firm cannot buy the service, the burden of $a(M)$ is much smaller than $b(M)$ and/or the wage in the South is much smaller than that in the North, and
3. The North firm cannot buy the marketing service from the outside firm.

4.2 Case of the Marketing Service-intensive Industry

In the M-intensive industry, making the technology service in-house is optimal for the South firm, whereas buying the marketing service is optimal for the North firm. However, the firms' actual choices depend on availability of the outside firms providing the technology and marketing services, amounts of $a(M)$ and $b(M)$, and wage differential between South and North.

M1: S makes T , but N buys M

The first case in the M-intensive industry is that in which the South firm does not or cannot buy the technology service, but the North firm can buy the marketing service. Since these choices are optimal for both South and North firms, the possibility of the South firm's market entry depends upon the burden difference between $a(M)$ and $b(M)$ and the wage differential between South and North.

$$\frac{a(M)^z w_S^z}{\beta_S(M)^{1-z} [1 - \beta_S(M)]^z} \leq \frac{w_N^z}{\beta_N(B)^z [1 - \beta_N(B)]^{1-z}}$$

M2: S makes T , and N also makes M

The second case is that in which the South firm does not or cannot buy the technology service, and the North firm cannot buy the marketing service. If the marketing service's vertical specialization is not well developed even in the M-intensive industry, the North firm faces a significant disadvantage. Comparing this case with M1, the South firm can enjoy an advantage to enter the market because the North firm faces the double impact of the sub-optimal choice and the burden of $b(M)$.

$$\frac{a(M)^z w_S^z}{\beta_S(M)^{1-z} [1 - \beta_S(M)]^z} \leq \frac{b(M)^z w_N^z}{\beta_N(M)^z [1 - \beta_N(M)]^{1-z}}$$

M3: S buys T, and N also buys M

The third case is that in which the South firm can buy the technology service, and the North firm can buy the marketing service. In this case, the South firm still faces a significant disadvantage. Although the South firm chooses buying if the burden is substantially larger, the choice is not optimal. In contrast, the North firm can choose the optimal boundary of buying.

$$\frac{1}{\beta_S(B)^{1-z} [1 - \beta_S(B)]^z} \leq \frac{1}{\beta_N(B)^z [1 - \beta_N(B)]^{1-z}}$$

M4: S buys T, but N makes M

The fourth case is that in which the South firm can buy the technology service, but the North firm cannot buy the marketing service. Comparing this case with T3, the South firm's probability of entry can increase because the North firm faces a two-fold problem of the sub-optimal choice and the burden of $b(M)$ as in the case of M2.

$$\frac{1}{\beta_S(B)^{1-z} [1 - \beta_S(B)]^z} \leq \frac{b(M)^z}{\beta_N(M)^z [1 - \beta_N(M)]^{1-z}}$$

In sum, the South firm would have the advantage to enter the M-intensive industry if the following conditions can be upheld:

1. When the South firm makes the technology service, the burden of $a(M)$ is much smaller than $b(M)$ and/or the wage in the South is much smaller than that in the North,
2. The South firm can buy the technology service from the outside firm, and
3. The North firm cannot buy the marketing service from the outside firm.

The second and third conditions are the same of the first and third ones, respectively, in the case of the T-intensive industry.

5. Conclusion

We have demonstrated that the various choices of the boundaries of the firm can be generated by setting certain realistic conditions for firms in developing and developed countries, such as their contrasting advantages, differences in development of vertical specializations for the marketing and technology services, and the wage differential between South and North. Consequently, whether foreign firms can grow largely depends on these conditions. From the classification and specified conditions of the South firm's entry, it is favorable for the South firm that

- In making a service in-house, that the burden of $a(M)$ is much smaller than $b(M)$ and/or the wage in the South is much smaller than that in the North, and
- In buying service from an external provider, that the South firm can buy the technology service and, on the other hand, the North firm cannot buy the marketing service.

For better or worse, business environments never remain unchanging and entry conditions, therefore, also correspondingly change in connection with operating environmental shifts. The first change relates to the location of the technology service. If the outside firm providing the technology service becomes able to make the service in the South, then the entry condition for the South firm can be mitigated by using the lower South wage. Correspondingly, if the North firm becomes able to make the technology service in the South, then the entry condition for the South firm can deteriorate following the North firm's use of the lower South wage. In addition to these location changes, technological changes can affect entry condition. If industry type shifts from M-intensive to T-intensive because product structures are modularized, and if the South firm can buy the technology service from the outside firm, then the South firm's entry condition can be mitigated. On the other hand, if industry type shifts from T-intensive to M-intensive because new models that are not technologically matured are booming, then the South firm's entry condition can deteriorate.

Even though we only focused on two different services that show the typical differences in advantages or disadvantages between firms in developing and

developed countries, we could find various patterns for the South firm's boundaries. Moreover, changes can occur in both business environment and entry conditions. Consequently, depending on industries, times, and countries, the South firm must have additional routes of growth. Further research is therefore required on the growth processes of firms in developing countries at the boundary level.

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