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## Qualitative Model for International Relocation of Japanese Companies

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### Abstract

*There is a significant increase in the number of companies transferring their production and sales sites to a foreign country. Recently, the number of companies withdrawing from the foreign country is likewise increasing. This paper considers four factors affecting international relocation: market, cost, risk and infrastructure. The factors are first discussed before examining the properties of international relocation with the case of Japanese companies. A qualitative model was then identified using catastrophe theory. Lastly, this paper discusses issues on enhancing infrastructure in Asia.*

**Keywords:** Global logistics, international relocation, catastrophe model, infrastructure

### 1. Introduction

Since the late 1980s, the number of Japanese foreign affiliates, such as company branches or factories, has risen steadily because many Japanese companies have shifted their sites of operations in overseas areas. Recently, the number of Japanese companies transferring to other countries, withdrawing from recipient countries, or coming back to Japan, has been increasing.

International relocation causes changes in international distribution such as in the volume of exports and imports. The model for the international relocation is considered to accommodate the planning for the location strategies and the international distribution business of companies as well as the industry policies of government.

This paper aims to describe a qualitative model for international relocation of companies based on factors and properties of international relocation. It is thus organised as follows:

- Section 2 identifies the factors of international relocation;
- Section 3 reviews the trends of Japanese companies locating abroad (shifts), transferring to another country or coming back to Japan (withdrawals), and explains their properties;
- Section 4 clarifies the qualitative model for the international relocation of companies, and suggests the issues related infrastructure; and
- Section 5 presents some conclusions.

In this study, *shift* means the transfer of production and/or sales sites or the transfer of the company itself to a foreign country (recipient) through Foreign Direct Investment (FDI). Thus, it includes the transfer from a foreign country to another foreign country. The company consequently operates its business, particularly production or sales, at the recipient countries. *Withdrawal* means the removal of investment from the foreign company and elimination of branches or firms from the recipients. The company consequently stops its operations at the recipients.

Normally, FDI is discussed from the perspective of international capital flow. However, in this study, shift and withdrawal are discussed from the viewpoint of international relocation of companies.

## 2. Factors affecting international relocation

### 2.1. Hypothesis for the selection of factors

Past several studies consider the market and production costs as main factors concerning shifts of companies' operation sites to a foreign country. Although these factors are very important, these do not guarantee benefits for shifting companies. There are some cases when companies failed to survive in a foreign country and have to withdraw due to several unconsidered reasons. For instance, after the shift, though there are savings generated from reduced production cost, the distribution cost is higher than the assumed cost. In the worst cases, domestic conflicts such as war or violence cause the companies to withdraw. It is therefore necessary to discuss the factors that discourage the shift and even affect withdrawal. This study tries to incorporate risk and infrastructure as additional factors for international relocation. It proposes four factors, namely: market, cost, risk and infrastructure factors (Figure 1).

Basically, companies perform logistics processes of procurement, production, distribution and sales, and they often aim at the benefits to be gained by performance outside home country. This is the reason they directly consider cost and market factors when planning an international relocation strategy. Thus, market and cost factors serve as '*tempter*' for transfer to a foreign location, i.e., the larger the market and the cheaper the cost, the more shifts will be carried out to the recipient.

However, it must be stressed that existing conditions in a foreign country are also instrumental for a company's performance. This is the reason risk and infrastructure factors should be considered as well. Risk and infrastructure play as the '*inhibitor*' for foreign relocation. The higher the risk involved and the worse the infrastructure, the fewer shifts will be carried out.

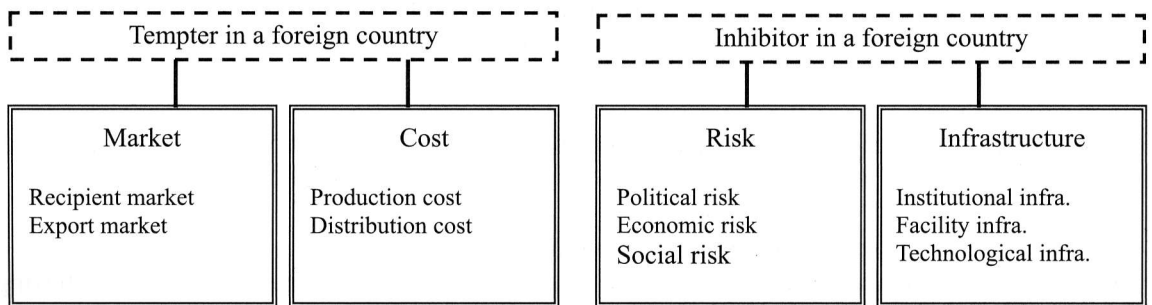


Figure 1. Factors of international relocation

### 2.2. Market factor

Market, as one of the factors of international location strategy, can be classified into two: recipient market and export market related to the recipient. Recipient market means that the demand of products and services is within domestic or local areas where the Japanese company shifts to. The export market means that the demand of products and services are outside of recipient country but includes Japan.

When companies shift their sites of production or sales to a foreign country to expand their sales, they mostly consider market factors. If in case their sales are less than they expected, they may decide to withdraw and they could either come back to Japan or transfer to another country.

### *2.3. Cost factor*

The cost factor can be divided into production cost and distribution cost. Production costs refer to expenses for materials, labor and operations. Distribution costs refer to expenses incurred for transportation, storage, loading/unloading, package, and other distribution activities.

To reduce costs, companies shift their production sites to foreign countries where labour and raw material costs are cheaper than in Japan. Meanwhile, they could also withdraw due to increased costs. Reducing production costs is one of the objectives for shifting to a foreign country. However, companies should not overlook the distribution costs, especially transportation cost. For example, consider a Japanese company supplying demand commodities in Japan. This company shifted its production site to a foreign country with the primary objective of reducing production costs. If the distribution costs such as transportation costs from the foreign country to Japan are significantly higher, then the company may not benefit from this shift. It is therefore necessary to consider both production costs and distribution costs.

### *2.4 Risk factor*

Risk factor in this paper is classified into political risk, economic risk and social risk. Political risk includes the probability of war or labor strikes that could occur due to political reasons. Economic risk includes the probability of changes in the economic conditions, such as exchange rate fluctuation and disruption of financial investments. Social risk includes the probability of societal problems, such as crimes, disease, accidents and natural disasters.

Generally, a company will not shift to a foreign country with high probability of risks happening, such as war or violence. A company could withdraw if unbearable risk occurs in the recipient country. Companies planning to shift should also consider the probability of economic risk such as exchange fluctuation in the foreign country.

### *2.5 Infrastructure factor*

Infrastructure factor in this study refers to software and hardware that supports the industry. There are three kinds of infrastructure: institutional, facility and technological infrastructure. First, institutional infrastructure refers to the rules and regulations of the country, such as the legal system and policy. Taxation system, contract law, business procedures and pricing systems are included under the legal system. For policy, several may be mentioned such as foreign funding promotion, import substitution, export promotion and domestic production policy. Second, facility infrastructure that refers to the transportation system made up of nodes, modes and links are considered as hardware infrastructure, while operation and control are software infrastructure. Lastly, technological infrastructure refers to the level of handling skill or automation that includes human, logistics and information technologies. Logistics technologies, such as unit-load system and multi-modal transportation system directly affect transportation cost.

There is rarely a case of shift with the infrastructure objective. However, it is essential to consider the

availability of infrastructure when companies shift to a foreign country. There are several cases when Japanese companies withdrew from the recipients because of the significant difference between the infrastructure of Japan and the foreign country. Companies preparing to establish international distribution centers have to take into consideration the available infrastructure in the foreign country in detail. This is because international distribution centers are required to maintain networks with other countries. For this reason, international distribution centers are mainly located in countries where good accessibility to other countries and good information platform are present.

### 3. International relocation of Japanese companies

#### 3.1. Analysis methodology

To examine the properties of international relocation of Japanese companies, the numerical trend of Japanese foreign affiliates could be analysed. International relocation refers to shift and withdrawal, as mentioned previously. The change in the number of foreign affiliates is the numerical difference between shift and withdrawal as expressed by Equation (1).

$$\Delta Na = Na_{(t)} - Na_{(t-1)} = Ns_{(t)} - Nw_{(t)} \quad (1)$$

where

- $\Delta Na$  : change in number of foreign affiliates
- $Na$  : number of foreign affiliates
- $Ns$  : number of shifts
- $Nw$  : number of withdrawals
- $(t)$  : year

Table 1. Example of change in the number of foreign affiliates

	t - 1	t	t + 1
No. of Foreign Affiliates	50	60	60
Number of Shifts	-	20	10
Number of Withdrawals	-	10	10

Table 1 shows an example indicating the change in the number of foreign affiliates as a result of the annual numerical difference between shifts and withdrawals. In year 't', 60 foreign affiliates are counted, while 50 affiliates are counted a year before that (t-1). Hence, there was a change in the number of foreign affiliates, which could be verified from the difference between 20 shifts and 10 withdrawals. Furthermore, in year 't+1,' 60 foreign affiliates are obtained as the number of shifts equal the number of withdrawals, i.e. 10 shifts and 10 withdrawals. There is no change in the number of affiliates at year 't+1' as the number of withdrawals is the same as the number of shifts.

This paper examined the trends of shifts and withdrawals using data from the "Overseas Expansion Companies Conspectus" of *Toyo Keizai Inc.* The order of examination is as follows:

1. Trend of shifts in three areas: Europe, North America (except Mexico) and Asia; and
2. Trend of withdrawals from these three areas.

3.2. Trends of shifts and withdrawals

Figure 2 shows the trend of shifts of Japanese companies from 1981 to 2000 by area. There were two significant rises in the number of shifts. The first was from year 1987 to 1991 and the second from 1994 to 1997. By area, shifts to Europe and North America grew steadily in the 1980s but has been declining in the 1990s, while more significant increases in the number of shifts to Asia could be noted. These results clarify that Japanese companies have shifted their sites of operations favorably to Asia since the 1990s. And it is possible to make a special mention that the trend of shifts in Europe and North America is changing moderately, but drastically in Asia.

Figure 3 shows the trend of withdrawals of Japanese companies since 1988 by area. The number of withdrawals had been increasing until 1999. This number dropped down sharply in 2000. By area, the number of withdrawals from North America was the highest for each year until 1997. However, withdrawals from Asia were most starting 1998. It can thus be inferred that the Asian monetary crisis that occurred in 1997 may have a sweeping impact on this trend as withdrawals in Asia is more drastic than that in Europe and North America.

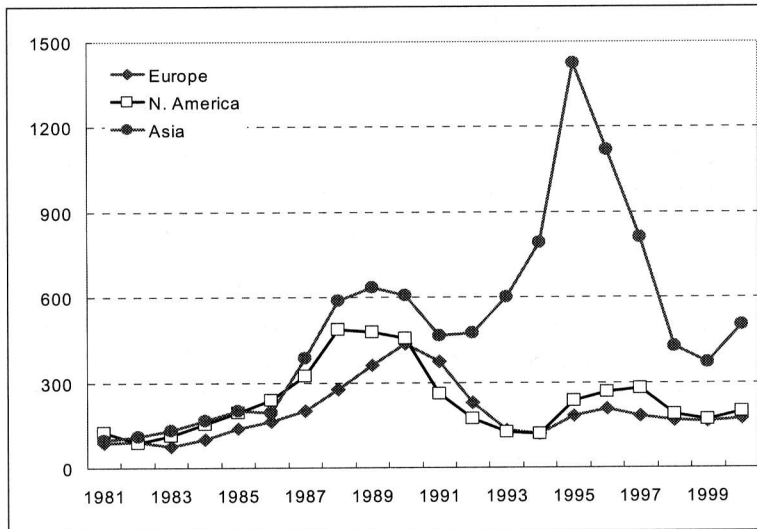


Figure 2. Trends of shifts of Japanese companies by area

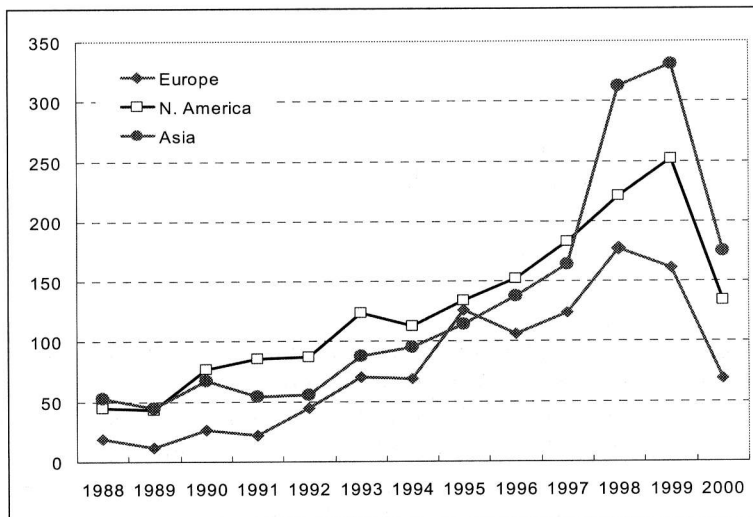


Figure 3. Trends of withdrawals of Japanese companies by area

### 3.3. Properties of international relocation of Japanese companies

The trends of shifts and withdrawals follow quite different ways between North America or Europe and Asia. There is a continuous change in the number of shifts or withdrawals in North America and Europe, unlike in Asia. This property of international relocation is called 'Asymmetry' in this paper.

Meanwhile, shifts and withdrawals occur simultaneously under the same conditions of a foreign country. A company's locational strategy could be considered both for domestic location and overseas location. Basically, the company's decision of shift or no-shift (i.e. domestic location) is based on their direct and indirect empirical business philosophy. This philosophy may either hold down a company in domestic location or encourage a company to go abroad. After all, simultaneous coming in and leaving of companies in a foreign country is a normal occurrence. This property is called 'Simultaneity,' which means there are two stable equilibriums under the same conditions of a recipient.

## 4. Qualitative model for international relocation

### 4.1. Hypothesis for modeling

It is necessary to explain the properties of an international relocation model. Therefore this paper tries to propose a model involving 'asymmetry' and 'simultaneity,' respectively. It is hypothesised that asymmetry and simultaneity could be effects of international location factors, i.e. Tempter (market, cost) and Inhibitor (risk, infrastructure).

The number of shifts is affected by Tempter and Inhibitor, which have opposite effects on the number of withdrawals. Moreover, Inhibitor could split the effect of Tempter on the number of shifts in the same way that Tempter could split the effect of Inhibitor on the number of withdrawals.

$$\begin{aligned}
 f(S) &= \{T, I\} \\
 \frac{\partial S}{\partial T} &> 0, \quad \frac{\partial S}{\partial I} < 0, \\
 f(W) &= \{T, I\} \\
 \frac{\partial W}{\partial T} &< 0, \quad \frac{\partial W}{\partial I} > 0
 \end{aligned}$$

where

$S$  : number of shift  
 $W$  : number of withdrawal  
 $T$  : tempter  
 $I$  : inhibitor

Figure 4 shows the former case. When Inhibitor is low (A), the number of shifts would be changing continuously in accordance with Tempter; the greater Tempter works, the more shifts will be followed. On the other hand, when Inhibitor is high (B), the number of shifts would often change discontinuously with Temper. Low Tempter could attract fewer shifts due to high Inhibitor (when  $Tempter=t1, n1 > n2$ ). And if Tempter becomes great ( $t2$ ), the number of shifts will jump up to  $n3$ . This is because there were many companies planning to shift for advantages from Tempter. Therefore, Tempter gets into 'normal variable' for the shift trend, while Inhibitor the 'splitting variable.'

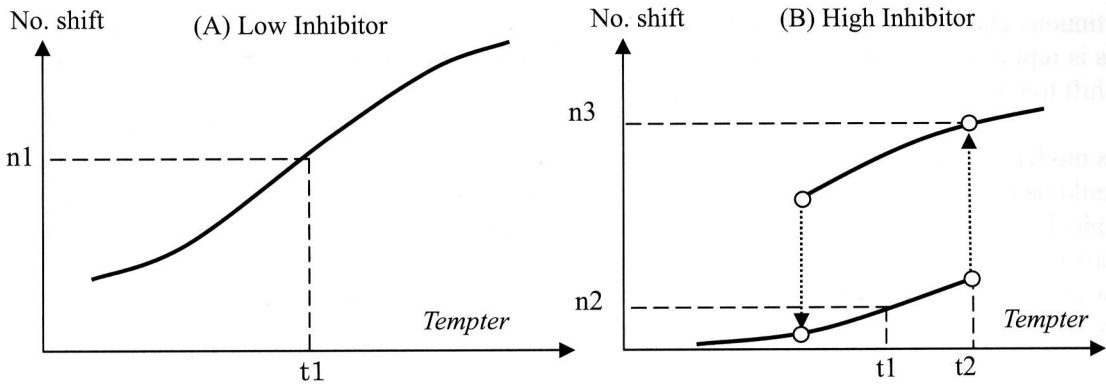


Figure 4. Tempter-shift trend

4.2. International relocation trends model

From the above hypothesis, the feature of international relocation trends model is shown in Figure 5. Tempter and Inhibitor are substituted in place of control variables (Tempter in normal variable and Inhibitor in splitting variable) on control plane. The number of shifts gets into the vertical axis (behavior variable) and follows suit over the surface M (except middle sheet, i.e. shaded portion).

The curve on the surface M, where the upper and lower sheets fold over into the middle sheet, is called the fold-curve. If splitting variable is greater than control point (O), then M is split into two sheets. The projection of the fold-curve down into the control plane is called the bifurcation set. Although the fold curve is a smooth curve, the bifurcation set has a sharp point, forming a cusp, and this is the reason for the name cusp-catastrophe. The cusp lines form the main thresholds for sudden behavioral changes between the upper and lower sheets.

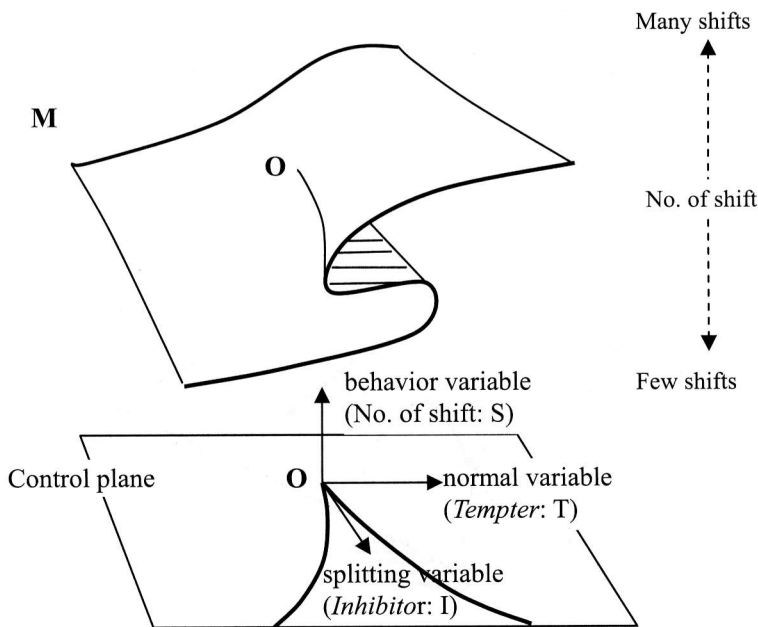


Figure 5. International relocation trends model



When Inhibitor < 0, the number of shifts is going up steadily in accordance with Tempter, called the continuous change of shifts trend. Meanwhile, if Inhibitor > 0, the number of shift varies drastically. This is represented by the fluctuations between the two sheets, meaning there is discontinuous change of shift trend.

This model can verify the trends of Japanese companies' international relocation examined previously. It could be possible to define a clear position on the three areas (Europe, North America and Asia) as a recipient to Japanese companies. Basically, Europe and North America have lower risks and higher infrastructures than in Asia, putting Inhibitor of Europe and North America into lower level. Whereas Asia gives Japanese companies the chance of cost reduction as well as market expansion, which indicates that Tempter in Asia is put into high level.

Figure 6 shows the *Asymmetry* of the change in the shifts of Japanese companies. The number of shifts into Europe and North America went up steadily (a-b) for the benefits of local sales in 1980s, and then this number went down slightly (b-c) due to sluggish sales in 1990s. Asia, on the other hand, represents a different trend. With the objective of cost reduction, Japanese companies shifted to Asia gradually in 1980s (d-e).

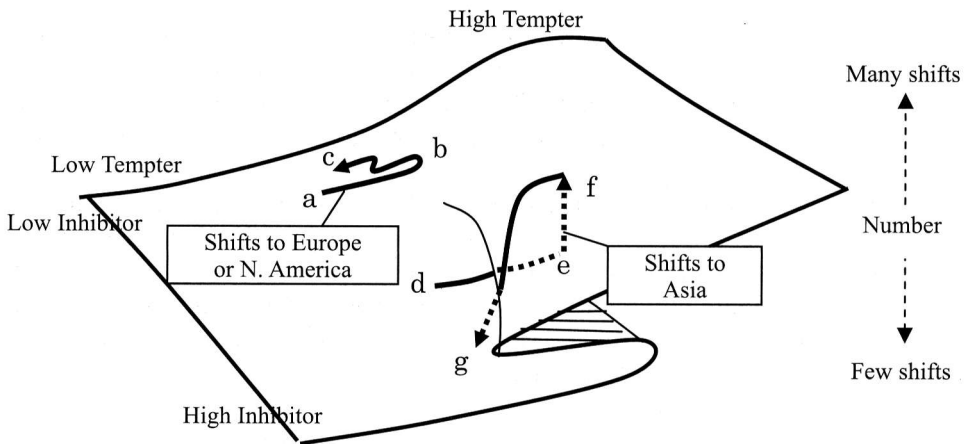


Figure 6. Shift trend model of Japanese companies

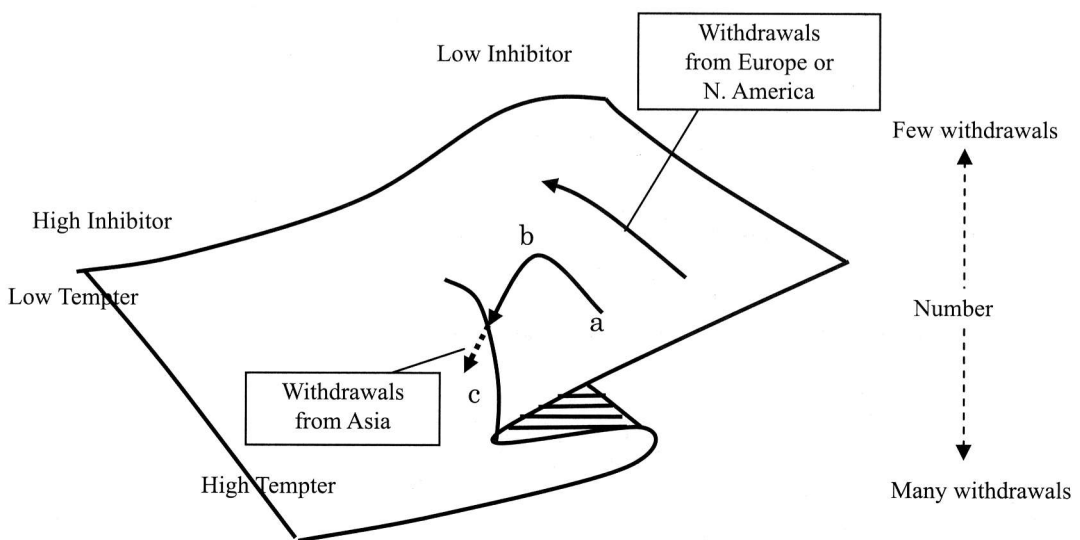


Figure 7. Withdrawal trend model of Japanese companies



The number of shift to Asia jumped up sharply (e-f) because companies considered Asia as another market in the mid 1990s.<sup>1</sup> However, the Asian monetary crisis in 1997 brought a sharp drop-off in the number of shifts (f-g).

In the same way, the trend of withdrawals can be examined in Figure 7. Note that Inhibitor is normal variable to withdrawal and Tempter is splitting variable; therefore, the number of withdrawal is going up from the upper sheet to the lower sheet. There was a significant increase in the number of withdrawals at the end of 1990s in Asia (b-c) resulting from the monetary crisis in 1997.

#### 4.3. International relocation strategy model

Companies' behavior in international relocation strategy, be it domestic location or overseas location, is subject to the condition of Tempter and Inhibitor of a foreign country, and strategy changes between domestic location and foreign location by a shift and a withdrawal discontinuously. The probability of selecting location, however, is changing both continuously and discontinuously. The international relocation strategy model explaining *Simultaneity* is shown in Figure 8.

Here the two options are domestic location (the lower sheet) and overseas location (the upper sheet), and the probability of selecting the location represent the company's behavior. The plane representing the strengths of Tempter and Inhibitor reflects the probability of a company's behavior (shift and withdrawal) at a moment. Tempter and Inhibitor get into 'conflicting variables' because they give opposite effects on the selection of location. This implies that far greater Tempter can attract a shift when Inhibitor is at a greater level, and that even low Tempter can lead companies to shift into the recipient against low Inhibitor.

If there is only Tempter in a foreign country (i.e. Tempter axis in control plane), there is the highest probability of foreign location (A). On the other hand, if only Inhibitor is present, there is the highest probability of domestic location (B). When both are present, the probability goes bimodal (C and D). This explains *Simultaneity*, which is observed where the upper sheet and the lower sheet are overlapped (i.e. inside cusp curves on control plane). Both Tempter and Inhibitor affect the location strategy of companies and bring two stable equilibriums simultaneously. Therefore, there are companies shifting to a foreign country and companies withdrawing from the same foreign country simultaneously.

This model explains also the behavior of shift and withdrawal. The path P1, representing increasing Tempter at a fixed level of Inhibitor, will lead to a shift from domestic location to overseas location at c1. Path P2 will lead to a withdrawal from overseas location to domestic location at c2. For instance, Sony Inc. shifted its production site of 8 mm video camera to China in 1993 to reduce cost. Inexpensive labor costs and increasing market in China were considered as Tempter. When Tempter reached the point of c1, Sony Inc. transferred its production sites to China. China-based products went to the export market of EU and local market of China. It unfortunately took so much time to clear customs in China. That worked as Inhibitor, and then Sony Inc. withdrew its export production sites from China at c2 to come back to Japan in 2002.

<sup>1</sup> According to a survey done by *Toyo keizai, Inc.* in 1983, 1988, 1995 and 2000, the reason of shift to Europe and North America was due to 'advance into market' (65% and 60%, respectively). The shift to Asia, meanwhile, was due to: 35% for 'cost reduction,' and 40% for 'advance into market' in 1983 and 1988, and about 20% for 'cost reduction,' and 60% for 'advance into market' in 1995 and 2000.

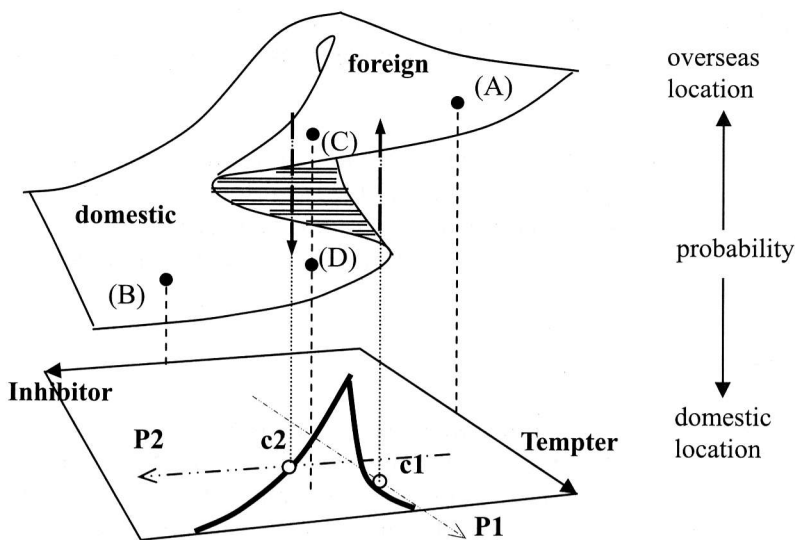


Figure 8. International relocation strategy model

4.4. Necessity of enhancing infrastructure

It was clarified that both Tempter and Inhibitor work as factors affecting shifts and withdrawals. A company planning to shift to a foreign country has to examine the whole factors. A government planning to invite FDI with Tempter should hasten a decline in Inhibitor. In the same way, it should also be quick to address risks and focus on infrastructure development.

Hence, engagement in infrastructure encourages foreign companies to shift into and stay in the recipient country. It is necessary to improve not only facility infrastructure, such as hardware and software in transportation system, but also technological infrastructure including human, logistics and information technologies. In addition, institutional infrastructure that refers to the rules and regulation must be arranged.

Figure 9 shows that reducing Inhibitor of a foreign country hastens a shift due to enhancement of infrastructure. When a country has Inhibitor at a level of  $i$ , it cannot invite FDI until Tempter reach a level of  $t$  (i.e. shift occurs at point of  $c$ ). If the country improves its infrastructure, then the level of Inhibitor moves to  $i'$ . As a result, a shift can be observed at point of  $c'$ , which has a lower level of Tempter ( $t'$ ). This indicates that a developing country which has a big Tempter (due to the cheapest cost and market potentials) must endeavour to improve its infrastructure.

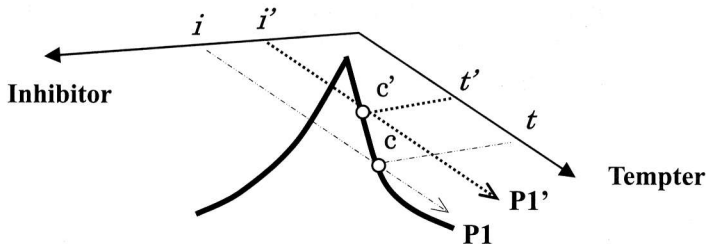


Figure 9. Decline of inhibitor to hasten shifts

## 5. Concluding remarks

This paper explained the properties of international relocation using the concepts of cusp-catastrophe. The current situation of shifts and withdrawals were examined with the case of Japanese companies; the factors affecting the international relocation were considered and a qualitative model was finally identified.

The paper then suggested some issues on global logistics related to international relocation. A company planning to shift into foreign countries should investigate not only *Tempter* (market and cost in a foreign country) but also *Inhibitor* (risk and infrastructure in a foreign country) in order to avoid a disappointing withdrawal.

Moreover, infrastructure would be one of the most important issues on global logistics among countries. Infrastructure is one of the determinants for companies' performances. As the platforms, technologies and institutions in a foreign country must be considered as well as facilities. A government should enhance its infrastructure to invite foreign direct investment. Furthermore, it is necessary to pay attention to the cooperation between nations. Finally, additional studies focusing on infrastructure should be examined, specifically the enhancement of facility infrastructure, the standardisation of technological infrastructure and the coordination of institutional infrastructure.

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