【Articles】

To Be or Not to Be? Incentive Policy: Impacts on Inward FDI Behaviors*

するべきかせざるべきか？ インセンティブ政策：外資企業行動への影響

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Contents

(**Abstract**)

Nation states often offer incentives to attract foreign direct investment (FDI). However, the withdrawal of such incentives can cause investors to suffer great losses and face critical decisions on exiting host countries. This paper observes changes of local incentives and FDI behaviors of international firms in a host economy. Specifically, it aims to build a model to address the mechanism driving FDI expansion and withdrawal behaviors derived from the subsequent changes to the incentive schemes of the host countries. Starting with the optimization behavior of foreign firms in the context of local agglomeration, this paper derives an entry support function measuring the degree of FDI activity in a host location. Taking the perspective that a host government pursues continuing control of in-and-out of FDIs, I then derive for the government an optimal incentives (increase or removal) strategy to investigate the impacts of the host incentive policy on the expansion and withdrawal behaviors of international firms, with a focus on the latter. Finally, in the context of uncertainty, the paper analyzes the optimal incentive policy of a government against the boom and bust of the economy.

1. Introduction

Incentive has become a central government strategy for inward foreign direct investment (FDI) and such polices have become widely adopted among developed and emerging countries over recent decades. Although incentive policies vary in their content and design, the aims are to attract target FDIs that satisfy selected measures and achieve the goals of government policy for each host location. These goals often expect inward FDIs to help increase host economic growth, employment, technological spillovers and others.

However, when the FDIs can no longer keep the performance levels sustainable, an unlimited FDI incentive policy is not practical and subsequent change should be expected. A host country might significantly revise incentive schemes toward all or some industries, substantially limiting or removing incentives, or even imposing negative incentives for various concerns and agendas. If the institutions with good-will regulation on the host side are not stable, an international firm is likely to worry if the flow of return is countable or not in the long run. Indeed, the result of the removal of FDI incentives can be detrimental for international firms and lead to corporate deficits and great uncertainty, including the possibility of withdrawal or retreat from host countries.

Just like international firms, which claim the rights to ponder the matter of commitment or flexibility, i.e. to stay or to withdraw from the host economy, the host economies will surely also have their options to adapt regulations to ever-emerging new needs and conditions derived from the evolution of domestic and global political, economic and social context. In other words, the welcome policies of incentive are subject to subsequent amendments and the promises yesterday do not guarantee forever favored protections for foreign firms in the host economies. The entry history of Taiwanese manufacturing firms in China illustrates a good case of the interaction between incentive policies and FDI expansion and withdrawals.[1)] It demonstrates that either local or national incentive schemes can be altered abruptly because of changes in governmental goals and policies, which could lead to a wave of retreat.[2)]

In short, the host locations are primarily assumed to attract in-coming FDI, which are expected to help the host government to achieve industrial goals and bring positive effects on local economies and industries. However, if the actual performance of FDI no longer fulfills the expectation of the host government, the removal of such incentives becomes an inevitable option. Once the wind of the policy changes to an unfavorable direction is in the air, it will surely force many of the less or least competitive firms to seriously consider the option to reduce the investment, shift toward other more favorable host locations, or end the relationship and leave the host country. Moreover, it may act as a catalyst in speeding up the closure or shifting-out of partial or all business activities of foreign affiliates, such as withdrawals of Japanese investments observed in China.[3)]

Taking the perspective of the host country, the subsequent change of incentive policy toward FDI can be seen as a double-edge sword. On the positive side, separating generous national incentive schemes from the once-desirable FDIs of targeted sectors helps to achieve new policy goals and protect the welfare of the economy by pushing non-desirable FDIs out the door. The change of the policy may allow the host government to accomplish their goals, such as breeding their own national firms in the same industries, bringing in firms of higher value-added or higher technology, or guarding from pollution-heavy industries. On the other side, subsequent alterations to the incentive policies give warnings to prospective new FDIs and might deter new entities from coming in, especially during an economic downturn. When the old firms are gone and the new ones do not show up as expected, the local authorities will surely worry the most because of worsening prospect of economic development and thus the domestic infrastructure.

Despite the importance of sustainability for FDI policy, there is limited research on the change of the FDI incentives and the entry and exit of international firms (Blomström & Kokko, 2003).[4] There has been only slight research on the removal of incentives and the withdrawal of FDIs. The focus of this study is to analyze the interaction between withdrawals of international affiliates and the removal of FDI incentives. It aims to build a model to address the mechanism driving FDI withdrawal behaviors derived from the subsequent change of incentive schemes of the host countries. Starting with the optimization behavior of foreign firms of a local agglomeration, this paper derives an entry support function measuring the degree of FDI support for a host location (i.e. the commitment of FDI towards a host location). Taking the perspective that the host governments, which pursue continuing control of in-and-out of FDIs, I derive for the government an optimal incentive (increase or removal) strategy to investigate the impact of local incentives removal policies on the withdrawal behaviors of international firms.

The rest of this paper is organized as follows: Section 2 introduces the model. Section 3 extends the model and analyzes the interaction between incentive policy changes and FDI behaviors. Section 4 concludes the paper.

2. Model

2.1 Model Building

This study builds a "static" model to analyze how a foreign affiliate is affected by the "leave or stay" decision of other counterparts of the same entry location. If a foreign affiliate's decision to increase or maintain its investment in the local host is affected by how many other counterparts of the agglomeration do the same,[5] or when a foreign affiliate's decision not to participate in the retreating actions is affected by how many foreign firms made the same decision, the decision-making of FDI appears to lead to two distinct equilibrium solutions. In other words, in the same political and economic context, it may appear that "many" or "very few" foreign firms withdraw from the host location.

First, it is assumed that every affiliate facing the decision to withdraw will ponder its cost and benefits. Since the analysis focuses on incentive policies, I assume that the cost of each foreign affiliate to withdraw is the same and that the cost is constant which is standardized as taking value of zero.[6] Costs might include economic, social and political cost both in the short run and long run. As for the benefits, I assume that foreign firms care for not only the derived economic consequences of their withdrawing action, but also care about the significance of the withdrawing behavior itself. Specifically, foreign firms care about the business and social capital that they can obtain under different host governments, and about their ideological impression of the decision of whether to commit to the local host.

Regarding the intensity level of the commitment to withdraw from or to stay at the entry location, I assume that it is impacted by not only objectively from business and social capital obtained under the different host governments but also the subjective impression of company's standing as "*a good corporate citizen*". In other words, the potential consequence on business and social capital, a direct result of the withdrawals from the agglomeration, is assumed to have indirect influence on foreign firms' political-social decisions through its "sense of corporate social responsibility".

To be specific, this study has the number of all foreign firms that may participate in the withdrawals normalized to 1, and denote x for foreign firms that commit to stay and not to withdraw investment. Therefore those not committing to stay (or participating in the withdrawals of investment) can be specified as 1-x.

This study assumes that different affiliates, because of subjective evaluation, have different degrees of location loyalty; however, for simplicity of the analysis, they share the same impression objectively of business and political benefits, which can be obtained through the agglomeration effects. I use $\theta u(x)$ to represent affiliates' subjective evaluation of the agglomeration effects, in which θ represents the location support (or loyalty) of different foreign firms in varying degrees; the stronger the support (or loyalty), the higher will be the value of θ. For simplicity, I let θ be uniformly distributed with support on [0, 1].

Moreover, the common item $u(x)$ denotes the utility or returns derived from committing to stay and not to withdraw investment. It is characteristically impacted by how many others in the agglomeration committed to stay and not to withdraw investment. Thus, $u(x)$ is a function of x. Moreover, to capture the following agglomeration effect – the more the foreign firms commit to stay and not to withdraw investment, the higher will be the utility of foreign firms to continue their investment – I further assume $u_x(x) > 0$. To explain why $u_x(x) > 0$, taking the example of the foreign firms participating in the withdrawals, the number of foreign affiliates[7] participating in the withdraws not only affects the opportunity and the political economic risk involved in this withdrawing, but also the *business network pressure*[8] to withstand pressure from stakeholders, including parent companies, other affiliates and/or major suppliers and customers, when not participating in the withdraws (usually the greater the number of foreign affiliates not participating, the greater the business and political stress perceived by the firm). Therefore, I argue whether a foreign affiliate will participate in the withdrawal is affected by how many others in the agglomeration participate in it.

Viewed as an agglomeration behavior, the number of affiliates choosing to stay in a host location affects not only the results of the incentive removal schemes and the propensity of related future policies, but also the internal and external agglomeration pressure to be withstood from the business ecosystem[9] when not participating in the withdrawal. Put simply, the decision of a foreign affiliate to commit to a host location or not is affected by how many foreign affiliates go for the host location because of the pressure of "the embedded business ecosystem",[10] which in turn propels foreign firms to go for a host location with more existing support, where the embedded network of interdependent firms is. In short, the higher the degree of support of FDIs for a host location, the more the members of the agglomeration follow the trend.

Therefore, I assume the utility function, U, of a foreign affiliate committing to stay and not to withdraw investment through one's expectations of return (costs and benefits) as follows:

$$U = \theta u(x) + y - T + G; \quad u_x(x) > 0 \tag{1}$$

where $\theta u(x)$ is affiliates' subjective evaluation of the agglomeration effects and y represents the benefits (of business and social capital) carried by the non-fiscal policy of the whole host economy, T, fiscal revenue[11] and G, government spending. The outcome of $y - T + G$ denotes the consequences of the business and social benefits and welfares of objective level that the host economy can bring. Moreover, I assume that government spending is a positive function of fiscal revenue:

$$G = G(T); \quad G'(T) > 0 \tag{2}$$

2.2 Stability Conditions

With the basic model constructed above, if $U \geq 0$, then foreign firms would commit to the location; conversely, they do not. Foreign firms will choose to commit to the current location if the following condition holds:

$$\theta u(x) + y - T + G \geq 0. \tag{3}$$

From (3), I obtain

$$\theta \geq \frac{T - G(T) - y}{u(x)} \equiv \tilde{\theta} \tag{4}$$

with

$$\tilde{\theta}_y = \frac{\partial \tilde{\theta}}{\partial y} = -\frac{1}{u(x)} < 0; \tag{4a}$$

$$\tilde{\theta}_T = \frac{\partial \tilde{\theta}}{\partial T} = \frac{1 - G'(T)}{u(x)} \gtrless 0; \tag{4b}$$

$$\tilde{\theta}_x = \frac{\partial \tilde{\theta}}{\partial x} = -\frac{[T - G(T) - y]u_x}{u^2} = -\tilde{\theta}\frac{u_x}{u} < 0; \tag{4c}$$

$$\tilde{\theta}_{xx} = \frac{\partial^2 \tilde{\theta}}{\partial x^2} = -\frac{[T - G(T) - y]u_{xx}}{u^2} + \frac{2[T - G(T) - y](u_x)^2}{u^3} \gtrless 0. \tag{4d}$$

where $\tilde{\theta}$ is the marginal type of foreign firms, which are merely indifferent between supporting or not supporting a host location. Foreign firms with $\theta \geq \tilde{\theta}$ will choose to commit to the location, while those with $\theta < \tilde{\theta}$ will not. The outcomes $\tilde{\theta}_y$, $\tilde{\theta}_T$, $\tilde{\theta}_x$, $\tilde{\theta}_{xx}$ explained below are derivatives of marginal type of foreign affiliates $\tilde{\theta}$.

In (4a), the outcome $\tilde{\theta}_y < 0$ indicates that the higher the benefits carried by the non-fiscal policy of the whole host economy, the greater will be the number of the entry location supporting foreign affiliates.

The result of the equation (4b), $\tilde{\theta}_T \gtrless 0$, states that how incentive increases will affect the support of international affiliates for the host location is ambivalent because the impact of the incentive increases for foreign firms can be both positive and negative. From the point of view of a corporate citizen, the incentive increases not only have the merits of the increase of economic rent, but also bring the disadvantages on the decrease of the government's public spending or infrastructure. Here, to ease the discussion of the analyses, this study has the incentive increases take the form of tax decreases, and incentive removals, the form of tax increases.

If $1 - G'(T) > 0$, the merits of incentive increases on the increase of the gross operating surplus will be higher than the demerits of incentive increases on the decrease of government public spending or infrastructure. Thus, incentive increases will attract more foreign firms to commit to the location ($\tilde{\theta}_T > 0$). Conversely, if $1 - G'(T) < 0$, the merits will be lower than the demerits. Thus, the incentive increases will attract more foreign firms to oppose the host location ($\tilde{\theta}_T < 0$). In the following analysis, I assume $1 - G'(T) > 0$.

In (4c), $\tilde{\theta}_x < 0$ says that as more foreign firms commit to the entry location, the marginal loyalty degree of supporting the entry location is lower for the newcomers than for the existing marginal supporters. In other words, the fact that more and more foreign firms commit to the entry location will attract more popular support for the same. This is due to a "go with the majority" mentality in the loosely embedded business network, resulting in the "self-reinforcing" agglomeration effect (Dunning & Lundan, 2008, p. 596; Fujita & Thisse, 2002; Krugman, 1991).[12)]

Moreover, since u_{xx} could be positive as well as negative, the sign of $\tilde{\theta}_{xx}$ in (4) is ambiguous a priori. For convenience, I assume $u_{xx} = 0$, which implies $\tilde{\theta}_{xx} > 0$

Given a number of current entry location supporters (x), there is a corresponding number of foreign affiliates ($1 - \tilde{\theta}$) who will "choose" to commit to the location. However, the corresponding ($1 - \tilde{\theta}$) for x may not be consistent with the given x. Since θ is a variable of uniform distribution with support on [0, 1] and the equilibrium condition requires x and $1 - \tilde{\theta}$ to complement each other, I have

$$1 - \tilde{\theta} = x \tag{5}$$

Except for the corner solutions, an equilibrium (x^*) supporting the host location must satisfy (4) and (5) simultaneously. The imbalance of x and $1-\tilde{\theta}$ makes both adjust further to reach consistency. The way of its adjustment is assumed as follows:

$$\dot{x} = \alpha[(1-\tilde{\theta}) - x)] \tag{6}$$

with

$$\frac{\partial \dot{x}}{\partial x} = \alpha[(-\tilde{\theta}_x - 1)] < 0 \tag{7}$$

where α is a positive constant and (7) shows its dynamic stability condition. The dynamic adjustment set-in (6) shows that when $(1-\tilde{\theta})$ is greater than (x), (x) will increase; on the contrary, when $(1-\tilde{\theta})$ is smaller than (x), (x) will decrease. Moreover, the decrease (increase) speed/amplitude of the adjustment gets slower as x increases (decreases). In other words, the fluctuations or the amplitude of reaction in the dynamic adjustment gets smaller and smaller and the system approaches a new equilibrium solution, showing the characteristics of stable solutions.

Substituting the equations (4c) and (5) into (7), the required dynamic stability condition becomes:

$$(1-x^*)u_x - u < 0 \tag{8}$$

3. Analyses

3.1 Status Quo

For the host economy, the policy choice of incentive increases and incentive removals brings different degree of challenges because the expected outcomes vary with different policy. The analysis employed a graphical approach[13)] to address the mechanism of policy choice on the investment decision making of the foreign affiliates. The result addresses why incentive increases bring less challenge and incentive removals, more.

In Figure 1, the locus $XX(T=T_0)$ stands for the functional relationship between $1-\tilde{\theta}$ and x when the incentive is $T=T_0$ in the panel of (x, $1-\tilde{\theta}$). Due to $\tilde{\theta}_x < 0$ (4c), the slope of XX curve is positive, and $\tilde{\theta}_{xx} > 0$ where $u_{xx} = 0$ in (4d), showing that the increased proportion of $1-\tilde{\theta}$ with the increase of x becomes smaller and smaller in the plane. Moreover, the trace in Figure 1 shows the relationship between $1-\tilde{\theta}$ and x as expressed in (5). It can be observed easily that the slope of YY is a line departing from the origin with the slope of 1.

Given any x, the extant proportion of the entry location supporters will be increasing if $1-\tilde{\theta} > x$, but it will be decreasing if $1-\tilde{\theta} < x$. The rationale behind this result is intuitive. When $1-\tilde{\theta} > x$, the proportion of foreign firms that would choose to commit to the location will be higher than the actual proportion of the entry location supporters. This will raise the existing proportion of the entry location supporters. On the contrary, when $1-\tilde{\theta} < x$, the opposite occurs. The arrows in Figure 1 summarize the movement of x.

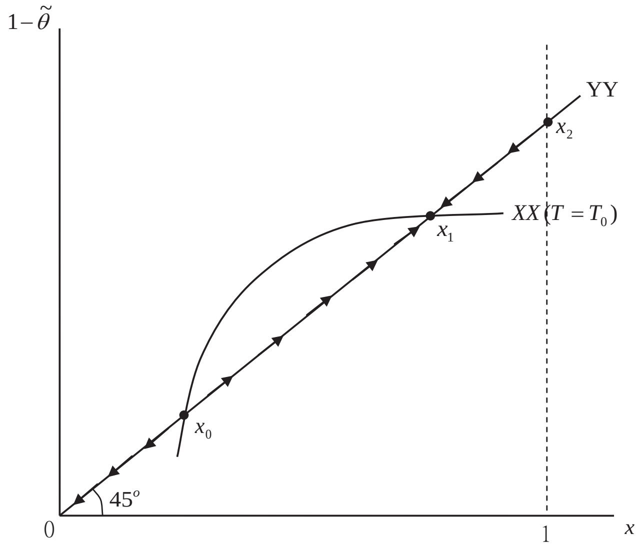

Figure 1. Status quo

I have the equilibria observed in Figure 1, two interior solutions (x_0 and x_1) and two corner solutions (the origin and x_2). It is easily seen in the arrow directions of Figure 1 that only interior solution x_1 and the origin are stable equilibria; the other two are not.

Although there are two stable equilibrium solutions in Figure 1, it is reasonable to assume in a general sense that the host location usually has its support rate at the interior solution x_1, rather than at the corner solution of the origin with the extreme value.

3.2 Incentive Increases or Removals

Here I consider the impact of incentive removals or incentive increases on the support for the entry location of international firms under the assumption of $1-G'(T)>0$. Let us analyze first the case of incentive increases. When the incentive is increased (e.g., tax is decreased) from $T=T_0$ to $T=T_1<T_0$, it brings the affiliates benefits due to the increase of the gross operating surplus, which are higher than the demerits of the decrease of the government's public spending or infrastructure. The result is that the incentive increases will attract more international investors to the entry location ($\tilde{\theta}_T>0$ in equation (4b)).

I observe this by the locus $XX(T=T_0)$ shifting upward to $XX(T=T_1<T_0)$ and the increase of the entry location from x_1 to x_3 (see Figure 2). In addition, one can easily see the other two characteristics of incentive increases (distinctly different from those of incentive removals). First of all, the greater the magnitude of incentive increases, the greater the rate of increase of the entry location supporting firms; incentives and the support rate, in the case of incentive increases, present the characteristics of a one-to-one continuous function.

Second, when the host economy cancels the original incentive measure for some reason, it is assumed that the location support rate of foreign affiliates will fall from the new equilibrium

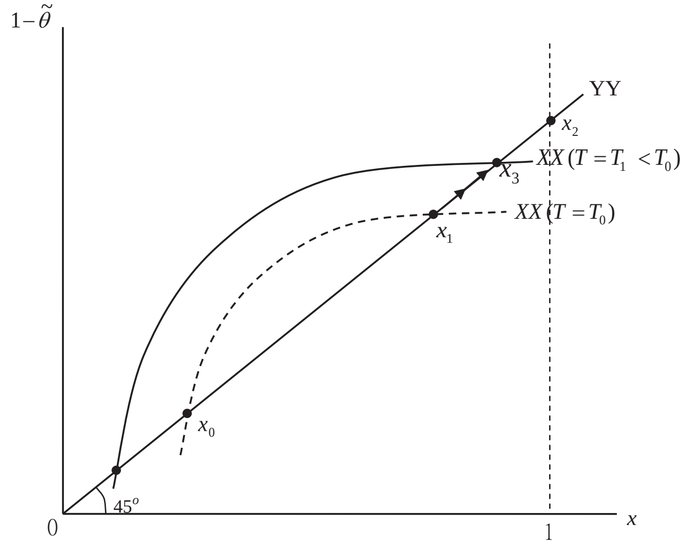

Figure 2. Incentive increase

point x_3 back to the old equilibrium x_1.

Let us consider now the case of an incentive decrease, from $T = T_0$ to $T = T_2 > T_0$ with $1 - G'(T) > 0$, where the demerits of the decrease of the gross operating surplus are higher than the merits of the public spending or infrastructure due to incentive decrease. The result is a decrease of the entry location investors because of the incentive decrease $\tilde{\theta}_T > 0$ in (4b), which I can trace from the downward shifting of $XX(T = T_0)$ to the location of $XX(T = T_2 > T_0)$, and the movement of the entry location support rate from x_1 to x_4 (see Figure 3). Moreover, if incentive removals are modest or the curve $XX(T = T_0)$ does not move across a threshold, it will not be difficult to recognize the two characteristics of incentive removals (distinctly different from those of large incentive removals or curve $XX(T = T_0)$ moving across a threshold): First of all, the greater the magnitude of incentive removals, the greater the rate of decrease of the entry location support from FDIs; incentives and support rate, in the case of incentive removals, present the characteristics of a one-to-one continuous function. Second, it is assumed that when the entry location cancels the original disincentive measure because of some consideration, the entry location support rate will rebound back from the new equilibrium point x_4 to the old equilibrium x_1.

What makes a case the most interesting and important is that regardless of how much the decrease in incentive, when the magnitude of the incentive decrease moves across a critical value $T = T_3 > T_0$, the incentive threshold T_3 will correspond to the critical curve of $XX(T = T_3 > T_0)$ as shown in Figure 4, which is tangent to the equilibrium equation YY at x_5. When incentive $T = T_3$, except $1 - \tilde{\theta} = x$ at the tangent point x_5, $1 - \tilde{\theta} < x$ holds for x at all the other values. As described in the foregoing analysis, when $1 - \tilde{\theta} < x$, i.e. the proportion of those choosing to commit to the location $(1 - \tilde{\theta})$ is lower than the proportion of the entry location supporters x, x

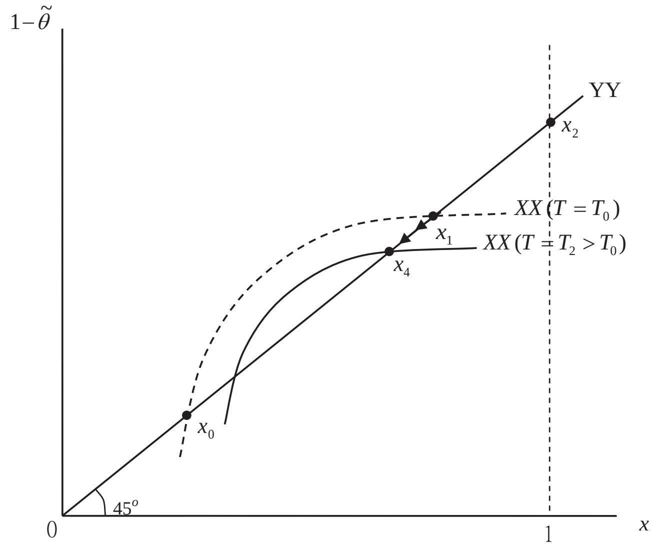

Figure 3. Incentive decrease

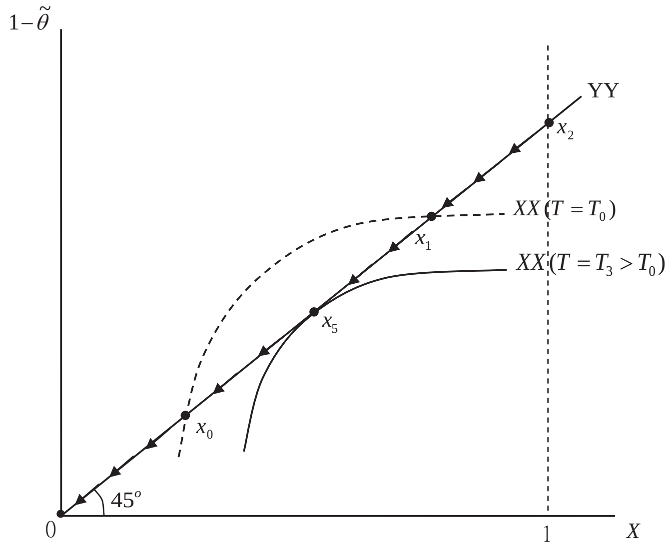

Figure 4. Incentive removals across the threshold

will become smaller.

So when incentives are decreased (e.g., a tax increase) from T_0 and go across the incentive threshold T_3, the number of entry location supporters will free-fall, from x_0 until the end. To make matters worse, when the entry location authority finds the situation out of control and decides to revert back to the original level of incentive T_0 in order to bring the support back to the original level x_0, they will find it is too late. The incentives have bounced back to the original level, but the support is still "sunk" at the level found after the collapse. Moreover, facing the critical moment, even when the local authority decides not only on no incentive removals but also on further incentive increases to T_4 with $T_4 < T_0$, and hoping to win back the support of the foreign firms, it will be too late. Support will remain "sunk" at par after the collapse; one is powerless in this hopeless situation.

In other words, when the incentive removals from T_0 and goes across the incentive threshold T_3, one can easily see the two characteristics of incentive removals: First, the greater the decrease in incentives, not only the greater the rate of decrease of the support of international firms for the entry location, but also the phenomenon of sudden changes (catastrophe) and a plunge of support due to slight incentive decrease measures occur. Incentives and FDI support rate appear to correlate positively but do not present the characteristic of a one-to-one continuous function. It is but a jumping phenomenon occurring at the critical value.

Second, assuming that when the entry location, found in a critical condition, cancels the original incentive decrease measures and even further increases the incentives to well above the previous level, it is still too late to save the FDI support rate for the host location because it will still be "sunk" at par after the collapse (hysteresis phenomenon).

Therefore, one must be cautious with even a slight incentive decrease measure; it may lead to an irreparable outcome, FDIs fleeing the host location. Incentive decreases must be watched over very carefully, but one worries less about problems of that kind for incentive increases.

3.3 FDI Support for an Entry Location

With (4c) and (5), I get to the entry location support (commitment) function of FDIs (without corner solution) as:

$$1 - x^* = \frac{T - G(T) - y}{u(x^*)} \tag{9}$$

where x^* denotes the equilibrium proportion of supporting firms for the entry location, called the entry location supporters hereon.

With (9) and the result of (8), I have the impact of the incentive changes on the entry location support:

$$x^* = x^*(T, y) \tag{10}$$

$$x^*_T = \frac{dx^*}{dT} = -\frac{G'(T) - 1}{(1 - x^*)u'(x^*) - u(x^*)} < 0 \quad \text{iff} \quad G'(T) - 1 < 0 \tag{10a}$$

$$x^*_y = \frac{dx^*}{dy} = -\frac{1}{(1 - x^*)u'(x^*) - u(x^*)} > 0 \tag{10b}$$

If the entry location support function is continuous at the equilibrium, (10) shows that $x^* = x^*(T, y)$ will be a continuous curve with a negative slope on the (x^*, T). However, the equilibrium proportion of the entry location support does not render the characteristic of a one-to-one continuous function, but the jumping of catastrophe and irrecoverable hysteresis at the critical value. Therefore, the shape of curve $x^* = x^*(T, y)$ on the plane (x^*,T) will not be recognized easily in (10).

One can explain by way of graphical illustration; however, since the analysis of the plane (x^*,T) will be the same as the one in the plane of $(x, 1-\tilde{\theta})$ in the previous section, please see above. Figure 5 is utilized to illustrate how the incentive policy will affect the entry location commitment of affiliates with a focus on the incentive removals beyond a threshold level.

In Figure 5, I consider the case of incentive increases from $T = T_0$ to $T = T_1 < T_0$ under the assumption of $1 - G'(T) > 0$. An incentive increase will make $XX(T = T_0)$ move upward to $XX(T = T_1 < T_0)$; hence, the proportion of the entry location support will increase from x_1 to x_3. At this time, the greater the magnitude of incentive increases, the greater the rate of increase of the entry location support received from international firms. In addition, incentives and the support rate in the plane of (x^*,T) present the characteristics of a one-to-one continuous curve with a negative slope. Second, it is assumed that when the original incentive increase measure is canceled, the entry location support rate will fall from the new equilibrium point x_3 back to the old equilibrium x_1 (see also Figure 2).

Consider now the case of incentive withdrawal (in the form of a tax increase) from $T = T_0$ to $T = T_2 > T_0$. This makes $XX(T = T_0)$ shift downward to $XX(T = T_2 > T_0)$, and the movement of the entry location support rate from x_1 to x_4. Moreover, the greater the magnitude of incentive withdrawal, the greater the rate of decrease of FDI support for entry location; incentives and support rate in the plane of (x^*,T) present the characteristics of a one-to-one continuous curve with a negative slope. Second, when the local authority cancels the original incentive withdrawal scheme, the entry location support rate will rebound back from the new equilibrium point x_4 to the old equilibrium x_1 (see also Figure 3).

However, regardless of how large the magnitude of incentive increase is, when it moves across the incentive threshold T_3, the equilibrium equation YY is tangential to the critical curve of $XX(T = T_3 > T_0)$ at x_5 as shown in Figure 5. As the magnitude of an incentive increase moves from T_0 to T_3 and the number of the entry location supporters decreases to the critical value at x_5, it will free-fall until it reaches the zero support rate. What makes it more dramatic is that when the incentive bounces back to the original level T_0, the support rate will be still “sunk” at the support rate of zero found after the collapse, which can be observed in the arrows pointing downward below T_3 on the vertical axis in Figure 5.

What makes it worse is that even a reverse operation, through a further upgrade to a higher incentive level T_4, with $T_4 < T_0$, will not be helpful in winning back the support of the foreign firms. Then, the support rate will remain “sunk” at the level found after the collapse, which can be observed in the arrows pointing upward found above T_3 on the vertical axis.

Thus, the shape of curve $x^* = x^*(T, y)$ on the plane of (x^*,T), can be divided into two parts (see Figure 5). The first part is the support rate before the crash. When the incentive withdrawal is lower than the critical value of T_3 $(T_3 > T_0)$, the incentive and support rate render in the plane a one-on-one continuous curve with a negative slope.

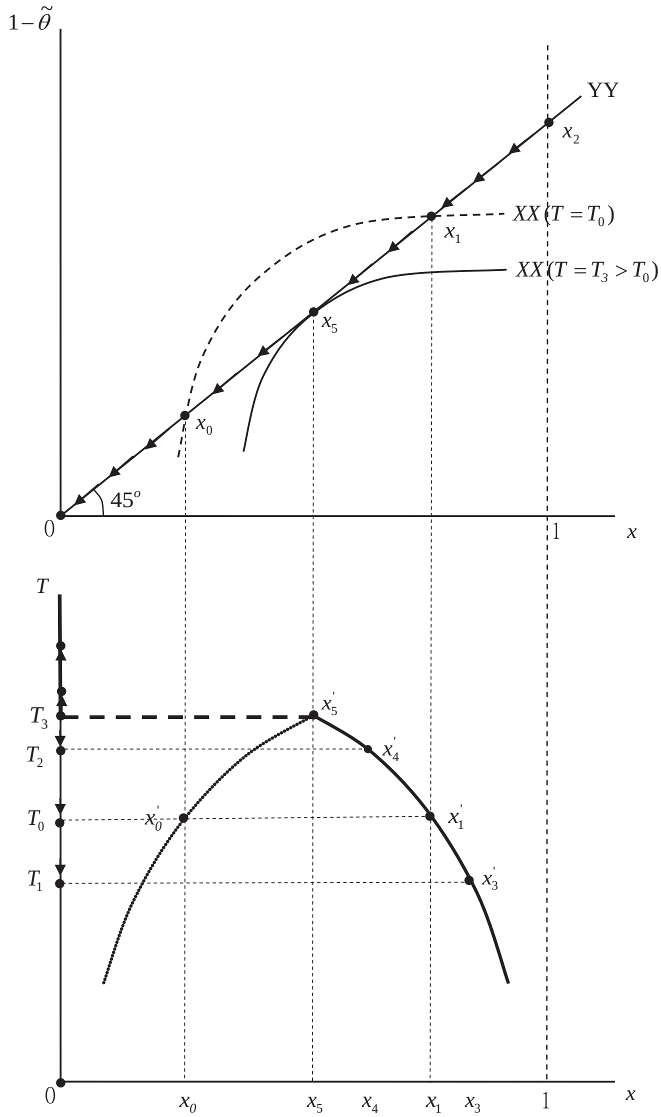

Figure 5. Incentive policy and FDI support for the host location

At equilibrium, the support of FDIs for entry location x^* decreases with the increase of incentive withdrawals, and increases with the reduction of the incentive withdrawals. This can be illustrated with a negative curve slope where point x_3' goes from x_1' and x_4' to x_5' (i.e., the curve of $x^* = x^*(T, y)$ found before the crash).

The second part is the stage after the collapse. Regardless of the incentive level, the proportion of the entry location support will be "sunk" at the level of zero support found after the collapse. As illustrated in Figure 5, the vertical axis is the $x^* = x^*(T, y)$ curve after the collapse. In addition, the (dashed) curve with positive slope connecting x_0' and x_5' in the figure below is the unstable equilibria corresponding to the figure above.

The discussion above as illustrated in Figure 5 examines the impacts of FDI incentives on the commitment of foreign affiliates for a host location with an emphasis on the plane of (x^*, T). Here, this paper assumes that the local authority of the host economy has complete information and a clear understanding of the shape and position of the entry support (commitment) function of foreign affiliates. On the contrary, the theoretical development below focuses on the plane of (y, T) illustrated in Figure 6, in which a more realistic assumption of the context of uncertainty is assumed and the local host authority does not have complete information and a clear understanding of the foreign affiliates' commitment function toward an entry location. It examines that how a local host authority might form its optimal incentive strategy toward FDI entry when facing boom and bust of the economy of the host location.

3.4 Host Country's Policy-Making

With the entry location support function $x^*(T, y)$, I assume the function of the host government's policy goal is:

$$W = x^*(T, y) + V(T) \quad ; \quad V'(T) > 0 \quad , \quad V''(T) = 0 \quad \text{if} \quad T < \tilde{T} \tag{11a}$$

$$W = 0 \quad ; \quad \text{if} \quad T > \tilde{T} \tag{11b}$$

where the first-order condition of optimization is:

$$W_T = x_T^*(T, y) + V'(T) = 0 \tag{12}$$

and the second-order condition is:

$$W_{TT} = x_{TT}^*(T, y) < 0 \quad ; \quad x_{TT}^* = \frac{d^2 x^*}{dT^2} = -\frac{2u'(x^*)}{(1-x^*)u'(x^*) - u(x^*)}(x_T^*)^2 \tag{13}$$

$$W_{Ty} = x_{Ty}^*(T, y);$$

$$x_{Ty}^* = \frac{d^2 x^*}{dTdy} = \frac{2u'(x^*)}{[(1-x^*)u'(x^*) - u(x^*)]^2} x_T^* = -\frac{2u'(x^*)}{(1-x^*)u'(x^*) - u(x^*)} x_T^* x_y^* > 0$$

The result of comparative statics analysis is:

$$T^* = T^*(y) \; ; \; \frac{dT}{dy} = -\frac{W_{Ty}}{W_{TT}} = -\frac{x_{Ty}^*(T, y)}{x_{TT}^*(T, y)} = -\frac{x_y^*}{x_T^*} > 0 \quad \text{iff} \quad G''(T) = 0 \quad \text{and} \quad T < \tilde{T} \tag{14a}$$

$$T^* = T^*(y) \; ; \; \frac{dT}{dy} = 0 \quad \text{iff} \quad G''(T) = 0 \quad \text{and} \quad T > \tilde{T} \tag{14b}$$

Here, W is a function of the government's policy goal for the host economy, $G''(T) = 0$ is assumed, and $\tilde{T}$ is the critical edge for the incentive level, which corresponds to T_3 in Figure 5.

Assuming the proportion of the entry location support is a continuous function, one can obtain a continuous curve with a positive slope on the plane of (y, T) observed in Figure 6. Regardless of the economic condition and incentive level, when the economy is getting better the government will increase the incentive-removal (or reduce the incentive) level, and the government will reduce the incentive-removal (or increase the incentive) level when the economy deteriorates. Changes in the economy and the incentive level show a one-to-one positive continuous and symmetric relation. The asymmetric phenomenon of "increasing incentives is easy, but removing them is difficult" will not appear.

Let us discuss the two-stage continuous support function of the location support rate $x^* = x^*(T, y)$ shown in Figure 6. A main characteristic of the non-continuous function of the location support rate is that there exists a critical edge for the incentive level, $\tilde{T}$. If the incentive decreases below this threshold, the phenomenon of rapid change will occur, with the support rate of foreign affiliates dropping drastically. With (12), I obtain:

$$x_T^*(\tilde{T}, \tilde{y}) + V'(\tilde{T}) = 0 \qquad (15)$$

where $\tilde{y}$ is the economic condition corresponding to incentive threshold $\tilde{T}$.

When $y < \tilde{y}$, regardless of the original economic condition and incentive level, the government will increase the incentive removal level (or reduce the incentive level) when the economy changes for the better; when the economy deteriorates, the government will reduce the incentive removal level (or increase the incentive level). Changes in the economy and the incentive level present a one-to-one positive relationship of continuity and symmetry, that is, for any $y < \tilde{y}$, I get $\dfrac{dT^*}{dy} > 0$. However, when $y > \tilde{y}$, to prevent the occurrence of crash, the government

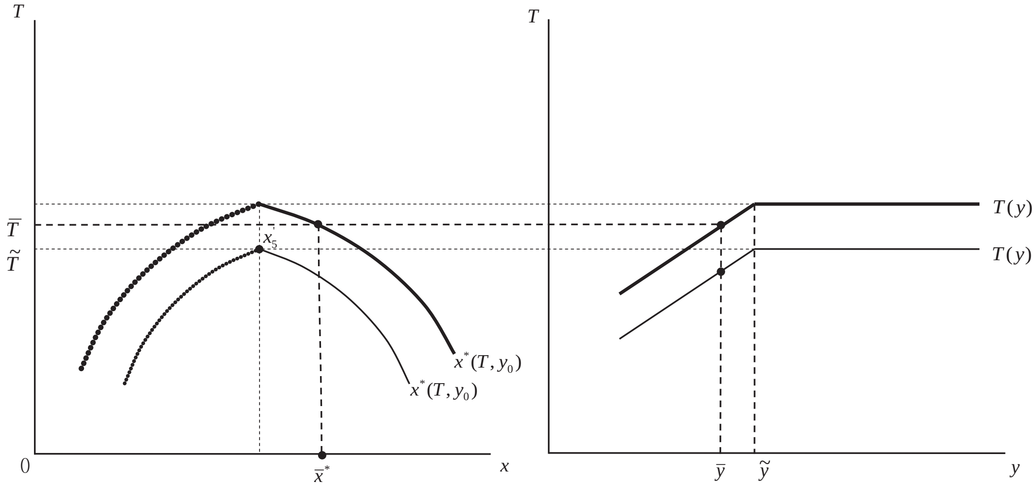

Figure 6. Policy with incomplete information: the case of incentive removals under uncertainty

will have the optimal incentive level T^* fixed at incentive threshold $\tilde{T}$; that is, for any $y > \tilde{y}$, I get that $\frac{dT}{dy} = 0$, i.e. $T^* = \tilde{T}$. This is also why the government shows the optimum incentive reaction in equation (15). This result enables us to explain the asymmetry that it is easy to have incentive increases but difficult to have incentive withdrawals.

In particular, when $y_0 \geq \tilde{y}$, for any $y \geq y_0$, I get $T^* = \tilde{T}$. This implies that facing a positive change of economic condition, the government will not increase the incentive level and make the incentive behave with upward rigidity, which is as shown in (14b). In contrast to (14b), incentive level and economic change appear in a one-to-one positive and continuous symmetric relationship, which gives incentive level a flexibility characteristic and highlights its rigidity characteristic. Together, these two characteristics indicate that one can rest assured in making adjustments based on the magnitude of the economic deterioration in the case of incentive increases, but in the case of incentive removals, one must be cautious about the incentive level and not go over the threshold, which will lead to the collapse of the support rate. Therefore, when the economy becomes good, the increase in incentive removals must not touch the threshold ceiling.

3.5 Uncertainty

Up until this point, I have assumed that the location authority has complete information, and a clear understanding of the shape and position of its support function. Therefore, based on the results of (14a) and (14b), the optimal incentive level can be determined with reference to how good or bad the economy is, as long as the incentive level does not cross the threshold rate. In the case of this complete information, I can expect two features for the model: first, I can expect the incentive level will not cross the threshold, and thus cause the phenomenon of the collapse of the entry location support of international firms; second, the incentive “rigidity” feature will appear only in the situation of $y \geq \tilde{y}$, and the incentive is rendered into complete vertical “rigidity”.

In the real world, however, no matter how skillfully the government or the media have pursued multi-channel surveys and estimates, it cannot have complete information and thus a perfect understanding of the shape and position of its support functions of foreign affiliates, nor does it really know how much the incentive threshold will be in various socio-economic situations. Under such circumstances, the context and pressure faced amid incentive increases and incentive removals will be significantly different. In the case of incentive increases, one just needs to worry about how high the support of foreign affiliates will be and not about the collapse of support issues. However, in the case of incentive removals, one needs not only to worry about how much the support rate has declined, but also to be very careful in each step not to touch the critical rate. Otherwise, the degree of support might collapse and all bets are off.

Let us take a look at Figure 6 to understand the latter case. On the left side of Figure 6, the finer curve at the bottom represents the real support curve of the entry location, but due to uncertain factors, the location authority overestimates its support curve as the thicker one at the top. On the right side of Figure 6, the finer curve at the bottom corresponds to the optimal incentive strategy the entry location should adopt at that time. The thicker curve at the top corresponds to the optimal incentive strategy that the location authority mistakenly thinks it should adopt at the time.

Accordingly, when the social and economic situations is $\bar{y}$, the location authority, based on the thicker line of the optimal incentive response strategy at the top, selects incentives $\bar{T}$ in pursuit of support rate $\bar{x}^*$. However, the real support curve of the entry location is the finer curve located below on the left side of Figure 6, which corresponds to the real critical incentive level $\tilde{T}$. The incentive level $\bar{T}$ that the location authority takes is apparently higher than the real critical incentive rate, so the outcome is the location authority accidentally crossed the critical rate, which leads to the collapse of support and a dire situation where all bets are off.

Therefore, in the real world of incomplete information, the government is indeed facing different issues when pondering incentive increases and incentive removals. For incentive increases, it needs just worry about the support rate, which one can obtain through solving the equations (11) added by the concept of the expected value of the decision-making under uncertainties or risks. Basically one will still find that a one-to-one positive function of continuity and symmetry relations exist for economic changes and incentive levels. However, for incentive removals, the location authority will face two very different results. First, when the incentive rate does not touch the critical incentive rate, the optimization problem is the same as in the case of incentive increases; second, when the incentive rate touches the threshold, the result is that the support collapses and all bets are off ($W = 0$) as shown in (11b).

To analyze this problem, this paper assumes that the location authority does not know exactly how much the critical incentive rate is in various socio-economic situations, but it knows the distribution function of the critical incentive rate under different situations. Thus, based on the probability function of the critical incentive rate, those in power can give a subjective estimate of the support collapse probability when facing the decision making of incentive removals. The probability is set as $\rho(T;T_0)$, where the main feature is that when the incentive withdrawal T_0 is made to increase, the probability of collapse of the support rate is positive, and the larger the magnitude of the incentive withdrawal increase, the greater the probability of the support collapse; (i.e., when $T \geq T_0$, $\partial\rho / \partial T > 0$).

When the status of the economy is $y = y_0$, the optimal incentive schemes and the location support rate it corresponds to is $T^*(y_0) = T_0$ and $x^*(T^*) = x_0$ respectively.

When the government is to reduce incentive withdrawal schemes (or increase incentives), it will maximize the objective function of (11), and its comparative static results are shown as (14). Conversely, when the government is to increase the incentive withdrawal (or decrease incentives), the objective function it will maximize becomes:

$$\Pi = (1 - \rho(T;T_0)) \cdot W + \rho(T;T_0) \cdot 0 \tag{16}$$

where $W = 0$ shows the utility of those in power in the event of a crash. What is worth noting is that when there is no problem of support collapse in the case of incentive increases, (16) it will degenerate back to (11a).

The first-order condition of the optimization of the entry location utility is:

$$(1-\rho)\cdot\frac{\partial W}{\partial T} - W\cdot\frac{\partial \rho}{\partial T} = 0 \tag{17}$$

Since $T \geq T_0$, $\partial\rho / \partial T > 0$. Optimal incentive policy under uncertainties I derived in (17) will be smaller than the optimal incentive policy $T^*(y)$ derived from (13). I thus obtain the result of $T^{**}(y_0) < T^*(y_0) = T_0$.

Using comparative statics analysis, one can still derive the result of $dT / dy > 0$ from (17). This result, together with $T^{**}(y_0) < T_0$, implies that there exists $y_1 > y_0$ with $T^{**}(y_1) = T_0$. Since $T^{**}(y) \leq T_0$ for all y with $y_1 \geq y \geq y_0$, I obtain the result that the host location will not decrease the incentive from the status quo incentive T_0 unless the economic situation is good enough to satisfy $y > y_1$.

The solid line in Figure 7 depicts the optimal incentive policy against the boom and bust of the economy under uncertainties in the political context of $T^*(y_0) = T_0$. One can observe clearly from the figure that the incentive T_0 will remain optimal in the presence of economic upturn unless economic prosperity continues to expand and satisfy $y > y_1$. It is also clear that the location authority will have incentive increases from the current T_0 when the economy deteriorates.

To sum up the findings, the results show that, in the context of uncertainty, the optimal incentive policy of a government against the boom and bust of the economy under consideration is: Facing an economic downturn, the location authority will have incentive increases, regardless of the deterioration of the socio-economic situation, but it will not decrease incentives unless the socio-economic situation has made a substantial improvement.

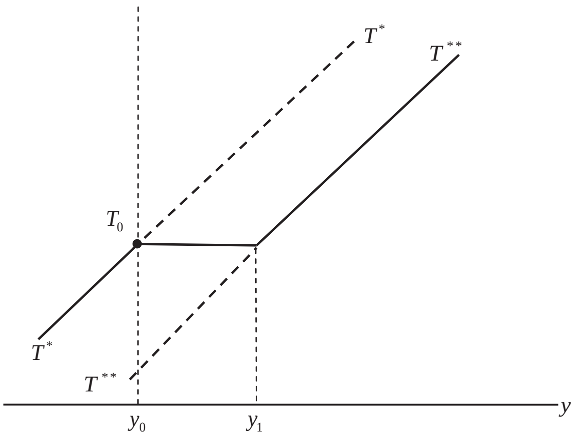

Figure 7. Optimal incentive policy

4. Conclusion

From the point of view of the foreign affiliates, incentive removals have the merit of increasing the government's public spending or infrastructure, but they cannot make up for the demerit of decreasing the economic rent of international firms. Incentive removals will hurt the foreign affiliates, which will in turn affect their support for the investment location and speed up FDI withdrawals. The higher the magnitude of incentive removals, the more foreign firms feel hurt and the higher the magnitude of the hurt. This will cause more foreign firms to reduce or change support for the entry location.

If a foreign affiliate's decision to go for an investment location is affected by how many others of the agglomeration (and business networks) go for the investment location, this will be a case of contagious interaction and diffusion. In this case, if the incentive removal measures continue to be introduced, an incentive cut bill will make some new foreign firms change their support of the entry location, and might bring self-reinforcing effects and make many foreign firms reduce or change their support for the entry location and cause a catastrophe phenomenon, such as an outbreak of large-scale withdraws of international firms.

Even if the government cancels the incentives removal bill and reverses the incentive to an even higher level than before, it cannot restore the investment location support rate to its original level, leading to a hysteresis phenomenon. Therefore, one must be very cautious with incentive removals. On the other hand, in the case of incentive increases, the improvement of gross operating surplus might benefit the foreign affiliates more if the benefits of the increase of economic rents it brings for the firms is enough to make up for the disadvantages of the decrease of the government's public spending or infrastructure.[14)]

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Notes

* This paper benefits greatly on the discontinuous model building and analyses from a previous joint-research on the topic of election and fiscal policy with C. C. Lin while I served as a visiting scholar in the Institute of Economics, Academia Sinica. Without his encouraging me to apply the unique analytical framework in the discipline of international economics, this paper could not be made possible.

1) For example, many foreign owned manufacturing firms have benefitted from incentive schemes in China since the early 1980s; however, thousands of manufacturing firms have been reported to root out in the agglomeration of Dong-guan city in southern China in recent years.

2) A new wave of closures has been observed in Dong-guan, a key manufacturing city located in the Pearl Delta in southern China, reported in a report from Voice of America (Tang, 2015). Accordingly, about one third of firms were gone by early 2015. It was estimated that nearly 4,000 firms closed in 2014, including many Taiwanese firms, and more are expected to join them in following years. It was estimated that one third of Taiwanese firms closed up in 2013 in the city. In addition, although around five thousand firms could be found at the peak, about half are now gone.

3) According to UNCTAD, China has become the largest FDI recipient in the world and enjoyed inflows of $129 billion in 2014, an increase of about 4 percent from previous years (UNCTAD, 2015). However, FDI flows from Japan declined by 39 percent during the same period. Besides, the partial or complete closure of all business activities in China occurred not only among many small and medium enterprises (SMEs) but also among well-known brand firms such as Panasonic, Citizen and Laox (Nihon Keizai Shinbunsha, 2016) .

4) Blomström and Kokko (2003) provided a good descriptive analysis of foreign direct investment incentives from a theoretical point of view, but no study of FDI incentive removals.

5) Empirical studies often reported that the agglomeration effect acts an important determinant of location choice, and international firms might cluster into a specific location in the decision making of FDI entry choice (Broadman & Sun 1997; Cheng & Kwan 2000; Dunning & Lundan, 2008; Gong 1995; ; Li 2004; Porter, 2000; Wei et al., 1999).

6) For the purpose of simplicity in model building, the assumption of constant cost of withdrawal for a foreign affiliate is made, which implies that these firms are homogeneous. A future study can make it a variable cost to make the model more flexible in addressing different scenarios.

7) My model incorporates the concept of internal agglomeration, which asserts that a firm's existing facilities affect subsequent location choices, and it prompts firms to collocate activities and business units across the value chain (Alcacer & Delgado, 2013). Thus, this paper asserts that the number of business units and business activities involved will surely be critical as the number of foreign affiliates found in the external agglomeration. For simplicity, this paper uses the term "foreign affiliates" to refer to all business entities/activities found in both external and internal agglomeration.

8) This study applied concepts derived from social interaction theory and network theory (Becker, 1974; Lindbeck et al. 1999; Manski, 2000).

9) The business ecosystem refers to the loose network in which an international affiliate is embedded, including parent companies, fellow affiliates, suppliers, distributors, customers, and others (Isaniti & Levien, 2004).

10) A good discussion of ecosystem as a strategy can be found in Isaniti and Levien (2004).

11) In the theoretical building of this paper, the fiscal revenue T also used to measure the core concepts of incentive from the opposite perspective. Specifically speaking, incentive removals are denoted by tax hikes and incentives increases, tax (fiscal revenue) cuts.

12) Research on agglomeration effects asserts that a "self-reinforcing tendency" will make "the attraction of one firm…generally…more attractive for another firm to co-locate in the same region" (Dunning & Lundan 2008, p. 596; Fujita & Thisse 2002; Krugman 1991).

13) The approach employed enables one to study the phenomena of discontinuous jumps and hysteresis. Its application can be found in recent literature (Lin & Yang, 2006; 2008).

14) It goes without saying that the government budget deficit cannot indefinitely expand. A policy of only incen-

tive increases and no incentive removals cannot continue indefinitely. One day when the budget deficit deteriorates to a critical point, incentive increases will cause more harm than good to the host economy. Therefore, when the situation has evolved to this critical threshold, the government must put an end to the incentive increase policy and reverse to a policy of incentive removal.

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（要旨）

国民国家は，外国直接投資（FDI）を誘致するため，よくインセンティブを提供する。しかし，FDI インセンティブの見直しや撤廃は，進出現地法人が大きな損失を被り，投資受入れ国から撤退する重要決定に直面する可能性が十分ある。本論文は，現地政府のインセンティブ政策と国際企業の直接投資行動の変化を観察する。具体的には，投資受入れ国の外資優遇制度の変化により FDI の拡大と撤退行動を駆動する仕組みを解明し，理論モデルを構築することを目指す。進出先地域の産業集積における外資企業の最適化行動の分析から出発し，それらの投資活動の変化を測定する進出先へのサポート（コミットメント）関数を導出する。そして，進出先政府は海外直接投資の流出入へ支配し続けようとする視点から，当局の最適なインセンティブ（増加または撤去）政策を導き出し，インセンティブ政策がいかに外資企業の海外拡張や撤退行動に影響を与えるかを考察する。最終的に，不確実性の下で，経済の好況と不況に対する政府の最適なインセンティブ政策を分析した。