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Inheritance of Local Culture and Disaster: Identity-formation-model Approach

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Abstract Local culture such as rituals and landscape has been inherited throughout the history of communities. However, current young generations who are expected to succeed their culture tend to move to urban areas. An outflow of residents is sometimes observed after disaster when an affected community is reconstructed and a provided different environment from the previous one. This study focuses on how residents' identities are inextricably associated with their behavioral choices: to live as successors, to move to an urban area, or something else. In the identity-formation model, it is assumed that each resident has two types of characteristics: the specialized skill for working in an urban area and the environmental factors that form the foundation of her/his life and self, which is called "the degree of rootedness in hometown" in this study. Based on these characteristics, residents are categorized into the following groups: those who emigrate to an urban area for work with their high skills, those who vitalize their culture in their community with strong rootedness, and those who are apathetic to any activities in their community and are without much skill and rootedness. The study analyzes the conceptual structure of the choice of identity, and describes the possibility that relocation of an affected community causes emigration of its members whose preference for identity is rather strong. The study implies that essential factors that the community has developed in its history should be carefully conserved in the recovery process for identity formation of community members.

Key words Local culture; Inheritance; Identity; Rootedness; Identity-formation model.

1. INTRODUCTION

Local culture such as rituals, landscape, shrines, and temples plays an important role in a community as the basis for daily life, creating distinctive culture or customs in each community (Tanaka 2007). Such

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culture has been inherited by not one generation but all the generations. The proper inheritance of culture is required to preserve that culture. The essential question about how to inherit local culture depends not on the appearance or the structure of local culture but on the attitude or behavior of successors (Fujii 2007), that is, the residents who inherit local culture. Whether they identify themselves as genuine residents considerably affects both the existence of a local community and the local culture. Disaster intervenes in several ways in local culture inheritance: The way that local people are supposed to participate in community-based disaster prevention activities, and the way that an affected community replaces natural and artificial components in reconstruction process will have impacts on residents' identity formation and accordingly sustainability of the culture. Disaster prevention and recovery plans should focus on local people's incentive to experience their local culture.

This study aims to analyze the identity-formation process of residents with regards to local culture, which is defined in this study to include local rituals, traditional performances, cultural landscape, and temples and shrines inherited by local residents. In other words, this study discusses the conceptual structure of the choice of identity as successors and further aims to elucidate how local culture can be sustainably inherited. Our analysis proceeds as follows. In section 2, we elaborate on the focus of this study, which relates to the relationship between the inheritance of local culture and identity formation. In section 3, we propose the basic model of identity formation in this study and describe in what situation residents choose their identities as successors. To describe residents' identity formation in more concrete terms, section 4 considers the case that a rule forces all residents to participate in a reactivity process after a disaster, section 5 considers the case that a community relocates to a safer place after it is devastated by disaster, and section 6 considers the case that residents form their identities by considering other peoples' attitudes ; each section extends the basic model as appropriate. Section 7 concludes the study and describes future research.

2. IDENTITY AND MODELING

2.1 Review of Previous Work

Many studies have observed that the extent to which community factors are connected, directly or indirectly, with an individual's life is strongly related to the individual's behavior in the community. For instance, Hagihara and Fujii (2005) and Hikichi *et al.* (2009) focus on the relation between an individual's behavior and the degree of his involvement in or his attachment to the community. In these studies, the degree of involvement in the community, in other words, the quality of experience in the community or the degree of contact with the local features, has a larger impact on the formation of local attachment than does the duration of residence in a community. In addition, Wakabayashi *et al.* (2000) show that an individual with strong attachment is more actively and positively involved in disaster drills, community revitalization activities, and recycling-related activities.

This study formulates a simple model to analyze the structure of identity formation regarding the inheritance of local culture. Akerlof and Kranton (2000, 2002) are well-known works that construct mathematical models of the conceptual structure in which identity affects an individual's behavior. These studies propose utility functions based on social categories and assume that identity formation is a choice by an individual of one social category. In the model, the individual's choice depends on the extent to which his characteristics match the ideal of each social category. Akerlof and Kranton (2002) addresses the problem of identity formation in school as one application of the modeling. The study describes the structure in which students choose their own identities from among a variety of identities in school, analyzes students' behavior, and finally proposes an educational policy. Other topics regarding identity,

such as sexual and racial discrimination, are also addressed in the model (Akerlof and Kranton 2010). This study applies Akerlof and Kranton (2002) and constructs a model to describe an individual's choice of identity with respect to the inheritance of local culture. However, unlike the previous studies, this study addresses the effect of the social or natural environment in a community on the formation of self, thus providing socio-psychological insights. Our model can clearly describe a problem that the traditional economic approach of utility maximization cannot explain. Since few works explicitly propose a model of residents' identity formation regarding the inheritance of local culture, this study should be considered basic research on the problem.

Research studies on disaster and identity formation have mainly been anthropological, in which each related issue has been treated separately (Dugan 2007; Yamazaki 2010). This study provides a basic framework to investigate those related issues in a theoretical and integrated way.

2.2 A Framework of the Study

Like Akerlof and Kranton (2002), we adopt the idea of category choice and assume that an individual chooses one category among the following three categories, which this study defines as social categories: 1) "Emigrants," who leave their community for an urban area to seek work or urban culture, 2) "Successors," who feel a strong attachment to their community and get involved in the inheritance of local culture or local activities, and 3) "the Apathetic," who do not leave their community but do not care about activities that contribute to the inheritance of local culture. An individual is assumed to choose one of the categories by considering which category maximizes his utility according to his characteristics. The characteristics in this study are given the following two types of parameters: "the specialized skills for work" and "the degree of rootedness of hometown in an individual." "The specialized skill for work" refers to the extent to which the individual's working skill and knowledge is specific in his area. Firms in local areas have relatively a small number of workers, and therefore require each worker to cover a wide variety of tasks. Workers tend to have general skills and knowledge in rural areas. In contrast, in urban areas, specialized skills and knowledge are relatively focused, and individuals with good skills and knowledge have an advantage in getting jobs and economic success. In other words, urban areas attract individuals with more specialized skills for work. On the other hand, another characteristic which we call "The degree of rootedness of hometown in an individual" refers to the extent to which the individual's notion of self depends on local culture, the local relationship, local climate, and local environment. A wide variety of socio-psychological literature investigates the notion of "the self" that is determined by the relationships with "others," which are not only human beings but artifacts such as physical equipment and institutional environment. Local unique conventions and rules are also regarded as "the generalized others." Similarly, for those who organize local rituals as long-time leaders, rituals can also be considered as the creator of the self. Moreover, the physical environment can also be regarded as the generalized others. Let us consider the example of the formation of the self of a grandfather. As part of daily routine, he leads his grandson by the hand up and down a hill. For the grandfather, the grandson forms the self of the grandfather. In the same way, the hill on which he walks can also form the self of the grandfather. This means that the hill is "rooted" in the grandfather. Thus, in this model we assume that the more each individual has factors like the hill mentioned above in his community, the higher is the degree of rootedness of hometown in an individual. We consider that the essential element to establish the identity of an active resident depends on the degree of rootedness of hometown in each resident. We formulate the identity formation model of a resident under factors such as cultural education to enhance the degree of rootedness, the quality of local culture, and the existence of urban area, and analyze how these factors affect his choice of identity and suggest a desirable proposal for establishing the resident's identity of

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"successor."

3. A BASIC IDENTITY FORMATION MODEL

3.1 Categories and Characteristics

This study applies the concept of the identity formation model in Akerlof and Kranton (2002). It is assumed in this model that **C** is the set of selectable social categories based on identity and that **P** is the set of prescriptions of different categories. Here, an individual i can choose a category $c_i \in \mathbf{C}$, and accordingly earn the "category image" I_i associated with that category, which is prestige or esteem that she/he obtains when she/he belongs to the category. Hence, we have the following utility function for an individual i depending on identity:

$$U_i = U(x_i, \epsilon_i, I_i), \tag{1}$$

where x_i and ϵ_i denote individual i's actions and characteristics, respectively. We then call the utility that is related to category image by "identity utility," and we define "identity formation" as one's category choice. In our study, we assume that individual i has the following two types of characteristics, given exogenously as

$$\epsilon_i = (s_i, h_i), \tag{2}$$

where s_i and h_i denote the specialized skill for work ($0 \leq s_i \leq 1$) and the degree of rootedness of hometown in an individual ($0 \leq h_i \leq 1$), respectively. Throughout the remainder of this work, we thus refer to s_i and h_i as the specialized skill and the degree of rootedness of hometown, respectively. Selectable categories in this model fall into the following three categories: "Emigrants" (U), "Successors" (H), and "the Apathetic" (A):

$$\mathbf{C} = \{U, H, A\}. \tag{3}$$

Each category has its own prescription: category U has the maximum of the specialized skill $s_i = 1$, category H has the maximum of the degree of rootedness of hometown $h_i = 1$, and category A has no prescription. An individual's identity utility depends on the category image I_i derived from his assigned category and the extent to which his characteristics match the prescription of the category. An individual who chooses $c_i = U$ gains the identity utility $I_U - \beta(1 - s_i)$, and an individual who chooses $c_i = H$ gains the identity utility $I_H - \beta(1 - \theta \cdot h_i)$, where $\beta(\geq 0)$ is a parameter scaling the distance between the prescription and one's characteristics, in other words, a parameter scaling the loss of the identity utility. If β becomes larger (smaller), as an individual is more (less) conscious of the gap between the prescriptions and her/his characteristics, less (more) identity utility is gained. $\theta(\geq 1)$ denotes the effect of education, which enhances the degree of rootedness of hometown. Let $I_U(\geq 0)$ and $I_H(\geq 0)$ denote the category images of categories U and H, respectively. Because the category A does not have a category image, it is described as $I_A = 0$. In what follows, we assume a representative individual and thus omit the subscript i when obvious.

3.2 A Decision Making Model

To maximize his utility, an individual chooses a category, comparing the utilities derived from the categories U, H, and A.

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Emigrants can earn salary $w \cdot s$ according to their skills, and enjoy pop-culture n created by the people in the urban area. w denotes the wage for the specialized skill, and n denotes the population size in the urban area. Successors and the apathetic can enjoy the quality of the local culture q because they live in their hometown and reap the benefits of local culture. Under these assumptions, each category has the following utility function with identity utility as follows:

$$U_U = \alpha(w \cdot s + n) + (1 - \alpha)\left(I_U - \beta(1 - s)\right), \tag{4a}$$

$$U_H = \alpha q + (1 - \alpha)\left(I_H - \beta(1 - \theta \cdot h)\right), \tag{4b}$$

$$U_A = \alpha q, \tag{4c}$$

where the parameter α denotes the ratio of the utility derived from normal consumption to the identity utility $(0 \leq \alpha \leq 1)$.

Based on his/her characteristics (2), an individual chooses a category, which maximizes his/her utility among (4a)∼(4c). If, for an individual, $U_U \geq U_H$ and $U_U \geq U_A$, then the individual chooses category U and identifies himself as an emigrant. Similarly, if we can assume the case that each category H and A is chosen, we can depict the figure that shows the distribution of categories according to the individual's characteristics.

The distribution of each category is depicted in Figure 1. The parameters s_1 and h_1 as well as the line

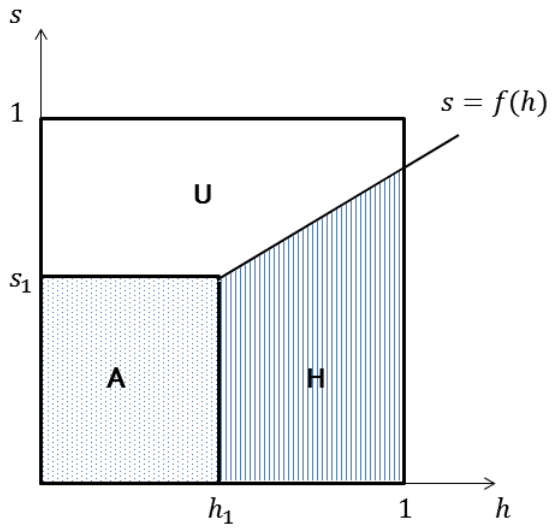

Figure 1. The Distribution of Each Category of the Basic Model

$s = f(h)$, which delineates categories U and H in Figure 1, are

$$s_1 = \frac{\alpha(q - n) + (1 - \alpha)\left(\beta - I_U\right)}{\alpha w + (1 - \alpha)\beta}, \tag{5a}$$

$$h_1 = \frac{1}{\theta} \cdot \left(1 - \frac{I_H}{\beta}\right), \tag{5b}$$

$$\begin{aligned} s &= \frac{1}{\alpha w + (1 - \alpha)\beta} \\ &\quad \cdot (\alpha(q - n) + (1 - \alpha) \cdot (I_H - I_U + \beta\theta h)) \\ &= f(h), \end{aligned} \tag{5c}$$

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where the line $s = f(h)$ satisfies $s_1 = f(h_1)$.

Because the specialized skills s and the degree of rootedness of hometown h should be, respectively, $0 \leq s \leq 1$ and $0 \leq h \leq 1$, and considering (5a) and (5b), I_U and I_H must satisfy

$$\frac{\alpha(q-n-w)}{1-\alpha} \leq I_U \leq \frac{\alpha(q-n)}{1-\alpha} + \beta, \tag{6a}$$

$$0 \leq I_H \leq \beta. \tag{6b}$$

3.3 Comparative Statics

We consider the changes in the distribution of each category by the increase in the effect of education or the improvements in quality of local culture. We express the slope of the line $s = f(h)$ as K, which satisfies

$$K = \frac{1}{\alpha w + (1-\alpha)\beta} \cdot (1-\alpha)\beta\theta. \tag{7}$$

3.3.1 The Effect of Education θ

$$\frac{\partial s_1}{\partial \theta} = 0, \tag{8a}$$

$$\frac{\partial h_1}{\partial \theta} = -\frac{1}{\theta^2} \cdot \left(1 - \frac{I_H}{\beta}\right) < 0, \tag{8b}$$

$$\frac{\partial f(0)}{\partial \theta} = 0, \tag{8c}$$

$$\frac{\partial f(1)}{\partial \theta} = \frac{1}{\alpha w + (1-\alpha)\beta}(1-\alpha)\beta > 0, \tag{8d}$$

$$\frac{\partial K}{\partial \theta} = \frac{1}{\alpha w + (1-\alpha)\beta}(1-\alpha)\beta h > 0. \tag{8e}$$

As a result of the comparative statics with respect to the effect of education, we can depict Figure 2, which shows the distribution after the increase in θ. The dotted line denotes the distribution before the increase (which is the same as in Figure 1). As we can see from Figure 2, the increase in the effect of education rotates counterclockwise the line $s = f(h)$ around its intercept and reduces h_1. In short, the strong effect of education increases the proportion of category H, but it can also decrease the proportion of both categories U and A.

3.3.2 The Quality of Local Culture q

$$\frac{\partial s_1}{\partial q} = \frac{\alpha}{\alpha w + (1-\alpha)\beta} > 0, \tag{9a}$$

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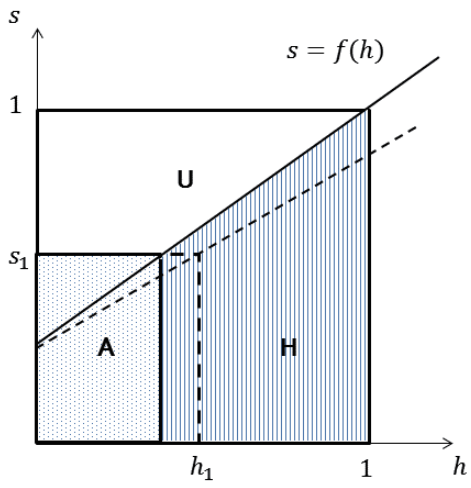

Figure 2. Changes in Each Category Resulting from the Increase in Effect of Education

$$\frac{\partial h_1}{\partial q} = 0, \tag{9b}$$

$$\frac{\partial f(0)}{\partial q} = \frac{\alpha}{\alpha w + (1-\alpha)\beta} > 0, \tag{9c}$$

$$\frac{\partial f(1)}{\partial q} = \frac{\alpha}{\alpha w + (1-\alpha)\beta} > 0, \tag{9d}$$

$$\frac{\partial K}{\partial q} = 0. \tag{9e}$$

As a result of the comparative statics with respect to the quality of local culture, we can depict Figure 3, which shows the distribution after the increase in q. As Figure 3 depicts, the increase in the quality of local culture q raises s_1 and moves the line $s = f(h)$ in a parallel direction toward the positive s-axis. In short, the increase in the quality of local culture increases the proportion of both categories H and A, whereas it can decrease the proportion of category U.

In short, both the strong effect of education and the improvement in the quality of local culture can prevent residents from moving to urban areas, while at the same time the former can reduce the number of the apathetic in a local area, while the latter increases the apathetic in a local area. The features of both should be considered carefully when these measures are performed to vitalize a community.

4. CREATION OF LOCAL CULTURE AND THE EFFECT OF A COMPULSORY PARTICIPATION RULE

In this section, we focus on the case that both successors and the apathetic become involved in the inheritance of local culture, in other words, the case that successors force the apathetic to become involved in the inheritance of local culture. To analyze the effect of the rule requiring all residents including the apathetic to participate in community activities, we describe and then compare the distribution figures in the no-rule and rule scenarios.

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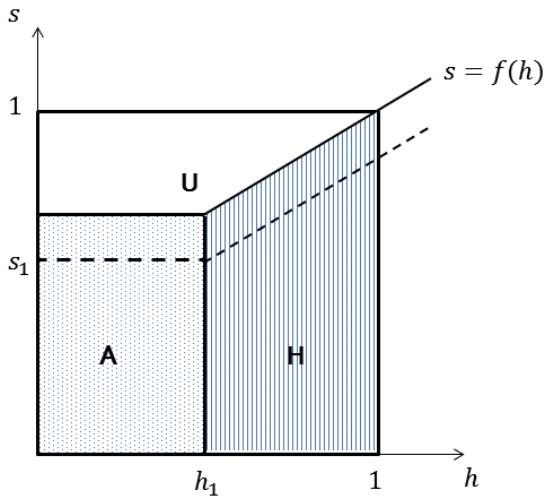

Figure 3. Change in Each Category Resulting from the Improvements in Quality

4.1 A Utility Function and the Distribution of Each Category

It is assumed that through the inheritance of local culture, successors can gain more identity utility. That is, according to the extent of the participation x, successors can gain the identity utility $I_H - \beta(1-\theta \cdot h) + \gamma x$, which means γx is added to the basic model, and where parameter γ is positive. Both successors and the apathetic have to pay opportunity cost $\frac{\zeta}{2}x^2$ for activities, where the parameter ζ is positive.

Under these assumptions, we define the following utility function in each category, where there is no mandatory participation rule.

$$U_U = \alpha(w \cdot s + n) + (1-\alpha)\left(I_U - \beta(1-s)\right), \tag{10a}$$

$$U_H = \alpha\left(q - \frac{\zeta}{2}x^2\right) + (1-\alpha)\left(I_H - \beta(1-\theta \cdot h) + \gamma x\right), \tag{10b}$$

$$U_A = \alpha q. \tag{10c}$$

According to the extent of the inheritance x, the quality of local culture q is formed as follows:

$$q = q_0 + x, \tag{11a}$$

where q_0 is the positive initial parameter that denotes the initial quality.

As in the preceding section, an individual chooses the most suitable category according to his characteristics. We can describe an individual's behavior of category H, solving the following maximization problem:

$$\max_x \ U_H. \tag{12a}$$

Hence, the optimal action x^* is expressed by

$$\begin{aligned} x^* &= \arg\max \ U_H \\ &= \frac{1}{\alpha\zeta}\left(\alpha + (1-\alpha)\gamma\right). \end{aligned} \tag{13}$$

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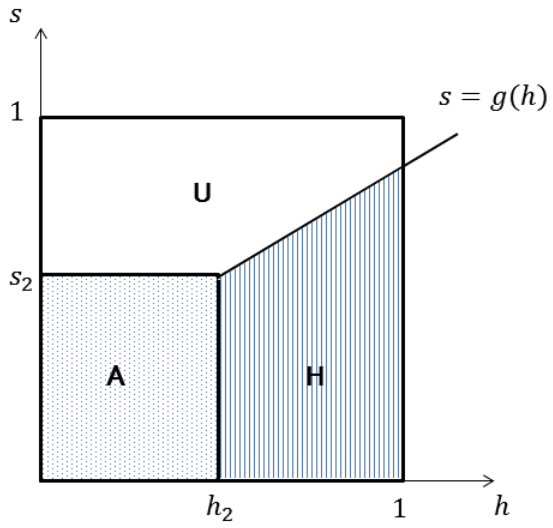

Figure 4. The Distribution of Each Category before the Mandatory Participation

The corresponding quality of local culture q^* is expressed by

$$q^* = q_0 + x^* \tag{14a}$$

$$= q_0 + \frac{1}{\alpha\zeta}\left(\alpha + (1-\alpha)\gamma\right). \tag{14b}$$

Category H follows the optimal action x^* and the corresponding quality of local culture q^*, whereas category A follows only q^*. Thus, an individual decides his own category, comparing the following utility functions:

$$U_U = \alpha(w \cdot s + n) + (1-\alpha)\left(I_U - \beta(1-s)\right), \tag{15a}$$

$$V_H = \max_x U_H$$

$$= \alpha\left(q^* - \frac{\zeta}{2}x^{*2}\right) + (1-\alpha)\left(I_H - \beta(1-\theta\cdot h) + \gamma x^*\right), \tag{15b}$$

$$V_A = U_A = \alpha q^*. \tag{15c}$$

As in the preceding section, an individual with certain characteristics chooses category U in the case that $U_U \geq V_H$ and $U_U \geq V_A$. In this situation, we can depict the following distribution figure as Figure 4.

The parameters s_2 and h_2 as well as the line $s = g(h)$, which delineates categories U and H in Figure 4, are expressed as follows:

$$s_2 = \frac{\alpha(q^* - n) + (1-\alpha)\left(\beta - I_U\right)}{\alpha w + (1-\alpha)\beta}, \tag{16a}$$

$$h_2 = \frac{1}{\theta}\cdot\left(1 - \frac{1}{\beta}\{I_H + \gamma x^* - \frac{\alpha\zeta x^{*2}}{2(1-\alpha)}\}\right), \tag{16b}$$

$$s = \frac{1}{\alpha w + (1-\alpha)\beta}$$

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$$\cdot \left(\alpha(q^* - n - \frac{\zeta}{2}x^{*2}) + (1-\alpha) \cdot (I_H - I_U + \gamma x^* + \beta\theta h) \right)$$
$$= g(h), \tag{16c}$$

where the line $s = g(h)$ satisfies $s_2 = g(h_2)$.

4.2 The Effect of Mandatory Participation

We assume the following utility function for each category in the case of the mandatory participation:

$$U_U = \alpha(w \cdot s + n) + (1-\alpha)\left(I_U - \beta(1-s)\right), \tag{17a}$$
$$U_H = \alpha\left(q - \frac{\zeta}{2}x^2\right) + (1-\alpha)\left(I_H - \beta(1-\theta \cdot h) + \gamma x\right), \tag{17b}$$
$$U_A = \alpha(q - \frac{\zeta}{2}x^2). \tag{17c}$$

In this case, the apathetic has to follow the same level of activities as do successors. That is, the apathetic follows actions x^*. An individual with certain characteristics chooses his category by comparing the following utility functions

$$U_U = \alpha(w \cdot s + n) + (1-\alpha)\left(I_U - \beta(1-s)\right), \tag{18a}$$
$$V_H = \max_x U_H$$
$$= \alpha\left(q^* - \frac{\zeta}{2}x^{*2}\right) + (1-\alpha)\left(I_H - \beta(1-\theta \cdot h) + \gamma x^*\right), \tag{18b}$$
$$V_A = \alpha\left(q^* - \frac{\zeta}{2}x^{*2}\right). \tag{18c}$$

We can depict the distribution figure as Figure 5. Parameters s_3, h_3, and the line $s = g(h)$, which delineates categories U and H in Figure 5, are as follows:

$$s_3 = \frac{\alpha(q^* - n - \frac{\zeta}{2}x^{*2}) + (1-\alpha)\left(\beta - I_U\right)}{\alpha w + (1-\alpha)\beta}, \tag{19a}$$
$$h_3 = \frac{1}{\theta} \cdot \left(1 - \frac{1}{\beta}\left(I_H + \gamma x^*\right)\right), \tag{19b}$$
$$s = \frac{1}{\alpha w + (1-\alpha)\beta}$$
$$\cdot \left(\alpha(q^* - n - \frac{\zeta}{2}x^{*2}) + (1-\alpha) \cdot (I_H - I_U + \gamma x^* \beta\theta h) \right)$$
$$= g(h), \tag{19c}$$

where the line $s = g(h)$ satisfies $s_3 = g(h_3)$.

From (16a), (16b), (16c) and (19a), (19b), (19c), it turns out that $h_3 < h_2$ and $s_3 < s_2$, implying that mandatory participation can reduce the proportion of category A. Moreover, we can see that those who gave up choosing category A choose the following actions: those with the higher specialized skill for work choose category U as emigrants, and those with the larger degree of rootedness of hometown choose category H as successors. Hence, forcing the apathetic to participate in activities causes them stress and can reduce the number of the apathetic. Therefore, we have to consider the possibility that the rule increases not only the number of successors but also the number of emigrants.

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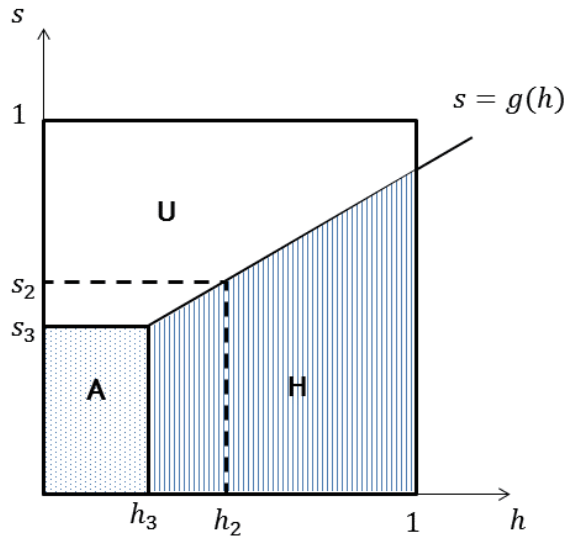

Figure 5. The Distribution of Each Category after the Mandatory Participation

5. RELOCATION AS RECOVERY PROCESS AFTER A CATASTROPHIC DISASTER

5.1 Relocation of Community

In this section, we consider the case where the environmental change could introduce the change of the prescriptions or rules to follow. One example of this phenomenon is the transfiguration of a shopping street in Shin-Nagata, Kobe, Japan, after the Great Hanshin Awaji Earthquake. Before the earthquake, people enjoyed shopping with a lot of chatting with storekeepers, and its narrow street had a lively atmosphere. Then, after the disaster, it was reconstructed to be a modern and safe space with wide streets and a large arcade, which brought on drastic changes to the atmosphere: people's chatting and excitement disappeared from the street. Namely, the transfiguration of the environment affected residents' identity and their shopping culture.

As the problem has the same structure as mentioned above, this section considers the case of community relocation after a massive disaster that changes the place to settle and requires people to follow different rules or conventions. In this case, what people had established in a former place might be useless in a new place. This gap causes an identity loss for successors because they had established a strong identity with the original place. Relocation to a more distant place has the following two trade-off effects: 1) it brings a safer life, while 2) it increases the gap between the new prescription and the rootedness of hometown that they had developed in the original place, which results in loss of the identity utility. Focusing on the trade-off, we describe how community relocation affects an individual's identity formation.

5.2 A Utility Function and Distribution of Each Category

We assume that the distance between a disaster-hit area and the relocation place is l. To simplify the model, we also assume that the larger the distance l is, the safer a life is, where l denotes the increase in utility of both successors and the apathetic due to the improvement of safety. However, successors, at the same time, are forced to move to a new place, which differs from a former place that deeply rooted to

them. Due to the distance-l migration, they can gain identity utility $I_H - \beta\{|l| + |1 - \theta \cdot h|\}$, implying that as the distance l increases, the identity utility decreases.

Under these assumptions, we define the utility function in each category as follows:

$$U_U = \alpha(w \cdot s + n) + (1 - \alpha)\left(I_U - \beta(1 - s)\right), \tag{20a}$$
$$U_H = \alpha\left(q + l\right) + (1 - \alpha)\left(I_H - \beta\{|l| + |1 - \theta \cdot h|\}\right), \tag{20b}$$
$$U_A = \alpha(q + l). \tag{20c}$$

An individual chooses the most suitable category according to his/her characteristics. If, for instance, $U_A \geq U_H$ and $U_A \geq U_U$ are satisfied for an individual with certain characteristics, then the individual chooses category A.

We can show, here, the area of each category like Figure 6. The parameters s_4 and h_4 as well as the

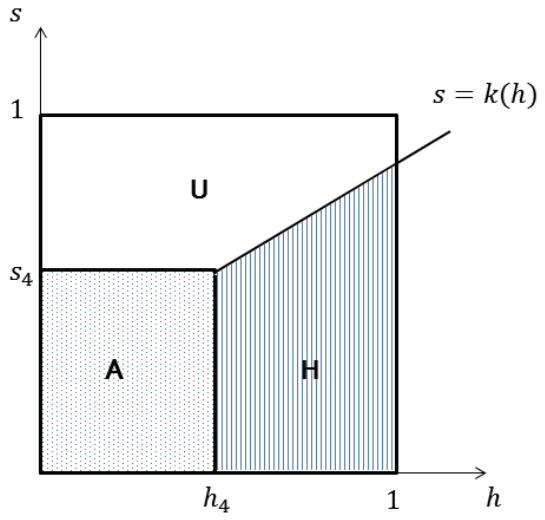

Figure 6. The Distribution Figure of Each Category Considering Relocation

line $s = k(h)$, which delineates the categories U and H in Figure 6, are as follows:

$$s_4 = \frac{1}{\alpha w + (1 - \alpha)\beta} \cdot [\alpha(q + l - n) + (1 - \alpha)(\beta - I_U)], \tag{21a}$$
$$h_4 = \frac{1}{\theta} \cdot \left(1 + l - \frac{I_H}{\beta}\right), \tag{21b}$$
$$\begin{aligned} s = & \frac{1}{\alpha w + (1 - \alpha)\beta} \\ & \cdot[\alpha(q + l - n) + (1 - \alpha)\{I_H - I_U + \beta(\theta h - l)\}] \\ = & \, k(h), \end{aligned} \tag{21c}$$

where the line $s = k(h)$ satisfies $s_4 = k(h_4)$.

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5.3 The Effects of Relocation

We consider how a community relocation affects the distribution of each category. In the following, we express the slope of the line $s = k(h)$ as M:

$$M = \frac{1}{\alpha w + (1-\alpha)\beta} \cdot (1-\alpha)\beta\theta. \tag{22}$$

The following are the results of comparative statics with respect to l:

$$\frac{\partial h_4}{\partial l} = \frac{1}{\theta} > 0, \tag{23a}$$

$$\frac{\partial s_4}{\partial l} = \frac{\alpha}{\alpha w + (1-\alpha)\beta} > 0, \tag{23b}$$

$$\frac{\partial M}{\partial l} = 0, \tag{23c}$$

$$\frac{\partial k(0)}{\partial l} = \frac{\alpha - \beta(1-\alpha)}{\alpha w + (1-\alpha)\beta}. \tag{23d}$$

5.3.1 In the Case of $\alpha - \beta(1-\alpha) > 0 \Leftrightarrow \alpha > \frac{\beta}{1+\beta}$

$$\frac{\partial k(0)}{\partial l} > 0 \tag{24}$$

In this case, we can describe the results of comparative statics as shown in Figure 7, where the dotted line expresses the situation of Figure 6.

As the distance l between the original place and the relocation place increases, h_4 and s_4 increase. Moreover, the slope of the line M remains at the same level while the intercept increases, implying that the line $s = k(h)$ moves in a parallel direction toward the positive s-axis. Hence, relocation to a more distant place can reduce the proportion of category U but can increase that of category A. The proportion of category H depends on whether the decrease in category U is greater than the increase in category A.

5.3.2 In the Case of $\alpha - \beta(1-\alpha) < 0 \Leftrightarrow \alpha < \frac{\beta}{1+\beta}$

$$\frac{\partial k(0)}{\partial l} < 0 \tag{25}$$

In this case, we can describe the results of comparative statics as shown in Figure 8, where the dotted line expresses the situation of Figure 6.

As the distance l between the original place and the relocation place increases, h_4 and s_4 increase. Moreover, the slope of the line M remains at the same level but the intercept decreases, implying that the line $s = k(h)$ moves in a parallel direction toward the origin. Hence, relocation to a more distant place can decrease the proportion of category H but can increase the proportion of category A. The proportion of category U depends on whether the decrease in category H is greater than the increase in category A.

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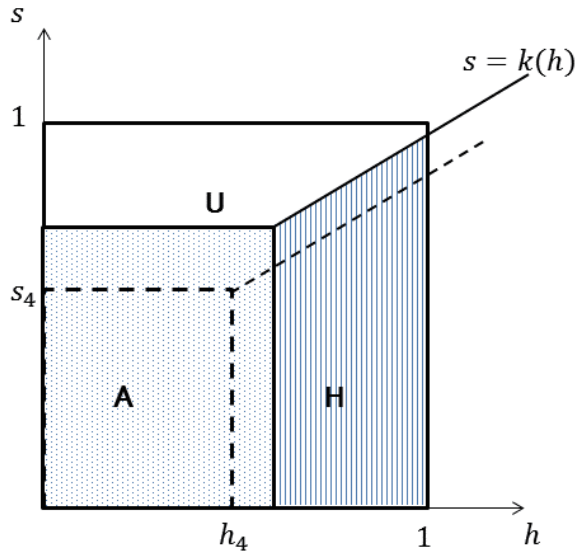

Figure 7. The Distribution of Each Category in the Case of $\alpha > \frac{\beta}{1+\beta}$

Therefore, our study shows that the extent to which the choice of identity is affected by relocation greatly depends on the parameter α, which decides the ratio of normal consumption to the identity utility. A large α implies that a community has many residents who value normal consumption. In this case, relocation helps prevent residents from moving to urban areas. In addition, relocation keeps a certain number of successors who remain in the community. In other words, relocation can play an important role in keeping motivated or potential persons in the community. On the other hand, a small α implies that people gain utility mostly from the identity utility. In other words, this case implies that a community has many residents who are rooted by factors constituting the community. In such a community, relocation can reduce the proportion of successors and increase the proportion of the apathetic. Therefore, when relocation is planned in a recovery process after a disaster, it is very important to understand the characteristics or needs of the residents and to create a community with original features or original landscape by measures like incorporating many environmental factors that form the self of residents.

6. THE RELATIONSHIP WITH OTHERS

In this section, we consider the case that residents establish their own identity through the relationship with others. To analyze how the identity formation of residents is affected by the changes in the prescription of category of successors resulting from the relationship with others, we describe the distributions of each category with changes in the prescription, and we compare the distribution figures.

6.1 A Utility Function and Distribution of Each Category

We assume that the prescription of category of successors can be formed by the degree of rootedness of hometown of residents who choose identity as successors. It is assumed, in other words, that h_p is the

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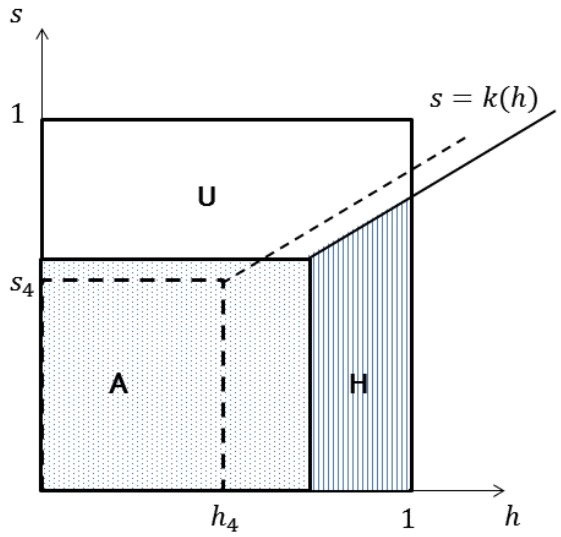

Figure 8. The Distribution of Each Category in the Case of $\alpha < \frac{\beta}{1+\beta}$

prescription of the successors' category as follows:

$$h_p = \eta h_{min} + (1 - \eta), \tag{26}$$

where h_{min} denotes the minimum degree of rootedness of an individual who chooses the successor identity and where parameter η denotes that the prescription is the point that divides the minimum and maximum h of successors internally into $\eta : 1 - \eta$. Here, η satisfies $0 \leq \eta \leq 1$.

Under these assumptions, we define the utility function of each category as follows:

$$U_U = \alpha(w \cdot s + n) + (1 - \alpha)\left(I_U - \beta(1 - s)\right), \tag{27a}$$
$$U_H = \alpha q + (1 - \alpha)\left(I_H - \beta(h_p - \theta \cdot h)\right), \tag{27b}$$
$$U_A = \alpha q. \tag{27c}$$

An individual chooses the most suitable category according to his characteristics. If, for instance, $U_A \geq U_H$ and $U_A \geq U_U$ are satisfied for an individual with certain characteristics, then the individual chooses category A. In this case, we can depict the distribution graph as shown in Figure 9. Here, after calculations, h_{min} satisfies

$$h_{min} = \frac{1}{\theta - \eta} \cdot \left(1 - \eta - \frac{I_H}{\beta}\right). \tag{28}$$

The parameters s_5, h_5, and $s = m(h)$, which delineates the categories U and H in Figure 9, are as follows:

$$s_5 = \frac{\alpha(q - n) + (1 - \alpha)(\beta - I_U)}{\alpha w + (1 - \alpha)\beta}, \tag{29a}$$
$$h_5 = h_{min}, \tag{29b}$$
$$s = \frac{1}{\alpha w + (1 - \alpha)\beta}$$

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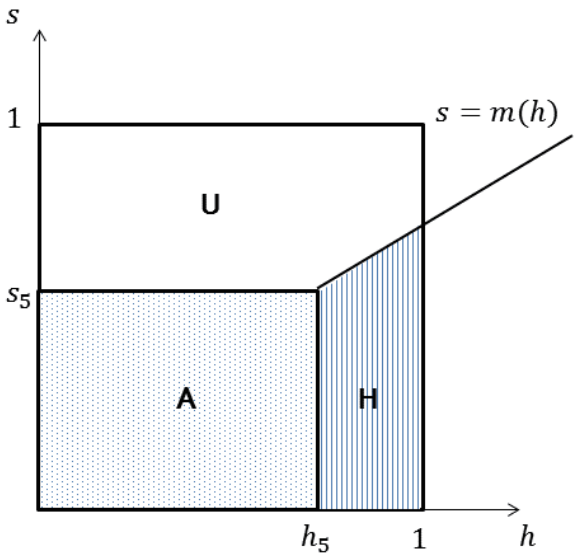

Figure 9. The Distribution in the Case of Changing Prescription

$$\cdot \left(\alpha(q-n) + (1-\alpha) \left(I_H - I_U + \beta\eta \frac{\frac{I_H}{\beta} + \theta - 1}{\theta - \eta} + \beta\theta h \right) \right)$$
$$= m(h), \tag{29c}$$

where $s = m(h)$ satisfies $s_5 = m(h_5)$.

6.2 Changes in the Prescription

We consider how the distribution of each category is affected by the changes of the prescription h_p of successors. The changes in the prescription can be expressed by the changes in parameter η. An increase in η implies that successors with the minimum degree of rootedness of hometown can be given more attention. In the following, we express the slope of the line as R, which is as follows:

$$R = \frac{1}{\alpha w + (1-\alpha)\beta} \cdot (1-\alpha)\beta\theta. \tag{30}$$

$$\frac{\partial h_5}{\partial \eta} = \frac{1 - \theta - \frac{I_H}{\beta}}{(\theta - \eta)^2} < 0, \tag{31a}$$
$$\frac{\partial s_5}{\partial \eta} = 0, \tag{31b}$$
$$\frac{\partial R}{\partial \eta} = 0, \tag{31c}$$
$$\frac{\partial m(0)}{\partial \eta} = \frac{(1-\alpha)\beta}{\alpha w + (1-\alpha)\beta} \cdot \frac{\theta(\frac{I_H}{\beta} + \theta - 1)}{(\theta - \eta)^2} > 0. \tag{31d}$$

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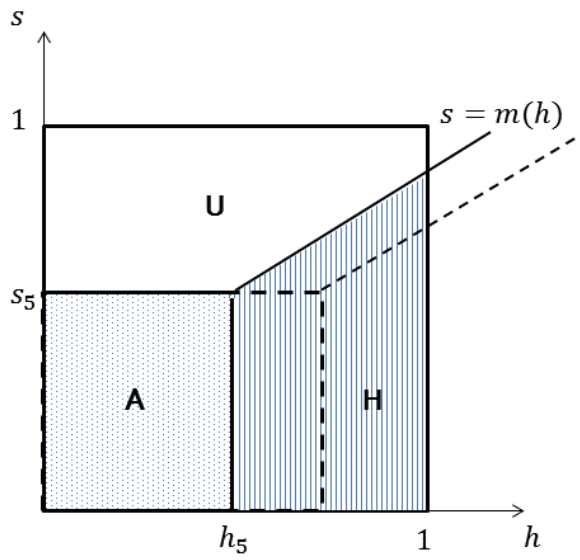

Figure 10. The Distribution in the Case of the Increase in η

Based on the comparative statics with respect to η, we can depict the distribution graph in the case of the increase in η as shown in Figure 10, where the dotted line shows the results presented in Figure 9.

As Figure 10 indicates, as η increases, h_5 decreases, and the line $s = m(h)$ moves in a parallel direction toward the positive s-axis. Hence, as the extent to which successors with a small degree of rootedness of hometown are given attention increases, the proportion of categories A and U can decrease and the proportion of category H can increase. In sum, the effect of successors with a small degree of rootedness of hometown can lead residents to be more familiar with successors, and can have a strong effect on establishing identities as successors. At first glance, the fact that successors' prescription is formed endogenously seems not to be related with the local culture inheritance. However, the result implies that people who get involved in community activities create their prescription, and play a pivotal role in increasing successors. In other words, for the sustainable inheritance of local culture, successors' prescription concerning inheritance of local culture should not always be fixed on the past experiences, but can change corresponding to members' characteristics. Especially, in the recovery process after a catastrophic disaster, it would be important to pay attention to those with the small degree of rootedness of hometown, such as young residents and immigrants from other regions, and to create a place for them so that they can actively get involved in the revitalization activities; doing so would contribute to residents' realization that they are successors in the community.

7. CONCLUSION

In this study, we refer to things inherited by residents, such as rituals, traditional arts, landscape, and temples and shrines, as "local culture," and we formulate an individual's choice of identity regarding successors of local culture. In the first half, we assumed the identity utility as a basic model and analyzed the effect of cultural education and the quality of local culture on the residents' choices of identity. We described that both the enhancement of cultural education and improvements in the quality of local culture can prompt residents to establish the identity of successors. We found that the effects are not the

same, and the enhancement of cultural education can not only increase the number of successors but also decrease that of the apathetic, unlike the improvements in the quality of local culture. In the latter half, first we considered the case that the apathetic are forced to participate in the activities with regard to the inheritance of local culture. We indicated that the mandatory participation for the apathetic can increase both the number of successors and the number of emigrants , and suggested that we have to be careful in carrying out such a rule to vitalize the community. Second, we focused on the case that residents lose land that partly produces local features, especially, the issue regarding relocation after a catastrophic disaster. It was found that the effect of relocation greatly depends on how much residents value identity utility. We indicated that in a community where residents see the value in identity, relocation could reduce the number of successors. Therefore, we suggested that when relocation is planned in a recovery process after a disaster, it is very important to understand the characteristics or needs of the residents and to create a community with original features or original landscape by measures like incorporating many environmental factors that form the self of residents. Finally, we focused on the case that identity is established through the relationship with others. It was shown that paying attention to the less experienced members in the community under the norm of the endogenous prescription formation can increase the number of successors. In particular, after a massive disaster, we observed that paying attention to those with little rootedness, such as young people and immigrants from urban areas, and creating a place where they can actively get involved in the revitalization activities are crucial to both preventing residents from moving to urban areas and revitalizing the community.

This study leaves us with certain problems. The first task of future research would be to address the situation in which the degree of rootedness of hometown is endogenous; this study considered the case that it was exogenous. This is because the degree of rootedness of hometown can be enhanced or accumulated through daily lives or activities in a community to a certain extent. The second task would be to perform empirical analysis to examine whether our model is reasonable in comparison with real situations.

REFERENCES

Akerlof, G. A. and Kranton, R. E. (2000) Economics and Identity. *The Quarterly Journal of Economics*, CXV (3): 715-753

Akerlof, G. A. and Kranton, R. E. (2002) Identity and Schooling: Some Lessons for the Economics of Education. *Journal of Economic Literature*, 40 (4): 1167-1201

Akerlof, G. A. and Kranton, R. E. (2010) Identity Economics: *How Our Identities Shapes Our Work, Wages, and Well-Being*, New Jersey: Princeton University Press

Dugan, B. (2007) Loss of Identity in Disaster: How Do You Say Goodbye to Home?. *Perspectives in Psychiatric Care*, 43 (1): 41-46

Fujii, S. (2007) *Civil Engineering and Landscape - Design and Management for scenery 1*, Kyoto: Gakugei Shuppansha (in Japanese)

Hagihara, G. and Fujii, S. (2005) The Psychological Effects of Travel Behavior on Place Attachment. *Infrastructure Planning Review (CD-ROM)* (in Japanese)

Hikichi, H., Aoki, T. and Obuchi, K. (2009) Attachment to Residence: Affect of Physical Environment and Social Environment. *Journal of Japan Society of Civil Engineering*, 65 (2): 101-110 (in Japanese)

Tanaka, N. (2007) *Civil Engineering and Landscape - Design and Management for scenery 5*, Kyoto: Gakugei Shuppansha (in Japanese)

Wakabayashi, N., Akasaka, T., Kojima, T. and Hirate, K. (2000) A study on the Structure of Inhabitant's Consciousness about Disaster Prevention Part-3 A Pass-Model Including the Item that Show How to Relate to Community. *Summaries of Technical Paper of Annual Meeting Architecture Institute of Japan*: 807-808 (in Japanese)

Yamazaki, J. (2010) The Actual Situation of Spatial Formation and Community Transformation after the Earthquake Disaster Revival Project in Rural Area - In the case of Toshima district at Hokudan-cho, and Kariya district at Higashiura-cho, in Awaji-city, Hyogo Prefecture -. *Journal of Architecture and Planning*, 75 (649): 609-618 (in Japanese)