

DISCUSSION PAPER SERIES

Discussion paper No.308

Strategic Intergovernmental Competition in Japan's Hometown Tax Donation System (Furusato Nozei): A Hotelling-Type Model with Household Attachment

Toshiyuki Uemura
(Kwansei Gakuin University)

April 2026



SCHOOL OF ECONOMICS

KWANSEI GAKUIN UNIVERSITY

1-155 Uegahara Ichiban-cho
Nishinomiya 662-8501, Japan

**Strategic Intergovernmental Competition
in Japan's Hometown Tax Donation System (*Furusato Nozei*):
A Hotelling-Type Model with Household Attachment**

Toshiyuki UEMURA *

Abstract

This study theoretically and empirically examines competition among local governments in Japan's hometown tax donation system (*Furusato Nozei*) using a Hotelling-type model. This study makes four main contributions. First, it develops a simplified Hotelling-type model that incorporates household attachment to local governments in an economic space with donor households and multiple local governments, thereby capturing strategic competition over donation prices. Second, it analyzes the strategic behavior of local governments under the hometown tax donation system within the frameworks of Bertrand and Stackelberg competition. Third, it identifies the effects of policy parameters on equilibrium donation shares through comparative static analysis and verifies these results using numerical simulations. Fourth, using prefecture-level data, it conducts an empirical analysis based on a two-stage least squares (2SLS) method to address potential endogeneity of donation prices, confirming that the theoretical sign conditions of the donation share function are supported by the data. The results indicate that higher marginal costs reduce donation shares, while stronger brand strength of reciprocal gifts and greater household attachment increase donation shares, yielding important policy implications for the design of the hometown tax donation system.

JEL Classification: H71, H72, and H77

Keywords : hometown tax donation system, Hotelling-type model, donation prices, household attachment

* Professor, School of Economics, Kwansei Gakuin University,
Email: uemuratoshi@hotmail.com

1. Introduction

According to the Ministry of Internal Affairs and Communications' website "Philosophy of the Hometown Tax Donation System," this system has three major features. First, it allows taxpayers to choose the recipients of their donations, thereby providing an opportunity to consider how funds are used. Second, it enables support not only for one's birthplace but also for regions that have provided past support and those one wishes to support in the future. Third, it functions as a mechanism through which local governments promote their initiatives and compete for donations by offering reciprocal gifts.

This study focuses on the second feature. The system allows households to donate to their birthplace, regions that have supported them, and regions they wish to support in the future. This suggests that the degree of household attachment to a local government influences donation decisions. At the same time, as the third feature indicates, the system also serves as a competitive mechanism through which local governments compete via reciprocal gifts.

Against this background, the paper develops an economic model to analyze the strategic behavior of local governments. Household donation behavior is assumed to depend on attachment to local governments, donation prices, and the brand strength of reciprocal gifts. The nature of strategic competition varies depending on whether local governments act simultaneously or sequentially, with one acting as a first mover and the other as a follower.

Local governments can choose when to begin accepting donations through reciprocal gifts, and the timing of price setting affects their market positioning. In practice, first-moving governments—those offering highly attractive reciprocal gifts—can capture donor attention, while later-moving governments set their donation prices in response to those of the first movers.

Several existing studies have developed explicit theoretical models to examine inter-municipal donation competition, including Furusawa, Furusawa, and Ogawa (2020), Suematsu (2020), and Fukazawa (2020), all of which focus on competition through reciprocal gifts. Building on this literature, this paper constructs an economic space consisting of donor households and multiple competing local governments based on a Hotelling (1929) framework, incorporating household attachment. While Hotelling-type models are widely used in spatial economics, they are particularly useful in this context because they can capture not only physical distance but also preference-based or psychological distance.

The paper makes four contributions. First, it formalizes household attachment—an inherent feature of the hometown tax donation system—together with the brand strength of reciprocal gifts within a simplified Hotelling-type model. Second, it analyzes how differences in the timing of donation price setting affect strategic competition under Bertrand and Stackelberg frameworks. Third, through comparative statics and numerical simulations, it examines how policy parameters influence equilibrium donation shares and derives their policy implications. Fourth, it conducts an empirical analysis using prefecture-level data to assess the external validity of the theoretical model.

The paper formulates intergovernmental competition in the hometown tax donation system as a multi-region competition model grounded in local public finance and industrial organization. The analytical framework builds on standard price competition models in industrial organization, as developed by Tirole (1988) and Vives (1999). In particular, the properties of reaction functions in Bertrand and Stackelberg equilibria for differentiated goods, as established by Singh and Vives (1984) and Bulow, Geanakoplos, and Klemperer (1985), provide the theoretical foundation for the equilibrium analysis in this study.

The remainder of the paper is organized as follows. Section 2 presents the model and analyzes Bertrand and Stackelberg equilibria. Section 3 conducts comparative statics

and discusses policy implications. Section 4 presents the empirical analysis. Section 5 concludes.

2. Simplified Hotelling Model

2.1. Basic Model Settings

This section presents the model. Kato and Yanagihara (2021) and Ayukawa (2022, 2023) are pioneering studies that explicitly incorporate household attachment to local governments into a Hotelling-type framework to analyze the hometown tax donation system. These studies are noteworthy for modeling spatial choice driven by households' psychological factors. Building on this literature, this paper also analyzes the hometown tax donation system using a Hotelling framework, while introducing several key differences.

Existing studies primarily examine the economic behavior of local governments and competition over reciprocal gifts within a two-region tax competition framework. In these models, households are assumed to donate to the local government in which they reside and receive reciprocal gifts in return. However, under the current hometown tax donation system, households may donate to their own local government but are not eligible to receive reciprocal gifts from it. This limitation has been acknowledged in the literature. In contrast, this paper adopts a three-region framework and explicitly incorporates the constraint that households cannot receive reciprocal gifts from their place of residence.

The analysis also focuses on donation competition among local governments, where donation prices serve as a strategic variable. In particular, the paper examines both Bertrand competition over donation prices and Stackelberg competition in which local governments set prices sequentially. To the best of our knowledge, this is the first study to analyze strategic donation behavior by local governments as first and second movers within a Hotelling-type framework.

The basic structure of the model follows Hotelling (1929), but simplifies household choice behavior by employing a linearized Hotelling-type model with a donation share function. Households determine their donation shares based on attachment to local governments, donation prices, the brand strength of reciprocal gifts, and the relative differences among these factors. Using this simplified framework, the analysis focuses on donation price strategies among local governments.

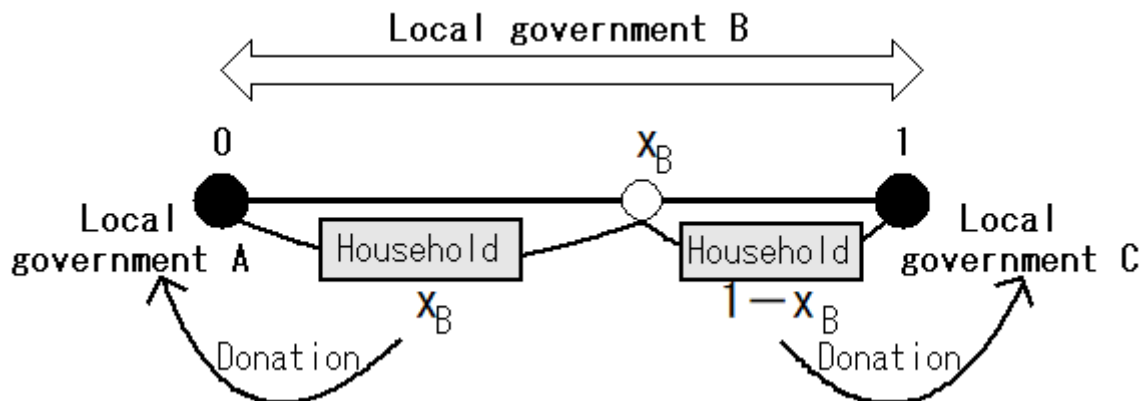
2.2. Structure of the Hotelling-type Model

Figure 1 illustrates the structure of the Hotelling-type model used in this study. Households, indexed by $x \in (0,1)$, are uniformly distributed over the one-dimensional interval $(0,1)$, which represents the administrative area of local government B, where the household resides, with unit density. Local Government A is located at 0, and local government C is located at 1. Local governments A and C, together with local reciprocal gift providers, supply reciprocal gifts to households. Each household makes exactly one unit of donation to a local government. Under the hometown tax donation system, households cannot receive reciprocal gifts from the local government in which they reside. Accordingly, households are assumed not to donate to their own local government B¹. The model therefore captures a situation in which households residing in B donate to external rural local governments A and C.

Each local government $j \in \{A, C\}$ strategically sets its donation prices P_j to compete for donations from households residing in local government B. In addition, the reciprocal gifts offered by local governments differ in their brand strength v_j . Consistent with the institutional design of the hometown tax donation system, households are assumed to prefer donating to local governments to which they feel stronger attachment.

¹ Under the current hometown tax donation system, households can make donations to the local government where they reside but cannot receive reciprocal gifts.

Figure 1: Structure of the Hotelling-type Model in This Study



Within the interval $(0,1)$, households with stronger attachment to local government A tend to donate to A, while those with stronger attachment to C tend to donate to C. Therefore, the interval $(0,1)$ should be interpreted not as representing households' physical locations within B, but rather as capturing the degree of attachment to A and C².

Households located in $(0, x_B)$ donate to A, while those in $(x_B, 1)$ donate to C. The cutoff x_B represents the household that is indifferent between A and C. The variable x_B is treated as an exogenous parameter capturing the degree of household attachment to A. The attachment to C correspondingly given by $(1 - x_B)$, and $(2x_B - 1) = x_B - (1 - x_B)$ represents the relative difference in attachment between A and C. Given the unit density of households, the number of households donating to A is x_B , and the number donating to C is $(1 - x_B)$. In addition, the brand strength of reciprocal gifts, and donation prices are key policy variables for local governments (Uemura, 2025, 2026).

Based on the above, the donation shares $s_A \in [0,1]$ and $s_C \in [0,1]$, representing the shares of households donating to A and C, respectively, are given by the reduced-form

² In this study, the "distance" is interpreted as a measure of psychological proximity or attachment to local governments, rather than geographical distance, thereby capturing heterogeneity in households' preferences.

Hotelling-type model.

$$s_A = \frac{1}{2} + \beta(P_C - P_A) + \gamma(v_A - v_C) + \theta(2x_B - 1) \quad (1)$$

$$s_C = \frac{1}{2} + \beta(P_A - P_C) + \gamma(v_C - v_A) + \theta(1 - 2x_B) \quad (2)$$

By construction, $s_A + s_C = 1$. Here, P_A and P_C denote the donation prices, and v_A and v_C denote the brand strengths. The parameter β captures sensitivity to price difference, γ captures sensitivity to brand strength differences, and θ captures sensitivity to differences in household attachment. When $\beta > 0$, higher donation prices reduce donation share. When $\gamma > 0$, stronger brand strength increases donation shares. When $\theta > 0$, stronger household attachment increases donation shares.

The objective function of local government $j \in \{A, C\}$ is net donation revenue Π .

$$\Pi_j = \{(1 - g_j)P_j - m_j\}s_j \quad (3)$$

Here, $g \in [0, 1]$ denotes the reciprocal gift ratio, and $m > 0$ denotes marginal cost. The reciprocal gift ratio represents the proportion of the procurement cost relative to the donation price. Under the current system, $g(\leq \bar{g})$ is capped at the regularly standard $\bar{g}(= 0.3)$. Marginal cost includes transportation costs of reciprocal gifts and advertising expenses associated with local governments' hometown tax donation programs.

2.3. Derivation of the Equilibrium Donation Price

Based on the above settings, we derive equilibrium donation prices under Bertrand competition, where local governments set prices simultaneously, and under Stackelberg competition, where one local government acts as a leader and the other as a follower.

First, we derive the Bertrand equilibrium donation prices, denoted by P^B , where local governments A and C simultaneously choose optimal responses. The reaction

functions for donation prices are obtained by applying the first-order conditions for net donation revenue Π maximization.

$$P_A(P_C) = \frac{1}{4\beta} + \frac{P_C}{2} + \frac{m_A}{2(1-g_A)} + \frac{\gamma}{2\beta}(v_A - v_C) + \frac{\theta}{2\beta}(2x_B - 1) \quad (4)$$

$$P_C(P_A) = \frac{1}{4\beta} + \frac{P_A}{2} + \frac{m_C}{2(1-g_C)} + \frac{\gamma}{2\beta}(v_C - v_A) + \frac{\theta}{2\beta}(1 - 2x_B) \quad (5)$$

The first term on the right-hand side represents the markup arising from donation price competition. The second term captures the effect of the competing local government's donation price. The third term reflects the impact of marginal cost and reciprocal gift ratio of the local government. The fourth term represents the markup arising from differences in brand strength. The fifth term captures the effect of differences in household attachment.

Solving the system of reaction functions simultaneously yields the Bertrand equilibrium donation price P^B as follows:

$$P_A^B = \frac{1}{2\beta} + \frac{2m_A}{3(1-g_A)} + \frac{m_C}{3(1-g_C)} + \frac{\gamma}{3\beta}(v_A - v_C) + \frac{\theta}{3\beta}(2x_B - 1) \quad (6),$$

$$P_C^B = \frac{1}{2\beta} + \frac{2m_C}{3(1-g_C)} + \frac{m_A}{3(1-g_A)} + \frac{\gamma}{3\beta}(v_C - v_A) + \frac{\theta}{3\beta}(1 - 2x_B) \quad (7).$$

The first term on the right-hand side represents the markup due to differences in donation prices. The second term reflects the impact of the marginal cost and reciprocal gift ratio of one's own local government. The third term reflects the impact of the marginal cost and reciprocal gift ratio of the competing local government. The fourth term represents the markup due to differences in brand strength. The fifth term represents the markup due to differences in attachment.

Second, we derive the Stackelberg equilibrium donation price, denoted by P_S where local government A acts as the leader, while local government C acts as the follower, with leader government A acting first and the follower government C acting second.

The follower's reaction function $P_C(P_A)$, takes the same form as in the Bertrand

case, since the strategic environment faced by the follower is identical to that under Bertrand competition. Substituting this into the follower's reaction function $P_C(P_A)$ into the net donation revenue Π_A of local government A and maximizing with respect to P_A yields the Stackelberg equilibrium donation price P_A^S for the leader.

$$P_A^S = \frac{3}{4\beta} + \frac{m_A}{2(1-g_A)} + \frac{m_C}{2(1-g_C)} + \frac{\gamma}{2\beta}(v_A - v_C) + \frac{\theta}{2\beta}(2x_B - 1) \quad (8)$$

The first term on the right-hand side represents the markup due to the differences in donation prices. The second term reflects the impact of leader government A's own marginal cost and reciprocal gift ratio. The third term reflects the impact of follower government C's marginal cost. The fourth term represents the markup due to the difference in brand strength. The fifth term represents the markup due to the differences in attachment.

Substituting this into the reaction price $P_C(P_A)$ of local government C yields the Stackelberg equilibrium price P_C^S for follower government C.

$$P_C^S = \frac{5}{8\beta} + \frac{3m_C}{4(1-g_C)} + \frac{m_A}{4(1-g_A)} + \frac{\gamma}{4\beta}(v_C - v_A) + \frac{\theta}{4\beta}(1 - 2x_B) \quad (9)$$

The first term on the right-hand side represents the markup due to the differences in donation prices. The second term reflects the impact of follower government C's own marginal cost. The third term reflects the impact of leader government A's marginal cost and reciprocity rate. The fourth term represents the markup due to the difference in brand strength. The fifth term represents the markup due to the differences in attachment.

We compare the components of equilibrium donation prices under Bertrand and Stackelberg competition. In both cases, the first term corresponds the donation-price component, the second and third terms represent cost-related components, the fourth term captures brand effects and the fifth term reflects household attachment. Here, we focus on the relative magnitudes of each term.

First, the markup term with donation price difference satisfies: $3/(4\beta) > 5/(8\beta) > 1/(2\beta)$. This implies that the leader's markup component is largest,

the leader possesses stronger power in setting donation prices.

Second, consider the effect of a local government's own marginal cost. When marginal cost and reciprocal gift ratio are equal ($m = m_A = m_C$ and $g = g_A = g_C$), we have $3/\{4(1 - g)\} > 2/\{3(1 - g)\} > 1/\{2(1 - g)\}$. This implies that the follower experiences a larger increase in its equilibrium donation price in response to an increase in its own marginal cost (or an increase in the reciprocity ratio).

Third, consider the effect of the rival government's marginal cost. Under the same condition ($m = m_A = m_C$ and $g = g_A = g_C$), we obtain $1/\{2(1 - g)\} > 1/\{3(1 - g)\} > 1/\{4(1 - g)\}$. This indicates that the leader has stronger power to set higher donation price even when the competitors' marginal cost increases.

Fourth, consider the markup associated with differences in gift brand strength, when $v_A \neq v_C$, we have $\gamma/(2\beta) > \gamma/(3\beta) > \gamma/(4\beta)$, implying that the fourth term of the leader's equilibrium donation price attains the largest magnitude. In other words, the leader can more strongly reflect the brand strength of reciprocal gifts in higher donation prices. Although it is generally assumed that $v_A > v_C$, in this case the fourth term of the follower's equilibrium donation price may become negative, implying a price below marginal cost (i.e., markdown).

Fifth, consider the markup associated with differences in household attachment. Unless the indifferent household position x_B lies at the midpoint of the interval $(0,1)$ ($x_B \neq 0.5$), we have $\theta/(2\beta) > \theta/(3\beta) > \theta/(4\beta)$, implying that the attachment effect is strongest for the leader. In other words, the leader can reflect the attachment differentials more strongly in higher donation prices. In general, households are assumed to exhibit stronger attachment to the leader, implying that $(2x_B - 1) > 0$. In this case, the equilibrium donation price for the leader increases, while that of the follower decreases.

2.4. Derivation of the Optimal Donation Share Function

By substituting the equilibrium donation price into the donation share function introduced at the beginning of the model, we derive the optimal donation share function s_A^B for local government A³.

First, the optimal donation share under Bertrand equilibrium is given by:

$$s_A^B = \frac{1}{2} + \frac{\beta}{3} \left\{ \frac{m_C}{(1-g_C)} - \frac{m_A}{(1-g_A)} \right\} + \frac{\gamma}{3}(v_A - v_C) + \frac{\theta}{3}(2x_B - 1) \quad (10).$$

Compared with the reduced-form of the Hotelling model presented earlier, the optimal donation share function derived under Bertrand competition shows that the effects of the differences in brand strength and household attachment are attenuated to one-third of their original magnitude. This attenuation arises because these factors also affect equilibrium donation prices, and their indirect effects are internalized through price competition. As a result, only one-third of the original direct effect remains in the donation share function. Furthermore, the optimal donation share function s_C^B for local government C takes a symmetric form with respect to that of the optimal donation share function s_A^B for local government A.

We next turn to the Stackelberg equilibrium. In this setting, the leader government determines its donation share first. The follower government's donation share s_C^S is determined subsequently, after the leader government's donation share s_A^S has been set. Therefore, we focus here on the optimal donation share of leader government. The optimal donation share function s_A^S for the leader government A, is obtained as follows:

$$s_A^S = \frac{3}{8} + \frac{\beta}{4} \left(\frac{m_C}{1-g_C} - \frac{m_A}{1-g_A} \right) + \frac{\gamma}{4}(v_A - v_C) + \frac{\theta}{4}(2x_B - 1) \quad (11).$$

As in the Bertrand case, comparison with the reduced-form Hotelling model shows that the effects of differences in brand strength and household attachment are attenuated to

³ The optimal donation shares between local government A and C satisfy $s_A^B + s_C^B = 1$ (or $s_A^S + s_C^S = 1$).

one-fourth under the Stackelberg equilibrium. Since the degree of attenuation under the Bertrand equilibrium is one-third, the attenuation is stronger under Stackelberg competition. This occurs because, in the Stackelberg equilibrium, the leader sets its donation price by anticipating the follower's response. As a result, differences in brand strength and household attachment are more fully internalized into equilibrium donation prices. Consequently, the remaining direct effect in the donation share function is further reduced to the Bertrand case, reducing the remaining direct effect to one-fourth.

3. Comparative Static Analysis and Numerical Analysis of the Optimal Donation Share Function

Local governments have incentives to increase their donation share. This section uses the model developed in the previous section to conduct a comparative statics analysis of the optimal donation share with respect to key policy parameters. Table 1 summarizes the results. We then perform a numerical analysis to verify these findings.

First, we examine the partial derivatives of the optimal donation share function s_A^B under Bertrand equilibrium with respect to marginal costs m :

$$\frac{\partial s_A^B}{\partial m_A} = -\frac{\beta}{3(1-g_A)} < 0 \quad (12),$$

$$\frac{\partial s_A^B}{\partial m_C} = \frac{\beta}{3(1-g_C)} > 0 \quad (13).$$

An increase in local government A's marginal cost reduces its donation share. Conversely, an increase in the rival local government C's marginal cost increases local government A's donation share. For example, local governments facing high logistics costs due to geographical constraints are likely to be at a disadvantage in the donation market.

In contrast, under the Stackelberg equilibrium, we obtain:

$$\frac{\partial s_A^S}{\partial m_A} = -\frac{\beta}{4(1-g_A)} < 0 \quad (14),$$

$$\frac{\partial s_A^S}{\partial m_C} = \frac{\beta}{4(1-g_C)} > 0 \quad (15).$$

Thus, as in the Bertrand case, an increase in A's own marginal cost reduces its donation share, while an increase in the rival's marginal cost increases it. When the reciprocal ratios are the same ($g = g_A = g_C$), the effect of marginal cost is stronger under Bertrand competition than under Stackelberg competition as: ($\beta/\{3(1-g)\} > \beta/\{4(1-g)\}$).

Second, we examine the effect of the reciprocal gift ratio g :

$$\frac{\partial s_A^B}{\partial g_A} = -\frac{\beta}{3} \frac{m_A}{(1-g_A)^2} < 0 \quad (16),$$

$$\frac{\partial s_A^B}{\partial g_C} = \frac{\beta}{3} \frac{m_C}{(1-g_C)^2} > 0 \quad (17).$$

An increase in A's reciprocal gift ratio reduces its optimal donation share, while an increase in the rival's reciprocal gift ratio increases A's donation share.

In this model, the reciprocal gift ratio g increases the effective marginal cost to $m/(1-g)$, thereby reducing the optimal donation share. The model abstracts from the channel through which a higher reciprocal gift ratio increases the attractiveness of gifts and thereby stimulates donations. Instead, it assumes that households always donate one unit, so this demand-enhancing effect is not captured. As a result, the reciprocal gift ratio operates solely through the cost channel.

Under the Stackelberg equilibrium, we obtain:

$$\frac{\partial s_A^S}{\partial g_A} = -\frac{\beta}{4} \frac{m_A}{(1-g_A)} < 0 \quad (18),$$

$$\frac{\partial s_A^S}{\partial g_C} = \frac{\beta}{4} \frac{m_C}{(1-g_C)} > 0 \quad (19).$$

Thus, an increase in A's own reciprocal gift ratio reduces its donation share, while an increase in the rival's reciprocal gift rate increases it. When reciprocal rates and marginal costs are equal ($g = g_A = g_C$ and $m = m_A = m_C$), the impact of g is a greater Bertrand

competition than under Stackelberg competition: $((\beta m)/\{3(1-g)\}) > (\beta m)/\{4(1-g)\}$.

Third, we examine the effect of brand strength v :

$$\frac{\partial s_A^B}{\partial v_A} = \frac{\gamma}{3} > 0 \quad (20),$$

$$\frac{\partial s_A^B}{\partial v_C} = -\frac{\gamma}{3} < 0 \quad (21).$$

An increase in A's brand strength increases its donation share, while an increase in the rival's brand strength reduces it.

Under the Stackelberg equilibrium, we obtain the following:

$$\frac{\partial s_A^S}{\partial v_A} = \frac{\gamma}{4} > 0 \quad (22),$$

$$\frac{\partial s_A^S}{\partial v_C} = -\frac{\gamma}{4} < 0 \quad (23).$$

These results are qualitatively identical to those under Bertrand competition. This finding provides theoretical support for the tendency of donations to concentrate on local governments offering high-quality reciprocal gifts. From a strategic perspective, this suggests that local governments have incentives to enhance the brand strength of their reciprocal gifts. However, the impact of brand strength on donation shares is weaker under Stackelberg competition than under Bertrand competition, as $\gamma/3 > \gamma/4$.

Fourth, we examine the partial derivatives of the optimal donation share functions s_A^B under the Bertrand equilibrium and s_A^S under the Stackelberg equilibrium with respect to household attachment to local government A, x_B :

$$\frac{\partial s_A^B}{\partial x_B} = \frac{2\theta}{3} > 0 \quad (24),$$

$$\frac{\partial s_A^S}{\partial x_B} = \frac{\theta}{2} > 0 \quad (25).$$

Table 1: Signs of Comparative Statics for Optimal Donation Share

	Own marginal cost m_A	Rival marginal cost m_C	Own reciprocal gift rate g_A	Rival reciprocal gift rate g_C	Own brand strength v_A	Rival brand strength v_C	Household attachment x_B
Optimal donation share s_A^B (Bertrand equilibrium)	--	++	--	++	++	--	++
Optimal donation share s_A^S (Stackelberg equilibrium, leader A)	-	+	-	+	+	-	+

Note: “++“ (“--“) indicates a stronger positive (negative) effect than “+“ (“-“).

Local governments that attract stronger household attachment achieve higher optimal donation shares. This mechanism explains the concentration of donations toward governments with stronger attachment. Hence, local governments have incentives to strategically disseminate information about their attractiveness to a broader population. However, the impact of attachment on the donation share is weaker under Stackelberg equilibrium than under Bertrand equilibrium, as $(2\theta)/3 > \theta/2$.

According to Table 1, the direction of the effects of each policy parameter is identical across Bertrand and Stackelberg equilibria. However, the magnitude of these effects is generally larger under Bertrand competition than under Stackelberg competition. Moreover, within the Stackelberg framework, the effect is larger for the follower than for the leader.

To verify the comparative statics derived above, we conduct a numerical analysis, the results of which are reported in Table 2. In the base case, symmetry is imposed by setting identical parameters for local governments A and C. Specifically, marginal costs are set to $m_A = m_C = 0.4$, the reciprocal gift ratio to $g_A = g_C = 0.3$, the brand strength to $v_A = v_C = 0.5$, and household attachment to $x_B = 0.5$. In addition, the sensitivity of the donation share to donation price differences is set to $\beta = 0.3$, the sensitivity to brand strength difference to $\gamma = 0.2$, and the sensitivity to attachment differences $\theta = 0.1$. Under these parameter values, the equilibrium donation amount, optimal donation share, and net donation revenue are computed for both Bertrand and Stackelberg equilibria.

According to the base case, under Bertrand competition, the equilibrium donation price, optimal donation share, and net donation revenue are identical across local government A and C. In contrast, under Stackelberg competition, the leader (local government A) sets a higher donation price than the follower (local government C). Although leader's optimal donation share is smaller than that of the follower, it sets a higher donation price, resulting in higher net donation revenue.

Table 2: Numerical Simulation Results

Case	Base case	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Local government A marginal cost m_A	0.4	0.6 (↑)	0.4	0.4	0.4	0.4	0.4	0.4
Reciprocal gift rate g_A	0.3	0.3	0.3	0.4 (↑)	0.3	0.3	0.3	0.3
Brand strength v_A	0.5	0.5	0.5	0.5	0.5	0.6 (↑)	0.5	0.5
Local government C marginal cost m_C	0.4	0.4	0.6 (↑)	0.4	0.4	0.4	0.4	0.4
Reciprocal gift rate g_C	0.3	0.3	0.3	0.3	0.4 (↑)	0.3	0.3	0.3
Brand strength v_C	0.5	0.5	0.5	0.5	0.5	0.5	0.6 (↑)	0.5
Household attachment α_B	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7 (↑)
Bertrand equilibrium								
Donation price (A) P_A^B	2.2381	2.4286 (↑)	2.3333 (↑)	2.3016 (↑)	2.2698 (↑)	2.2603 (↑)	2.2159 (↓)	2.2825 (↑)
Donation price (C) P_C^B	2.2381	2.3333 (↑)	2.4286 (↑)	2.2698 (↑)	2.3016 (↑)	2.2159 (↓)	2.2603 (↑)	2.1937 (↓)
Optimal donation share (A) s_A^B	0.5000	0.4714 (↓) ▲0.0286	0.5286 (↑) +0.0286	0.4905 (↓) ▲0.0095	0.5095 (↑) +0.0095	0.5067 (↑) +0.0067	0.4933 (↓) ▲0.0067	0.5133 (↑) +0.0133
Optimal donation share (C) s_C^B	0.5000	0.5286 (↑) +0.0286	0.4714 (↓) ▲0.0286	0.5095 (↑) +0.0095	0.4905 (↓) ▲0.0095	0.4933 (↓) ▲0.0067	0.5067 (↑) +0.0067	0.4867 (↓) ▲0.0133
Net donation income (A) Π_A	0.5833	0.5186 (↓)	0.6519 (↑)	0.4811 (↓)	0.6058 (↑)	0.5990 (↑)	0.5679 (↓)	0.6149 (↑)
Net donation income (C) Π_C	0.5833	0.6519 (↑)	0.5186 (↓)	0.6058 (↑)	0.4811 (↓)	0.5679 (↓)	0.5990 (↑)	0.5526 (↓)
Stackelberg equilibrium								
Donation price (leader A) P_A^S	3.0714	3.2143 (↑)	3.2143 (↑)	3.1190 (↑)	3.1190 (↑)	3.1048 (↑)	3.0381 (↓)	3.1381 (↑)
Donation price (follower C) P_C^S	2.6548	2.7262 (↑)	2.8690 (↑)	2.6786 (↑)	2.7262 (↑)	2.6381 (↓)	2.6714 (↑)	2.6214 (↓)
Optimal donation share (leader A) s_A^S	0.3750	0.3536 (↓) ▲0.0214	0.3964 (↑) +0.0214	0.3679 (↓) ▲0.0071	0.3821 (↑) +0.0071	0.3800 (↑) +0.0050	0.3700 (↓) ▲0.0050	0.3800 (↑) +0.0101
Optimal donation share (follower C) s_C^S	0.6250	0.6464 (↑) +0.0214	0.6046 (↓) ▲0.0186	0.6321 (↑) +0.0071	0.6179 (↓) ▲0.0071	0.6200 (↓) ▲0.0050	0.6300 (↑) +0.0050	0.6149 (↓) ▲0.0101
Net donation income (leader A) Π_A	0.6563	0.5834 (↓)	0.7334 (↑)	0.5413 (↓)	0.6015 (↓)	0.6739 (↑)	0.6389 (↓)	0.6917 (↑)
Net donation income (follower C) Π_C	0.5469	0.4626 (↓)	0.6376 (↑)	0.4441 (↓)	0.5764 (↑)	0.5497 (↑)	0.5439 (↓)	0.5525 (↑)

Note: The sensitivity parameters are set as $\beta = 0.3$ (donation price differences), $\gamma = 0.2$ (brand strength differences), and $\theta = 0.1$ (attachment differences).

Arrows in parentheses indicate increases (↑) or decreases (↓) relative to For optimal donation shares, the values in the lower row represent deviations from the base case (+ indicates positive, ▲ indicates negative).

Cases 1 through 7 present the results of numerical simulations in which each parameter is varied one at a time. Arrows in parentheses indicate an increase (↑) or decrease (↓) relative to the base case. The numerical results are consistent with the theoretical comparative statics. In particular, changes in optimal donation shares from the base case (+ indicates positive, ▲ indicates negative) are reported in the lower section of the table. The magnitude of changes in optimal donation shares due to parameter variations is larger under Bertrand competition than under Stackelberg competition. This finding is consistent with the results of the comparative static analysis.

The analysis in this section reveals that, while policy variables such as donation price and the brand strength of reciprocal gifts significantly affect local governments' ability to attract donations, household attachment to the local government is also an important determinant. For local government policymakers, enhancing the brand strength of reciprocal gifts, and fostering household attachment—such by increasing the population connected to the area—are crucial for increasing their net donation revenue.

4. Empirical Analysis of the Donation Share Function

In the preceding sections, we developed a theoretical model based on a Hotelling-type framework and conducted a comparative static analysis of the optimal donation share function. While the theoretical analysis provides clear predictions, whether the model holds in the actual hometown tax donation system requires empirical verification. This section therefore empirically estimates the donation share function, which constitutes the core of the theoretical model.

To derive the estimation equation, we approximate the donation share function for local government A around the symmetric point $s_A = 1/2$, yielding:⁴

⁴ In general, if we perform a linear approximation of $\ln y$ at $y = y_0$, we obtain:

$$\ln y \approx \ln y_0 + \frac{1}{y_0}(y - y_0).$$

$$\ln s_A \approx \ln \frac{1}{2} + 2\beta(P_C - P_A) + 2\gamma(v_A - v_C) + 2\theta(2x_B - 1) \quad (26).$$

Furthermore, by applying a local approximation around benchmark value of donation price \bar{P} and brand strength \bar{v} , we obtain:⁵

$$\ln s_A \approx \ln \frac{1}{2} + 2\beta\bar{P} \ln \frac{P_C}{P_A} + 2\gamma\bar{v} \ln \frac{v_A}{v_C} + 2\theta(2x_B - 1) \quad (27).$$

Based on the above framework, the estimation equation is specified as:

$$\ln s_i = \tilde{\alpha} + \tilde{\beta} \ln \left(\frac{P_i}{P_T} \right) + \tilde{\gamma} \ln \left(\frac{v_i}{v_T} \right) + \tilde{\theta} x_i + \varepsilon_i \quad (28).$$

Here, subscript i denotes a local government, subscript T denotes the reference local government, and ε denotes the error term. The expected signs of the constant and coefficient estimates are $\tilde{\alpha} > 0$ and $\tilde{\gamma} > 0$, while $\tilde{\beta} < 0$, reflecting the inverse relationship between relative donation prices and donation shares⁶. The choice of the benchmark local government T will be discussed later.

Because donation shares s and donation prices P are simultaneously determined, donation prices are endogenously determined. To address this issue, we employ a two-stage least squares (2SLS) approach using the lagged donation price as an instrumental variable for the current donation price. The donation price in the previous year is strongly correlated with the current donation price but is unlikely to directly affect

⁵ More generally, when there exists a reference value \bar{a} between two values a_0 and a_1 , the following approximation holds:

$$a_0 - a_1 \approx \bar{a} \ln \frac{a_0}{a_1}.$$

⁶ Here, we rewrite the expressions as $\tilde{\alpha} = \ln(1/2) - 2\theta$, $\tilde{\beta} = -2\beta\bar{P}$, and $\tilde{\gamma} = 2\gamma\bar{v}$. Note that the signs of $\tilde{\beta}$ and the theoretical parameter β are reversed. In the theoretical model presented in the previous section, the sign condition for the sensitivity parameter β of the donation share s_A with respect to the donation price difference is assumed to be positive. This is because the donation price difference is defined as $(P_C - P_A)$. In the contract, in the empirical specification of this section, since the donation price ratio P_i/P_T between local government i and the benchmark local government T is used, the expected sign of the estimated sensitivity $\tilde{\beta}$ becomes negative.

the current donation share, thereby constituting a valid instrument. The first-stage estimation is given by:

$$\ln\left(\frac{P_i}{P_T}\right) = \delta_0 + \delta_1 \ln\left(\frac{P_{i,-1}}{P_{T,-1}}\right) + \epsilon_i \quad (29).$$

Here, δ_0 is the constant term, δ_1 is the coefficient, and ϵ is the error term. Using the fitted values obtained from the first-stage estimation $\ln(\widehat{P_i/P_T})$, the donation share function is estimated in the second stage.

The following describes the data used in the analysis. First, data for fiscal years 2023 and 2024 are obtained from the Ministry of Internal Affairs and Communications' *"Survey Results on the Current Status of Hometown Tax Donations."* The data are aggregated at the prefecture level.

The dependent variable, the donation share, is calculated as the ratio of the "number of donations" received by municipalities and prefectures in fiscal year 2024, aggregated at the prefectural level, to the total "number of donations". The explanatory variable, the donation price P for fiscal years 2023 and 2024, is calculated by dividing the total donation amount (aggregated by prefecture) by the "number of donations".

To calculate the donation price ratio P_i/P_T and the brand strength ratio v_i/v_T a benchmark local government T must be defined. This study sets Tokyo as the benchmark local government, as it represents the largest source of donations in the system. Approximately 25% of total donations originate from households residing in Tokyo, making it the largest demand-side region.

Table 3 presents the prefectural ranking of donation outflow under the hometown tax donation system, based on the Ministry of Internal Affairs and Communications' *"Survey Results on the Current Status of Hometown Tax Donations,"* the "donation amounts" for prefectures and municipalities are aggregated at the prefectural level to construct this ranking. In fiscal year 2024, approximately 25% of the total donations originated from households residing in Tokyo. Tokyo is the local government where the

largest demand-side households reside, accounting for about one-quarter of total donations under the hometown tax donation system. It effectively serves as the benchmark in competition among local governments to attract donations. Securing donations from Tokyo households — the largest source of demand — is therefore crucial for the strategies of other local governments.

Next, regarding the brand strength v of reciprocal gifts, since no directly observable measure is available, we use the number of reciprocal gift types by prefectural level as a proxy variable. The rationale is that stronger brand strength enables the creation of a greater variety of reciprocal gifts. Data on the number of reciprocal gift varieties per local government were obtained from the hometown tax donation portal site "*Furusato Choice*," aggregated by prefecture, and the ratio of reciprocal gift varieties v_i/v_T is calculated⁷.

Furthermore, since no directly observable indicator is available for household attachment to local governments. Therefore, we set Tokyo as the reference local government T and use the ratio of Tokyo-origin households from each prefecture as a proxy for household attachment to that local government and residing in Tokyo.

However, no data directly identify the prefectural origins of Tokyo households. Therefore, we use the proportion of migrants from each prefecture to Tokyo, calculated as the number of migrants from each prefecture to Tokyo in a given year divided by Tokyo's population, as a proxy for attachment. While this measure reflects a flow rather than a stock of household origins, in the absence of better data and assuming that migration trends are relatively stable over time, it can be considered a reasonable proxy for the stock of prefectural origins. Accordingly, the migration rate used here captures the influence of households residing in Tokyo on the donation shares of other prefectures.

⁷ Data were collected from December 24 to 26, 2025.

Based on the above considerations, we compute the new resident population ratio x for each prefecture as the "number of in-migrants" from each prefecture to Tokyo by Tokyo's "population," using the "Number of Inter-prefectural Migrants" from the Ministry of Internal Affairs and Communications' "Basic Resident Register Population Migration Report" for fiscal year 2023 and Tokyo's population from the "Basic Resident Register Population." This ratio serves as a proxy for household attachment to local governments.

Table 4 reports the descriptive statistics of the variables. The estimation results for the first and second stages are as follows:

$$\ln\left(\frac{P_i}{P_T}\right) = -0.4035 + 0.9042 \ln\left(\frac{P_{i,-1}}{P_{T,-1}}\right) + \epsilon_i \quad (30),$$

(0.000) (0.000) *Adjusted R*² = 0.8055

$$\ln s_i = -5.4622 - 1.2711 \ln\left(\frac{P_i}{P_T}\right) + 1.0409 \ln\left(\frac{v_i}{v_T}\right) + 0.1347 x_i + \epsilon_i \quad (31).$$

(0.000) (0.000) (0.000) (0.0955)

The values in parentheses are p-values. The estimated coefficient $\tilde{\beta}$ on the donation price ratio is negative, while the coefficients $\tilde{\gamma}$ for the reciprocal gift variety ratio (a proxy for brand strength) and $\tilde{\theta}$ for the new resident population ratio (a proxy for household attachment) are positive, consistent with the expected sign conditions. The coefficients for the donation price ratio and the reciprocal gift variety ratio are statistically significant at the 1% level, whereas the coefficient on the new resident population ratio is significant at the 10% level.

These results provide empirical support for the theoretical donation share function derived in the model. In particular, donation prices P and brand strength v significantly affect donation shares. From a policy perspective, lowering donation prices and strengthening the brand of reciprocal gifts are effective strategies for increasing donation shares.

Table 3: Prefectural Rankings of Donation Outflows under the Hometown Tax Donation System (FY 2024)

Rank	Prefecture	Donation outflows (billion yen)	Share of total donations (%)
1	Tokyo	2,761	24.789%
2	Kanagawa	1,141	10.243%
3	Osaka	896	8.045%
4	Aichi	802	7.202%
5	Saitama	636	5.707%

Note: Based on data from the Ministry of Internal Affairs and Communications' "*Summary of Findings from the Survey on the Current Status of Hometown Tax Donations*" (FY2024). Donation outflows are calculated by aggregating the "donation amounts" from prefectures and municipalities at the prefectural level.

Table 4 Descriptive Statistics of the Variables

	Donation share s_i (FY 2024)	Donation price ratio P_i/P_T (FY 2023)	Donation price ratio P_i/P_T (FY 2024)	Reciprocal gift variety ratio v_i/v_T	New resident population ratio x (FY 2023)
Mean	0.0216	0.3392	0.2522	1.9153	0.000713
Standard error	0.0037	0.0139	0.0103	0.1804	0.000178
Median	0.0150	0.3133	0.2297	1.5682	0.000251
Standard deviation	0.0254	0.0943	0.0704	1.2238	0.001214
Minimum	0.0024	0.2128	0.1566	0.5993	0.000077
Maximum	0.1638	0.5842	0.4619	6.3931	0.006250
Number of observations	46	46	46	46	46

Note: Compiled from the Ministry of Internal Affairs and Communications' "*Summary of Findings from the Survey on the Current Status of Hometown Tax Donations*" (FY2023-2024), the hometown tax donation portal site "*Furusato Choice*," the Ministry of Internal Affairs and Communications' "*Basic Resident Register Population Migration Report*," and the Ministry of Internal Affairs and Communications' "*Basic Resident Register Population*."

Although the expected coefficient on household attachment x has the expected sign, its statistical significance is weaker than that of donation prices and brand strength. This suggests that, within the hometown tax donation system, donation price and the brand strength of reciprocal gifts play a more dominant role than household attachment. However, because the proxy for attachment—the proportion of new residents—is based solely on migration to Tokyo, the estimated coefficient may be downward biased.

5. Conclusion

This study examines strategic donation competition among local governments within the hometown tax donation system using a Hotelling-type framework and provides empirical evidence supporting the model. Specifically, we consider an economic environment composed of donor households and multiple local governments. We develop a simplified Hotelling-type model that incorporates donation prices, the brand strength of reciprocal gifts, and household attachment to local governments, and analyze competition in which local governments strategically set donation prices. Overall, this study provides a unified analysis of strategic donation competition among local governments within the hometown tax donation system from both theoretical and empirical perspectives.

In the theoretical model, donation price competition among local governments is first analyzed under Bertrand competition, which characterizes the equilibrium properties of the donation share function. We then extend the analysis to a Stackelberg framework, allowing for sequential price setting by a leader and a follower. The analysis shows that increases in marginal costs and reciprocal gift ratios reduce donation shares, whereas stronger brand strength of reciprocal gifts and greater household attachment increase donation shares. Moreover, even with a lower donation share, maintaining a higher donation price can increase net donation revenue. To support these theoretical findings, numerical simulations further support the results of the comparative static analysis.

To assess the empirical validity of the theoretical model, we conduct an empirical analysis based on prefecture-level data. The estimation equation specifies donation share as the dependent variable and donation price, the brand strength of reciprocal gifts, and household attachment as explanatory variables. To address the endogeneity of donation price, we employ a two-stage least squares (2SLS) approach with an instrumental variable. The estimation results show that the coefficient on donation price is negative, whereas those on the brand strength of reciprocal gifts and household attachment are positive, consistent with the predictions of the theoretical model. These findings provide strong empirical support for the theoretical framework. Notably, the statistically significant effect of the variety of reciprocal gifts—a proxy for brand strength—suggests that product differentiation plays a crucial role in donation competition within the hometown tax donation system.

These findings suggest that the hometown tax donation system should be understood not merely as a fiscal transfer mechanism but as a competitive economic system among local governments. While policy variables such as donation prices and the brand strength of reciprocal gifts significantly influence local governments' ability to attract donations, household attachment also emerges as an important factor that cannot be ignored. For policymakers, enhancing the brand strength of reciprocal gifts and fostering household attachment—such as by increasing the number of people connected to the locality—are crucial for increasing net donation revenue.

The main contributions of this study are as follows. First, we develop a simplified Hotelling-type model that incorporates household attachment to local governments in an economy consisting of donor households and multiple local governments, thereby capturing strategic competition in donation prices. Second, we analyze the strategic behavior of local governments under both Bertrand and Stackelberg competition frameworks. Third, we clarify the effects of key policy parameters on the optimal donation share through comparative statics and validate these results with numerical simulations.

Fourth, we conduct an empirical analysis using prefecture-level data and employ a two-stage least squares (2SLS) approach to address the endogeneity of donation prices, providing empirical support for the theoretical predictions of the donation share function.

Finally, several limitations of this study remain. First, the analysis is based on a static framework and does not fully capture how the brand strength of reciprocal gifts and household attachment are formed and evolve over time. Second, more refined measures of brand strength and household attachment would improve the empirical analysis, as the current proxies may not fully capture them. Third, it would be important to empirically identify whether the hometown tax donation system is better characterized by Bertrand or Stackelberg competition. However, such an analysis would require detailed data on the timing of donation price setting and adjustment processes. Future research should further clarify the mechanisms of strategic donation competition among local governments by developing dynamic models and using more detailed micro-level data.

References

- Ayukawa, M. (2022) "Effects of Administrative Cost for Accepting Hometown tax donation by Local Governments on Local Public Finance," *Journal of Household Economics*, 56, pp.49–67, The Japan Society of Household Economics. (in Japanese)
- Ayukawa, M. (2023) "Effects of Corporate Inhabitant Tax on Local Finance under the Hometown Tax Payment System," *Journal of Regional Studies*, 53(1), pp.37–57, Japan Society of Regional Science. (in Japanese)
- Bulow, J., Geanakoplos, J., and Klemperer, P. (1985) "Multimarket Oligopoly: Strategic Substitutes and Complements," *Journal of Political Economy*, 93(3), pp.488–511.
- Fukasawa, E. T. Fukasawa and H. Ogawa (2020) "Intergovernmental Competition over

- Donations: The Case of Japan's Hometown Tax System," *Journal of Asian Economics*, 67, pp. 101178.
- Fukasawa, T. (2020) "Structural Estimation of Hometown Tax Donations System," *Discussion Paper Series*, DP2020-J13, Institute of Economic and Business Research, Kobe University. (in Japanese)
- Hotelling, H. (1929) "Stability in Competition," *Economic Journal*, 39(153), pp. 41–57.
- Kato, H. and M. Yanagihara (2021) "Gift Competition in the 'Furusato Nozei System': A Theoretical Approach in the Framework of Tax Competition," *Journal of Regional Studies*, 51(2), pp.175-195, Japan Society of Regional Science.(in Japanese)
- Singh, N., and X. Vives (1984) "Price and Quantity Competition in a Differentiated Duopoly," *RAND Journal of Economics*, 15(4), pp.546–554.
- Suematsu T. (2020) "Analysis of Competition in Reciprocal Gift Ratio of Hometown Tax Donations," *PRI Discussion Paper Series*, No.20A04, General Affairs Research Department, Policy Research Institute, Ministry of Finance. (in Japanese)
- Tirole, J. (1988) *Industrial Organization*, Cambridge University Press.
- Uemura, T. (2025) "Economic Behavior of Local Governments and Hometown Tax Donation (Furusato Nozei) in Japan: Effects of Regulations in a Monopolistic Competition Model," *Japanese Journal of Local Public Finance*, 32, pp.53-77, Japanese Association of Local Finance Studies (ed.), Gogen-sha. (in Japanese)
- Uemura, T. (2026) "Structure of the Hometown Tax Donation (Furusato Nozei) Market and Revenue and Expenditure Structure of Local Governments in Japan," *Japanese Journal of Local Public Finance*, 33, forthcoming, Japanese Association of Local Finance Studies (ed.), Gogen-sha. (in Japanese)
- Vives, X. (1999) *Monopoly Pricing*, Cambridge, MA: MIT Press.