Tax Policy under the "Generational Election System"*

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Abstract
This chapter investigates the effects of introducing the "generational election system" proposed by Ihori and Doi (1998). The generational election system (or the election district by generation) consists of election districts divided by not only region but also generation. In industrial countries, intergenerational conflicts of interest are large at present. In particular, the older generation has more political power because of aging and fewer children. In an electoral system that consists of election districts divided only by region, conflicts of interest among regions can be dealt with in the Congress, but intergenerational conflicts are buried in each district because the opinions of older people dominate those of younger people. Therefore, this chapter analyzes the effects of introducing the generational election system using an overlapping generations model. The results of the voting equilibrium show that the preferred policy of the younger generation can be better represented in the generational election system compared with the current majoritarian system. Furthermore, the selected policy does not depend on the turnout rate of the younger generation. These results suggest that introducing the generational election system benefits both the younger and future generations.

JEL Classifications: H20, D72, H31

1. The "Generational Election System"

This chapter investigates the effects of introducing the "generational election system" proposed by Ihori and Doi (1998). The generational election system (or the election district by generation) consists of election districts divided by not only region but also generation. In Japan, as well as industrial countries, intergenerational conflicts of interest are large at present. In particular, the older generation has more political power because of aging and fewer children. In the current electoral system that consists of election districts divided by only region, conflicts of interest among regions can be dealt with in the Congress, but intergenerational conflicts are buried in each district because the opinions of older people dominate those of younger people.

In particular, the turnout rate of the younger generation in national elections is notably lower than that of the older generation in Japan. Figure 1 shows turnout rates by age group in national elections in Japan. It suggests that the opinions of older people dominate those of younger people in each district. If election districts were divided by generation, such different turnout rates could block to reflect in election results.

Moreover, there is malapportionment in Japanese national elections. Electoral districts in urban areas, where more young people live, are more populous, while those in rural areas, where more old people live, are less populous. Though the Supreme Court rendered a judgment that the degree of malapportionment of allocated seats in the national election was "state of unconstitutional," it is fundamentally unchanged. The ratio of the most populous electoral district to the least populous was 2.4 in the 2012 general House of Representatives election, and 4.77 in the 2013 regular House of Councilors election. This malapportionment reduces intergenerational equity.

Therefore, the generational election system may be a solution in such situations. This chapter analyzes the effects of introducing the generational election system using an overlapping generations model.

2. Model

The model established in this chapter is based on the overlapping generations model in Ihori (1987). In this model, each household lives for two periods. N_t denotes the population of generation t and n denotes the rate of population growth. This means that $N_t = (1+n)N_{t-1}$. There are Z election districts in this economy. Households do not migrate across regions over time.

The utility function of a household of generation t can be written as

$$u^i = \ln c^i_t + \beta \ln x^i_{t+1} + \gamma^i_t \ln g_t + \delta^i_t \ln g_{t+1} \tag{1}$$

where γ^i_t and δ^i_t vary among individuals.

The budget constraint of the household i of generation t is

$$c^i_t = w^i_t - s^i_t - \tau_t$$

$$x^i_{t+1} = (1 + r_{t+1})s^i_t - \rho_{t+1}$$

Hence, the lifetime budget constraint of the household can be rewritten as

$$c^i_t + \frac{x^i_{t+1}}{1+r_{t+1}} = w^i_t - \tau_t - \frac{\rho_{t+1}}{1+r_{t+1}}.$$

The budget constraint of the government can be written as

$$N_t \tau_t + N_{t-1}\rho_t = G_t$$

$$\tau_t + \frac{\rho_t}{1+n} = \frac{G_t}{N_t} \equiv g_t.$$

Assume $\tau_t = \rho_t$. Then $\frac{2+n}{1+n}\tau_t = g_t$.

The household i of generation t maximizes its lifetime utility with respect to s_t, τ_t, and ρ_{t+1} given the tax rates or amounts of public goods in both periods. The optimal amount of consumption in each period is determined by the first-order conditions

$$c^i_t = \frac{\tau_t}{\gamma^i_t}$$

$$x^i_{t+1} = \frac{\beta\rho_{t+1}}{\delta^i_t}$$

$$\frac{x^i_{t+1}}{c^i_t} = \beta(1+r_{t+1}).$$

Under these conditions, tax rates which the household i of generation t prefers are as follows.

$$\tau^i_t = \frac{\gamma^i_t}{1+\beta+\gamma^i_t+\delta^i_t} w^i_t \tag{2}$$

$$\rho^i_{t+1} = \frac{\delta^i_t}{1+\beta+\gamma^i_t+\delta^i_t}(1+r_{t+1})w^i_t \tag{3}$$

A household, that is, a voter, casts a vote sincerely in an election. Furthermore, I assume that malapportionment in the electoral system is not allowed in this economy.

3. Properties of voting equilibria with homogenous districts

In this section, I investigate the properties of voting equilibria if all election districts are homogenous. Before considering a voting equilibrium, some assumptions are made. For simplicity, the parameter γ^j_t is the same (γ_t) for all members of generation t. I assume $\delta_t = \beta\gamma_t$. w^i_t is predetermined for the household and different for each household. The distribution of w^i_t is presumed to follow a uniform distribution. Hence, the distributions of τ^i_t and ρ^j_t follow uniform distributions because of (2) and (3).

Without loss of generality, I assume there is no population growth ($n = 0$: and $N_{t-1} = N_t \equiv N$), and that there are six election districts ($Z = 6$) in this economy, for simplicity. Therefore, there are $N/3$ electorates per election district. In this section, the income distribution is assumed to be the same in each district. In this sense, all districts are homogenous. Let w^i_t denote the income of household i in a district, I set $w^i_t \sim \mathrm{U}[\underline{w}_t, \overline{w}_t]$, where $\underline{w}_t$ denotes the lower bound of the uniform distribution, and $\overline{w}_t$ denotes the upper bound of the uniform distribution.

The household whose income is $\underline{w}_t$ prefers

$$\underline{\tau}_t \equiv \frac{\gamma_t}{(1+\beta)(1+\gamma_t)}\underline{w}_t .$$

Furthermore, the household whose income is $\overline{w}_t$ prefers

$$\overline{\tau}_t \equiv \frac{\gamma_t}{(1+\beta)(1+\gamma_t)}\overline{w}_t .$$

Therefore, $\tau^i_t \sim \mathrm{U}[\underline{\tau}_t, \overline{\tau}_t]$. Hence, the cumulative distribution function of τ^i_t is $\frac{\tau^i_t - \underline{\tau}_t}{\overline{\tau}_t - \underline{\tau}_t}$ for $\tau^i_t \in [\underline{\tau}_t, \overline{\tau}_t]$.

In an analogous way, the household of generation t–1 whose income is $\underline{w}_{t-1}$ prefers

$$\underline{\rho}_t \equiv \frac{\beta\gamma_t}{(1+\beta)(1+\gamma_t)}(1+r_t)\underline{w}_{t-1}.$$

Furthermore, the household whose income is $\overline{w}_{t-1}$ prefers

$$\overline{\rho}_t \equiv \frac{\beta\gamma_t}{(1+\beta)(1+\gamma_t)}(1+r_t)\overline{w}_{t-1}.$$

Therefore, $\rho^i_t \sim \mathrm{U}[\underline{\rho}_t, \overline{\rho}_t]$. Hence, the cumulative distribution function of ρ^i_t is

$$\frac{\rho^i_t - \underline{\rho}_t}{\overline{\rho}_t - \underline{\rho}_t} \text{ for } \rho^i_t \in [\underline{\rho}_t, \overline{\rho}_t].$$

This economy implements an indirect democracy, in which the election for the Congress representatives occurs in each election district in the first stage, and the representatives select a lump-sum tax rate by ballot in the Congress in the final stage. Furthermore, I can consider a voting equilibrium in a setting where the median voter theorem holds.

In comparing both electoral systems, the majoritarian system and the generational election system, I assume $\beta(1+r_t) > 1$. This means that $\tau^i_t < \rho^i_t$, if $w^i_t = w^i_{t-1}$ and $\gamma_t = \gamma_{t-1}$ from (2) and (3).

Moreover, electorates of the younger generation may abstain in the election. I assume that the turnout rate of the younger generation is α ($\times$ 100)%, where $0 \leq \alpha \leq 1$, and electorates of the older generation are certain to vote. The turnout rate is presumed to be the same across all election districts and to be independent of income levels.

3.1 Voting equilibrium of the majoritarian system

First, the following majoritarian system is introduced in this model. This means that there are $N/6$ electorates for each generation.

In each election district in period t, the tax rate preferred by the pivotal voter, τ_t, is as follows.

$$\alpha\frac{\tau_t - \underline{\tau}_t}{\overline{\tau}_t - \underline{\tau}_t} + \frac{\tau_t - \underline{\rho}_t}{\overline{\rho}_t - \underline{\rho}_t} = \frac{1+\alpha}{2},$$

because of the cumulative distribution functions and the median voter theorem. Therefore, in each election district,

$$\tau_t = \frac{\overline{\tau}_t \overline{\rho}_t - (1-\alpha)\underline{\tau}_t \overline{\rho}_t - \alpha \underline{\tau}_t \underline{\rho}_t}{\overline{\tau}_t - \underline{\tau}_t + \alpha(\overline{\rho}_t - \underline{\rho}_t)}. \tag{4}$$

In each election district, a representative who has the preferred tax rate (4) is elected.

Next, the representatives from each election district convene in the Congress to decide the nationwide tax rate. However, all districts are homogenous, such that all representatives prefer the same tax rate τ_t. Thus, the preferred tax rate in the Congress is τ_t, in equation (4).

Equation (4) implies that the tax rate determined in the Congress depends on the turnout rate α. The tax rate depends strongly on the values of the older generation, $\underline{\rho}_t$ and $\overline{\rho}_t$, when the turnout rate α decreases.

3.2 Voting equilibrium of the generational election system

Ihori and Doi (1998) proposes the "generational election system" that consists of election districts divided by not only region but also generation.

Therefore, in the model below, the election districts are divided by not only region but also generation. Thus, there are three election districts of the younger generation. Furthermore, there are three election districts of the older generation.

For the younger generation in period t, the pivotal voter is the voter who has the median income, because both the income distribution and the distribution of the preferred tax rate are uniform distributions and the turnout rate, α, is independent of the income level. Thus, the tax rate preferred by the median voter of the younger generation, τ_t, in each election district is as follows:

$$\tau_t = \frac{\underline{\tau}_t + \overline{\tau}_t}{2}, \tag{5}$$

because of the cumulative distribution functions and the median voter theorem. Similarly, for the older generation in period t, the pivotal voter is the voter who has the median income. Thus, the tax rate preferred by the median voter of the older generation, ρ_t, in each election district is as follows:

$$\rho_t = \frac{\underline{\rho}_t + \overline{\rho}_t}{2}, \tag{6}$$

because of the cumulative distribution functions and the median voter theorem.

Finally, I investigate the voting equilibrium of the generational election system in the Congress. The tax rate is determined based on the median voter theorem. This result depends on the values of π_t and ρ_t. However, from (5) and (6), the tax rate determined in the Congress does not depend on the turnout rate, α. This is an important property of the voting equilibrium.

4. Properties of voting equilibria with heterogeneous districts

In this section, I investigate the properties of voting equilibria if all electoral districts are heterogeneous. This case is more general and complicated than that in the previous section.

Before considering a voting equilibrium with heterogeneous districts, I make the same assumptions as in the previous section; γ^j_t is the same (γ_t) for all persons of generation t, $\delta_t = \beta\gamma_t$, $\beta(1+r_t) > 1$, and the distribution of w^i_t is presumed to follow a uniform distribution. Furthermore, $n = 0$ ($N_{t-1} = N_t \equiv N$) and there are six election districts ($Z = 6$) in this economy.

I assume that there are three types of people in each generation; types A, B, and C. There is an equal number of each type ($N/3$). The distribution of each type is assumed to be different. In this sense, all districts are heterogeneous. Let w^{ij}_t denote the income of household i in type j, I set $w^{ij}_t \sim$ U[$\underline{w}^j_t, \overline{w}^j_t$] for j = A, B, and C, where $\underline{w}^j_t$ denotes the lower bound of the uniform distribution of type j, and $\overline{w}^j_t$ denotes the upper bound of the uniform distribution of type j. I assume that $\underline{w}^A_t < \underline{w}^B_t < \underline{w}^C_t$ and $\overline{w}^A_t < \overline{w}^B_t < \overline{w}^C_t$ in each generation.

The household whose income is $\underline{w}^j_t$ prefers

$$\underline{\tau}^j_t \equiv \frac{\gamma_t}{(1+\beta)(1+\gamma_t)}\underline{w}^j_t \qquad j = \text{A, B, and C.}$$

Furthermore, the household whose income is $\overline{w}^j_t$ prefers

$$\overline{\tau}_t^{\,j} \equiv \frac{\gamma_t}{(1+\beta)(1+\gamma_t)}\overline{w}_t^j \qquad j = \text{A, B, and C.}$$

As the distributions of τ^i_t are uniform because of (2), $\tau^{ij}_t \sim \mathrm{U}[\underline{\tau}_t^{\,j}, \overline{\tau}_t^{\,j}]$ for j = A, B, and C. Hence, the cumulative distribution function of τ^{ij}_t is $\dfrac{\tau_t^{ij}-\underline{\tau}_t^{\,j}}{\overline{\tau}_t^{\,j}-\underline{\tau}_t^{\,j}}$ for $\tau^{ij}_t \in [\underline{\tau}_t^{\,j}, \overline{\tau}_t^{\,j}]$. In this situation, $\underline{\tau}_t^A < \underline{\tau}_t^B < \underline{\tau}_t^C$ and $\overline{\tau}_t^A < \overline{\tau}_t^B < \overline{\tau}_t^C$.

In an analogous way, the household of generation t-1 whose income is $\underline{w}_{t-1}^j$ prefers

$$\underline{\rho}_t^j \equiv \frac{\beta\gamma_t}{(1+\beta)(1+\gamma_t)}(1+r_t)\underline{w}_{t-1}^j \qquad j = \text{A, B, and C.}$$

Furthermore, the household whose income is $\overline{w}_{t-1}^j$ prefers

$$\overline{\rho}_t^j \equiv \frac{\beta\gamma_t}{(1+\beta)(1+\gamma_t)}(1+r_t)\overline{w}_{t-1}^j \qquad j = \text{A, B, and C.}$$

As ρ^j_t follows uniform distribution because of (3), $\rho^{ij}_t \sim \mathrm{U}[\underline{\rho}_t^j, \overline{\rho}_t^j]$ for j = A, B, and C. Hence, the cumulative distribution function of ρ^{ij}_t is $\dfrac{\rho_t^{ij}-\underline{\rho}_t^j}{\overline{\rho}_t^j-\underline{\rho}_t^j}$ for $\rho^{ij}_t \in [\underline{\rho}_t^j, \overline{\rho}_t^j]$. In this situation, $\underline{\rho}_t^A < \underline{\rho}_t^B < \underline{\rho}_t^C$ and $\overline{\rho}_t^A < \overline{\rho}_t^B < \overline{\rho}_t^C$.

This economy implements an indirect democracy, in which a representative is elected to the Congress from each election district in the first stage, and the representatives then select a lump-sum tax rate by ballot in the Congress in the final stage. Furthermore, I can consider a voting equilibrium in which the median voter theorem holds.

As there are six election districts in this economy, there are $N/3$ electorates per election district. Moreover, as in the previous section, electorates from the younger generation may abstain in the election. The turnout rate of the younger generation is α, where $0 \le \alpha \le 1$, and electorates from the older generation are sure to vote. The turnout rate is presumed to be the same in all election districts and to be independent of the income level.

4.1 Voting equilibrium of the majoritarian system

First, the following majoritarian system is introduced in this model. I assume that election districts are divided by type, which means that there are $N/6$ electorates of type j of generation t and $N/6$ electorates of type j from generation t-1 in each district, for j = A, B, and C. Furthermore, there are two election districts that are comprised of type j electorates.

In the type j election district in period t, the following is true for the tax rate preferred by the pivotal voter, $\tau^j{}_t$.

$$\alpha \frac{\tau_t^j - \underline{\tau}_t^j}{\overline{\tau}_t^j - \underline{\tau}_t^j} + \frac{\tau_t^j - \underline{\rho}_t^j}{\overline{\rho}_t^j - \underline{\rho}_t^j} = \frac{1+\alpha}{2} \qquad j = \text{A, B, and C,}$$

because of the cumulative distribution functions and the median voter theorem. Figure 2 describes this situation from the viewpoint of the voter distribution. Therefore, in an election district of type j,

$$\tau_t^j = \frac{\overline{\tau}_t^j \overline{\rho}_t^j - (1-\alpha)\underline{\tau}_t^j \overline{\rho}_t^j - \alpha \underline{\tau}_t^j \underline{\rho}_t^j}{\overline{\tau}_t^j - \underline{\tau}_t^j + \alpha(\overline{\rho}_t^j - \underline{\rho}_t^j)} \qquad j = \text{A, B, and C.} \tag{7}$$

From each election district, a representative who has the preferred tax rate (7) is elected.

Next, representatives from every election district are convened to decide the tax rate nationwide in the Congress. There are two representatives whose preferred tax rate is $\tau^A{}_t$, two representatives whose preferred tax rate is $\tau^B{}_t$, and two representatives whose preferred tax rate is $\tau^C{}_t$. Under certain conditions, the preferred tax rate of the median representative in the Congress is

$$\tau_t^B = \frac{\overline{\tau}_t^B \overline{\rho}_t^B - (1-\alpha)\underline{\tau}_t^B \overline{\rho}_t^B - \alpha \underline{\tau}_t^B \underline{\rho}_t^B}{\overline{\tau}_t^B - \underline{\tau}_t^B + \alpha(\overline{\rho}_t^B - \underline{\rho}_t^B)}. \tag{8}$$

Equation (8) implies that the tax rate determined in the Congress depends on the turnout rate α. The tax rate depends mainly on the values of the older generation, $\underline{\rho}_t^j$ and $\overline{\rho}_t^j$, when the turnout rate α decreases.

4.2 Voting equilibrium of the generational election system

In this model, under the generational election system, the election districts are divided by not only region but also generation. Therefore, there is one election district of the younger generation of each type because the population of the younger generation of each type is $N/3$. Furthermore, there is one election district of the older generation of each type.

For the younger generation in period t, the pivotal voter is the voter who has the median income, because both the income distribution and distribution of the preferred tax rate have uniform distributions and the turnout rate, α, is independent of income level. Therefore, the tax rate preferred by the median voter of the younger generation, τ^j_t, for type j election district is as follows.

$$\tau_t^j = \frac{\underline{\tau}_t^j + \overline{\tau}_t^j}{2} \qquad j = \text{A, B, and C,} \qquad (9)$$

because of the cumulative distribution functions and the median voter theorem. Figure 3 shows this situation from the viewpoint of the voter distribution. Similarly, for the older generation in period t, the pivotal voter is the voter who has the median income. Therefore, the tax rate preferred by the median voter of the older generation, ρ^j_t, for type j election district is as follows.

$$\rho_t^j = \frac{\underline{\rho}_t^j + \overline{\rho}_t^j}{2} \qquad j = \text{A, B, and C,} \qquad (10)$$

because of the cumulative distribution functions and the median voter theorem (see Figure 3).

Finally, I investigate the voting equilibrium of the generational election system in the Congress. The tax rate is determined based on the median voter theorem. This result depends on the values of τ^j_t and ρ^j_t. However, from (9) and (10), the tax rate determined in the Congress does not depend on the turnout rate, α. This is an important property of the voting equilibrium.

5. Numerical analysis of voting equilibria

Now, I set the values of the parameters in this model. Furthermore, I set $\beta = 0.95$, $\gamma = 0.3$, $\alpha = 0.5$, and the interest rate at 5 percent. I assume that type A implies $1 \leq w^{iA}_t \leq 4$, as shown in Table 1. Similarly, type B implies $2 \leq w^{iB}_t \leq 5$, and type C implies $3 \leq w^{iC}_t \leq 6$ as shown in Table 1. The income distribution of generation t-1 is presumed to be the same as for generation t.

5.1 Voting equilibrium of the majoritarian system

In each election district, there exist households of both the young generation and the old generation. I can calculate the upper bound and lower bound of the uniform distribution of the preferred tax rate in each type of generation, as shown in Table 1.

In this situation, the tax rate preferred by the median voter in the Congress is 0.4759.

5.2 Voting equilibrium of the generational election system

Under the generational election system, election districts are divided by not only region but also by generation. First, I consider the election districts of the younger generation. The preferred tax rate of the median voter of the younger generation in each district is shown in Table 1.

Second, I examine the election districts of the older generation. The preferred tax rate of the median voter of the older generation in each district is shown in Table 1.

In the Congress, the tax rate is determined by six representatives. In this situation, the median voter theorem holds. Therefore, the tax rate determined in the Congress is 0.4139. The tax rate determined in the generational election system is lower than that in the majoritarian system. The ratio of the tax rate determined in the majoritarian system to that determined in the generational election system is 1.1499, as shown in Table 1.

5.3 A higher turnout rate

Table 2 shows the results when the turnout rate of the younger generation is higher than that of the baseline case. I set $\alpha = 0.75$. The voting equilibrium of the generational election system is the same as that in Section 5.2. However, the voting equilibrium of the majoritarian system is different from that in Section 5.1. The tax rate under in the majoritarian system for $\alpha = 0.75$ is closer than that in the generational election system. The ratio of the tax rate determined in the majoritarian system to that determined in the generational election system is 1.0638, as shown in Table 2.

5.4 A lower turnout rate

Table 3 shows the results when the turnout rate of the younger generation is lower than that of the baseline case. I set $\alpha = 0.25$. The voting equilibrium of the generational election system is the same as Section 5.2. However, the voting equilibrium of the majoritarian system is different from that in Section 5.1. The tax rate under the majoritarian system for $\alpha = 0.25$ is larger than that in the generational election system. The ratio of the tax rate determined in the majoritarian system to that determined in the generational election system is 1.2714, as shown in Table 3.

These results show that the preferred tax rate of the younger generation, which is smaller than that of the older generation, can be achieved in the Congress by introducing the generational election system.

5.5 Voting equilibrium in the case where the older generation is richer

I also assume that the mean and median incomes of generation t-1 are higher than those of generation t. I assume that type A implies $2 \leq w^{iA}_{t\text{-}1} \leq 8$, as shown in Table 1. Similarly, type B implies $4 \leq w^{iB}_{t\text{-}1} \leq 10$, and type C implies $6 \leq w^{iC}_{t\text{-}1} \leq 12$, as shown in Table 4. I can calculate the upper bound and lower bound of the uniform distribution of the preferred tax rate in each type of generation, as shown in Table 4.

In the majoritarian system, the tax rate preferred by the median voter in the Congress is 0.7093, as shown in Table 4.

In contrast, under the generational election system, the tax rate determined in the Congress is 0.5623. The ratio of the tax rate determined in the majoritarian system to that in the generational election system is 1.2614, as shown in Table 4. This ratio is higher than the one in the case where the income distribution of generation t-1 is presumed to be the same as that of generation t, as shown in Table 1.

Furthermore, I analyze the case where the turnout rate of the younger generation is higher. I set $\alpha = 0.75$. In this case, the tax rate preferred by the median voter in the Congress under the majoritarian system is 0.6123, as shown in Table 5. The voting equilibrium of the generational election system is the same as that in Table 4. The ratio of the tax rate determined in the majoritarian system to that determined in the generational election system is 1.0890, as shown in Table 5. This ratio is higher than the one in the case where the income distribution of generation t-1 is presumed to be the same as for generation t, as shown in Table 2.

Moreover, I investigate the case where the turnout rate of the younger generation is lower. I set $\alpha = 0.25$. In this case, the tax rate preferred by the median voter in the Congress under the majoritarian system is 0.8725, as shown in Table 6. The voting equilibrium of the generational election system is the same as that in Table 4. The ratio of the tax rate determined in the majoritarian system to that determined in the generational election system is 1.5517, as shown in Table 6. This ratio is higher than the one in the case where the income distribution of generation t-1 is presumed to be the same as for generation t, as shown in Table 3.

6. Conclusion

The generational election system, proposed by Ihori and Doi (1998) consists of election districts divided by not only region but also generation. This chapter examined the effects of introducing the generational election system using an overlapping generations model.

These results show that the preferred tax rate of the younger generation, which is smaller than the older generation, can be achieved in the Congress by introducing the generational election system. Furthermore, the tax rate determined in the Congress does not depend on the turnout rate of the younger generation. This is an important property of the generational election system.

This suggests that introducing the generational election system benefits both the younger and future generations.

References

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Table 1
Baseline Case

β = 0.99 r = 0.05
γ = 0.3 α = 0.5

Type

w_t	A	B	C
upper bound	4	5	6
lower bound	1	2	3

w_{t-1}	A	B	C
upper bound	4	5	6
lower bound	1	2	3

Results

Type

τ^{ij}_t	A	B	C
upper bound	0.4639	0.5798	0.6958
lower bound	0.1160	0.2319	0.3479

ρ^{ij}_t	A	B	C
upper bound	0.4822	0.6027	0.7233
lower bound	0.1205	0.2411	0.3616

under the majoritarian system

	A	B	C
τ^j_t	0.3569	0.4759	0.5949
median tax rate (M)		**0.4759**	

under the generational election system

	A	B	C
τ^j_t	0.2899	0.4059	0.5218
ρ^j_t	0.3014	0.4219	0.5425
median tax rate (G)		**0.4139**	

(M)/(G)	1.1499

Table 2

In case of $\alpha = 0.75$

β	$= 0.99$	r	$= 0.05$
γ	$= 0.3$	α	$= 0.75$

Type

w_t	A	B	C
upper bound	4	5	6
lower bound	1	2	3

w_{t-1}	A	B	C
upper bound	4	5	6
lower bound	1	2	3

Results

Type

τ^{ij}_t	A	B	C
upper bound	0.4639	0.5798	0.6958
lower bound	0.1160	0.2319	0.3479

ρ^{ij}_t	A	B	C
upper bound	0.4822	0.6027	0.7233
lower bound	0.1205	0.2411	0.3616

under the majoritarian system

	A	B	C
τ^j_t	0.3217	0.4403	0.5588
median tax rate (M)		**0.4403**	

under the generational election system

	A	B	C
τ^j_t	0.2899	0.4059	0.5218
ρ^j_t	0.3014	0.4219	0.5425
median tax rate (G)		**0.4139**	

(M)/(G)	1.0638

Table 3

In case of $\alpha = 0.25$

β	= 0.99	r	= 0.05
γ	= 0.3	α	= 0.25

Type

w_t	A	B	C
upper bound	4	5	6
lower bound	1	2	3

w_{t-1}	A	B	C
upper bound	4	5	6
lower bound	1	2	3

Results

Type

τ^{ij}_t	A	B	C
upper bound	0.4639	0.5798	0.6958
lower bound	0.1160	0.2319	0.3479

ρ^{ij}_t	A	B	C
upper bound	0.4822	0.6027	0.7233
lower bound	0.1205	0.2411	0.3616

under the majoritarian system

	A	B	C
τ^j_t	0.4066	0.5262	0.6458
median tax rate (M)		**0.5262**	

under the generational election system

	A	B	C
τ^j_t	0.2899	0.4059	0.5218
ρ^j_t	0.3014	0.4219	0.5425
median tax rate (G)		**0.4139**	

(M)/(G)	1.2714

Table 4
In case that the older generation is richer ($\alpha = 0.5$)

β = 0.99 R = 0.05
γ = 0.3 α = 0.5

Type

w_t	A	B	C
upper bound	4	5	6
lower bound	1	2	3

w_{t-1}	A	B	C
upper bound	8	10	12
lower bound	2	4	6

Results

Type

τ^{ij}_t	A	B	C
upper bound	0.4639	0.5798	0.6958
lower bound	0.1160	0.2319	0.3479

ρ^{ij}_t	A	B	C
upper bound	0.9644	1.2055	1.4465
lower bound	0.2411	0.4822	0.7233

under the majoritarian system

	A	B	C
τ^j_t	0.5319	0.7093	0.8866
median tax rate (M)		**0.7093**	

under the generational election system

	A	B	C
τ^j_t	0.2899	0.4059	0.5218
ρ^j_t	0.6027	0.8438	1.0849
median tax rate (G)		**0.5623**	

(M)/(G)	1.2614

Table 5

In case that the older generation is richer ($\alpha = 0.75$)

β	$= 0.99$	r	$= 0.05$
γ	$= 0.3$	α	$= 0.75$

Type

w_t	A	B	C
upper bound	4	5	6
lower bound	1	2	3

w_{t-1}	A	B	C
upper bound	8	10	12
lower bound	2	4	6

Results

Type

τ^{ij}_t	A	B	C
upper bound	0.4639	0.5798	0.6958
lower bound	0.1160	0.2319	0.3479

ρ^{ij}_t	A	B	C
upper bound	0.9644	1.2055	1.4465
lower bound	0.2411	0.4822	0.7233

under the majoritarian system

	A	B	C
τ^j_t	0.4475	0.6123	0.7772
median tax rate (M)		**0.6123**	

under the generational election system

	A	B	C
τ^j_t	0.2899	0.4059	0.5218
ρ^j_t	0.6027	0.8438	1.0849
median tax rate (G)		**0.5623**	

(M)/(G)	1.0890

Table 6

In case that the older generation is richer ($\alpha = 0.25$)

$\beta = 0.99$ $\quad r = 0.05$

$\gamma = 0.3$ $\quad \alpha = 0.25$

Type

w_t	A	B	C
upper bound	4	5	6
lower bound	1	2	3

w_{t-1}	A	B	C
upper bound	8	10	12
lower bound	2	4	6

Results

Type

τ^{ij}_t	A	B	C
upper bound	0.4639	0.5798	0.6958
lower bound	0.1160	0.2319	0.3479

ρ^{ij}_t	A	B	C
upper bound	0.9644	1.2055	1.4465
lower bound	0.2411	0.4822	0.7233

under the majoritarian system

	A	B	C
τ^j_t	0.6742	0.8725	1.0708
median tax rate (M)		**0.8725**	

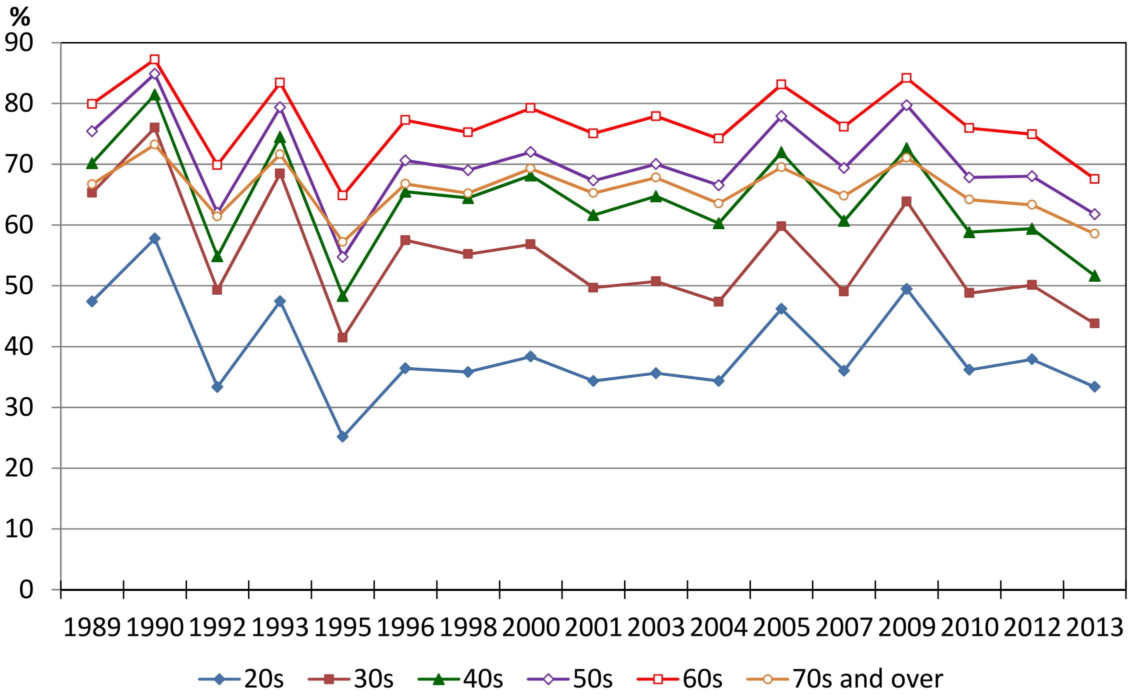
under the generational election system

	A	B	C
τ^j_t	0.2899	0.4059	0.5218
ρ^j_t	0.6027	0.8438	1.0849
median tax rate (G)		**0.5623**	

(M)/(G)	1.5517

Figure 1

Turnout rates of national elections in Japan



Source: Association for Promoting Fair Elections website

Figure 2

Distribution in each election district under the majoritarian system

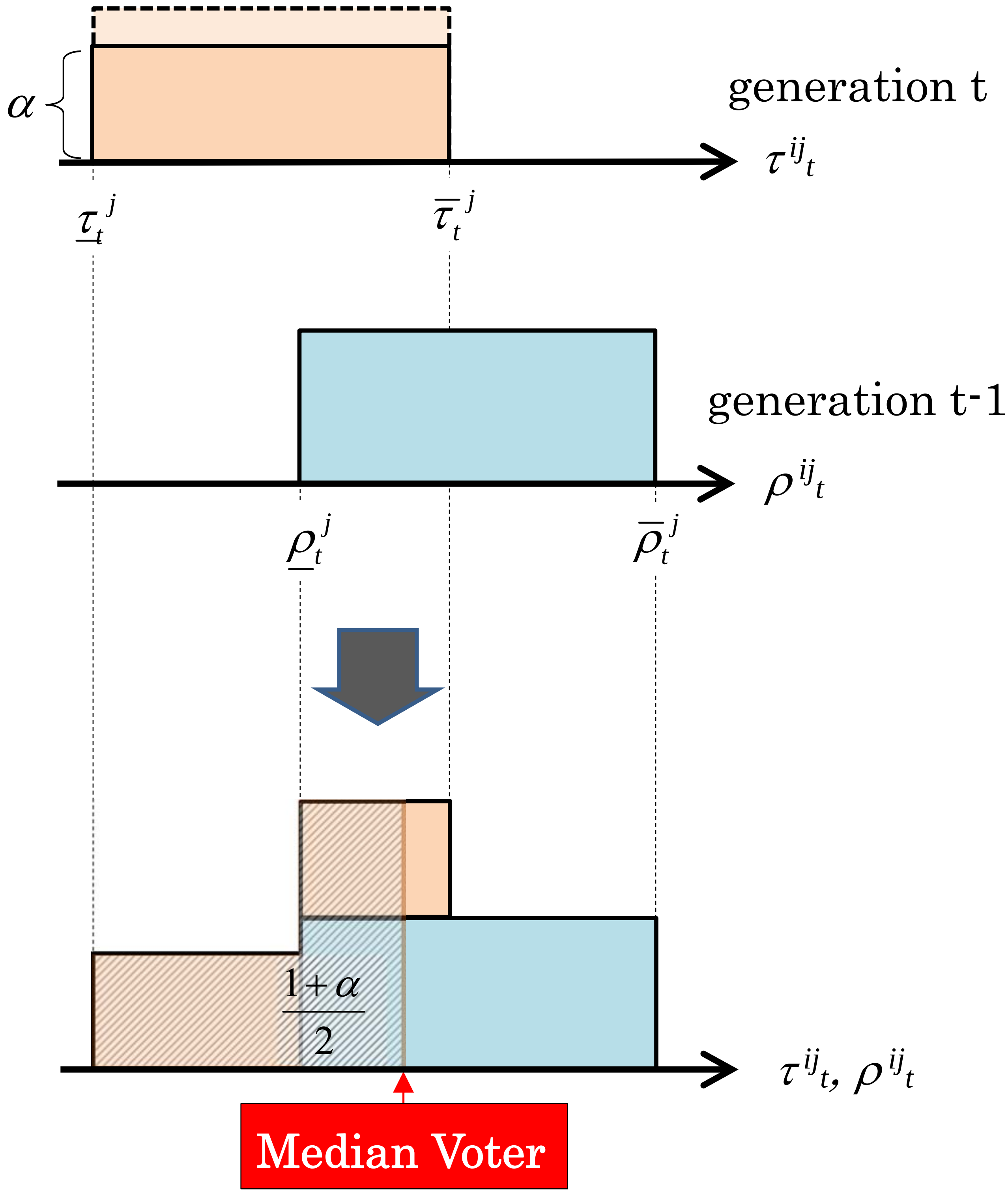
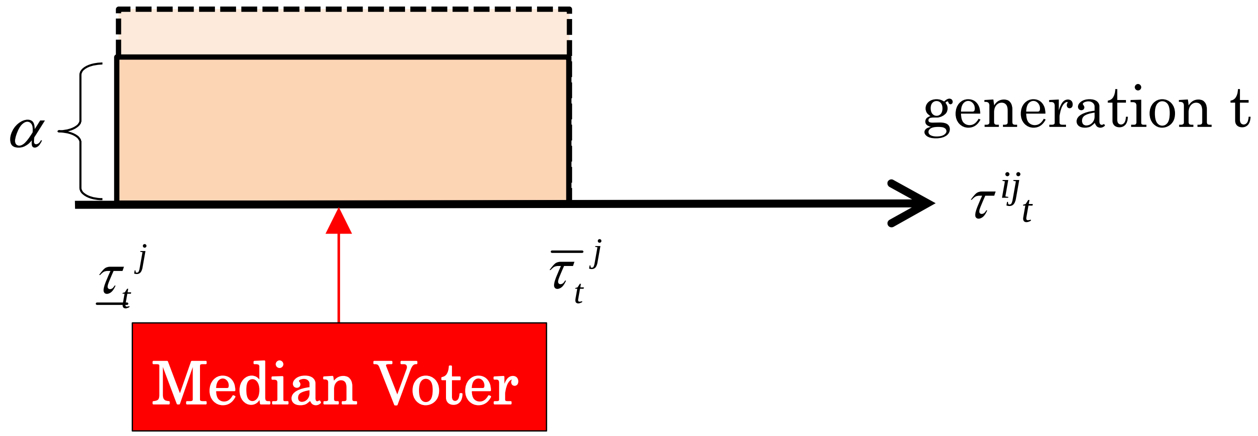


Figure 3

Distribution in each election district under the generational election system

・Structure in each election district of the younger generation



・Structure in each election district of the older generation