

Strategies for Revitalizing Educational Donation in Korea: Application of System Dynamics

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ABSTRACT: The aim of this study is threefold: first, to determine the causal relationship between key policy variables affecting Korean educational donation via the system dynamics methodology; second, to uncover, on the basis of this analysis, the feedback structure that is considered important for revitalizing educational donations in Korea in the future; and third, to grasp via sensitivity analysis what the most effective procedures are for actively carrying out educational donation activities given limited resources. As a result of the analysis, a causal map was created using variables that are thought to have an impact on the activation of educational donations in Korea, and all ten feedback structures were found. In addition, as a result of sensitivity analysis, it was determined that the capacity of the intermediate support organization relating to education donation was the *most important factor*.

KEY WORDS: education donation, intermediary, sensitivity analysis, system dynamics.

I. INTRODUCTION

Education donation is the act of donating to others one's own skills and assets, out of public interest, for the purpose of furthering education. As such, it has recently received emphasis in Korea, directing as it does the human and material resources possessed by society (e.g. by corporations, universities, and public institutions) to early, secondary, and tertiary education activities so as to cultivate the creative skills required in the twenty-first century (Jang, 2018). It may also be said to afford a variety of high-quality educational opportunities (see: <http://www.teachforkorea.go.kr>) by providing these on a non-profit basis. The range and scope of education donation activities are expanding beyond personal acts to social and institutional support. In addition, it is necessary to promote the paradigm of a new donation culture that freely presents and shares the material and human resources, including knowledge and experience, held by society (both by public institutions and individuals) for the benefit both of education and of society more generally. This provides an opportunity to promote active links between the education system and industry, schools, and research institutes. Furthermore, it not only contributes to promoting innovation in existing educational programs and improving the competitiveness of public education, but also considers the role of students and shares resources naturally with them. Thus it is emphasized as a very important activity that strongly helps students to learn.

However, in recent years it has been pointed out that educational donating operates in an over-formal way, and there are limitations in changing the culture and paradigm of society. In order to solve these problems, the direction of the education donation revitalization project should be re-set, and the mid-to-long-term direction of development should be clearly established so as to encompass future strategies and specific tasks. These may include activities such as the following:

- (1) The institutional and financial support activities of national and local government should be arranged so as to enable actors participating in educational donation activities to have autonomy.
- (2) In order to establish a culture of education donation, it is necessary to check related systems, such as establishing a cooperative system among related ministries.
- (3) Measures to secure financial support and various incentives for educational donation activities should be prepared.
- (4) On the basis of social partnership, close consultation should be established among education donation

actors, which should include the efficient use of human and material resources and infrastructure in the specialized field of preparing a sharing plan

In response to these social needs and changing circumstances, the government-wide initiative to promote educational donation should be emphasized. In the field of education and education policy, educational donation activities have been promoted in various ways, but research has not been conducted as extensively as in other fields. It is particularly lacking in relation to the specific achievements of education donation, how to construct a system that systematically operates and manages this, and what is needed in order to activate educational donations in the future. Against this background, the purpose of this study is to analyze the causal relationships between the major policy variables affecting educational donation via the system dynamics methodology. On the basis of this analysis, the study aims to provide necessary information for selectively using policies to revitalize future education donations, and to ascertain the most effective means of actively carrying out educational donation activities given limited resources.

II. THEORETICAL BACKGROUND AND REVIEW OF EXISTING RESEARCH

Many theoretical studies (Clark, 2000; Driscoll & Lynton, 1999; Maignan & Ferrell, 2004; Epstein & Dauber, 1991; Henderson, 1987; Fantuzzo et al., 1995) have been conducted to establish the theoretical framework for educational donation, or to verify the research model. Some studies (Eccles & Harold, 1996; Epstein, 1991; Jang, 2018; Jeynes, 2003; Marcon, 1999; Sheldon, 2002; Hill & Craft, 2003) on recognition of education donations are centered on specific areas of activity, but it is difficult to identify a systematic perspective. However, in fields other than education (mainly in the fields of culture and art), research has been conducted to establish the concept of donation and actively introduce skills donations. In order to revitalize education donations, many studies present sub-tasks in three areas: parent and school, community communication and capacity building; school's capacity building; and education and government support functions

In particular, at the national level, it is argued that it is necessary to prepare national educational donation standards, and complement the existing system by establishing a new and better system for educational donations (including the education of skilled donors, teacher training, and improvements to the system for evaluating university professors' participation in community service) (Hill, 2001; Hoover-Dempsey & Sandler, 1995, 2005). In addition, some researchers have conducted research to investigate the extent to which elementary and secondary teachers are aware of the creative experience activities that government-funded research institutes are participating in so as to contribute to public education. It is argued that participating research institutes should have a responsibility to contribute to public education as a national institution and to actively participate in public education.

In this context, it is argued that justification for government research institutes to legitimately themselves make and execute budgets should be given, and also that various departments, such as the Ministry of Education and the Ministry of the Knowledge Economy, are in need of specific attention and encouragement. In addition, in order to revitalize education donations, existing education-donation-related projects, such as the sharing of wisdom between generations, volunteering activities for older people in science and technology, and the third-generation harmony project, should be expanded, creating an atmosphere for revitalizing education and effectively linking demand and supply. It is also proposed to promote specific programs and projects; to build up a skills pool for each type of profession; and to foster ODA experts who will promote donations aimed at expanding the participation of retirees in science and technology and educational experience in supporting human resources in developing countries.

Some researchers (Grolnick et al., 1997; Griffith, 1998; Hoover-Dempsey & Sandler, 1997); Fan & Chen, 2001 suggest that a donation culture activation policy should operate in the following three ways. First, the donation culture might be revitalized according to income groups. The existence of a more "passive" middle-class group suggests an online donation method and an easy-sharing method as an activation strategy, focused on skills donation or time donation, and a donation culture linked to everyday consumer life. By contrast, more active middle-class groups are presented with ways of donating their skills, such as pro-bono work, thus activating donations based on a sense of community development, diversification of tax benefits, and online donation methods for donors. The need for various donation models such as donation simulation, donation simulation schools, the establishment of donation experience schools, and a donor advice fund, has been suggested to passively rich people. "Aggressively wealthy" groups are offered donation advice by donation experts, and presented with various ways of diversifying donation methods such as through heritage management plans and consideration of family and the Hall of Fame.

Second, some researchers (Epstein & Lori, 1992; Hill et al., 2004; Epstein, 1986; Epstein & Sanders, 2002) present a policy for revitalizing the donation culture by life cycle. During the semester, there is a need to present donation education in textbooks, and to offer a method of internalizing donations through easy donations. It has been suggested that early-workers need to provide information on how to donate and how to obtain donation information, highlighting the awareness of tax payments, and presenting the importance of volunteering activities. The need for donation and branding by donation field, such as social welfare, education and the environment, has been suggested.

Third, as regards the donation infrastructure, the restructuring of the donation system, improvements to the operation of donation institutions, and the training of donation experts have been suggested. In relation to the construction of an overall donation system, there is a perceived need to establish donation information sites and information centers. It is also argued that the donation agency's operation plan should be sought so as to secure the expertise and ensure the transparency of the donation agency, and diversify the program operation.

Thus, as described above, various methods for activating donations have been suggested, but not much research has been done on education donation methods that can maximize the effectiveness of limited resources by examining Korea's education donation culture alongside current conditions. To do this, it is necessary to review the reality of educational donations in Korea from the perspective of system dynamics. In other words, there is a need to decompose and examine a number of variables affecting educational donations from a causal perspective (Shure, 1991). Against this background, this study seeks to analyze the reality of education donations in Korea from the perspective of system dynamics and thus to provide useful information to policymakers.

III. RESEARCH DESIGN

3.1 Variables

In this study, the variables considered to affect education donation activities were selected as follows (the terms in parentheses are abbreviations used in the model):

- education donation budget (budget)
- advertisement of education donation (advertise)
- central government's willingness to offer support (central)
- legal support (legal)
- institutional support (institution)
- restructuring of portal site (portal)
- realignment of control tower (control tower)
- matching of donor and recipients (matching)
- program diversification (program diversification)
- incentivizing of education donation (incentive)
- number of programs developed (programs)
- revitalizing of the network involving stakeholders (network)
- capacity of intermediary (intermediary)
- number of donors (donor)
- demand for education donation (demand)
- number of donor organisations (donor organisation)
- number of success cases (success case)
- performance management system of education donation (performance mgnt)
- education donation atmosphere (atmosphere)
- satisfaction of recipients (satisfaction)

- number of recipients (recipient)
- quality of education donation (quality)
- alleviation of educational disparities (educational disparity)
- creativity of recipient students (creativity)
- private education expenses (private expense)
- social capital (social capital)
- perception of school principal (principal)

3.2 Analysis procedure and method

The system dynamics method is used for the analysis in this study. This enables the causal structure of the variables affecting education donation to be grasped. In addition, we explore the feedback loop that can most effectively activate educational donation activities in the context of limited resources. This feedback loop can provide useful information to policymakers responsible for education donation. Furthermore, in this study we will conduct a policy sensitivity simulation. Via this sensitivity simulation, it will be possible to establish which policy measures may be most helpful in promoting educational donation. For this analysis, the POWERSIM program, which is software designed for system dynamics analysis, is used.

IV. FEEDBACK LOOP SEARCH AND SENSITIVITY SIMULATION

4.1 Causal diagram

First, a variety of variables that are thought to activate educational donation activities in Korea were selected, and the causal relationship between these variables was used to prepare a causal map for education donation. Figure 1 shows the basic composition of the causal map. Here, R means a reinforcing loop, and B means a balancing loop.

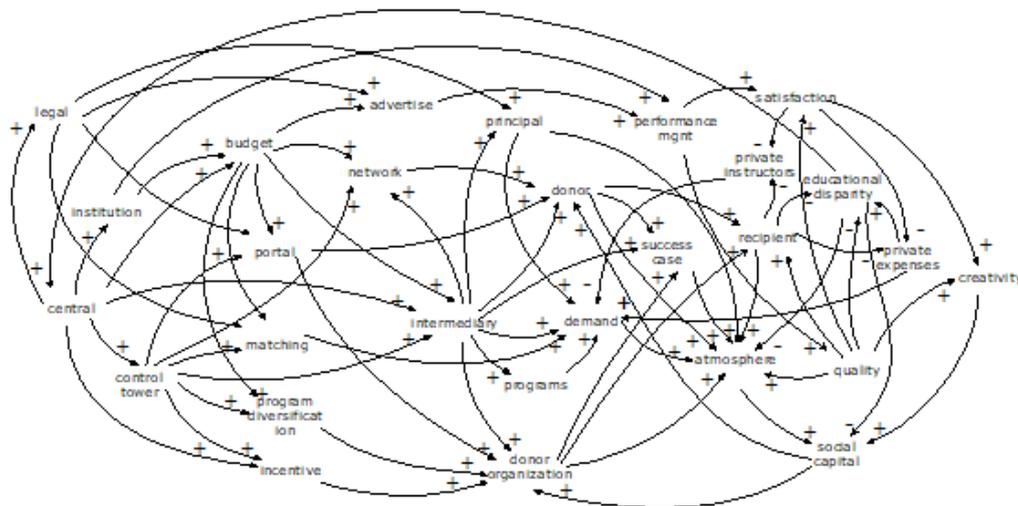


Figure 1 Causal map showing activation of educational donations

4.2 Feedback loops

The feedback loop is divided into a reinforcing loop and a balancing loop. The reinforcing loop and the balancing loop for activation of education donation can be derived as follows.

4.2.1 Feedback loop 1: Education donation atmosphere loop (reinforcing loop)

The feedback loop below is an education donation mood loop. If the social atmosphere for education donation is high, the social capital of the community will increase, which will increase the number of education donors in the community, and so the number of recipients of education donations will increase. This is, again, a feedback loop structure that strengthens the atmosphere for educational donation in the community and has the characteristics of a reinforced loop.

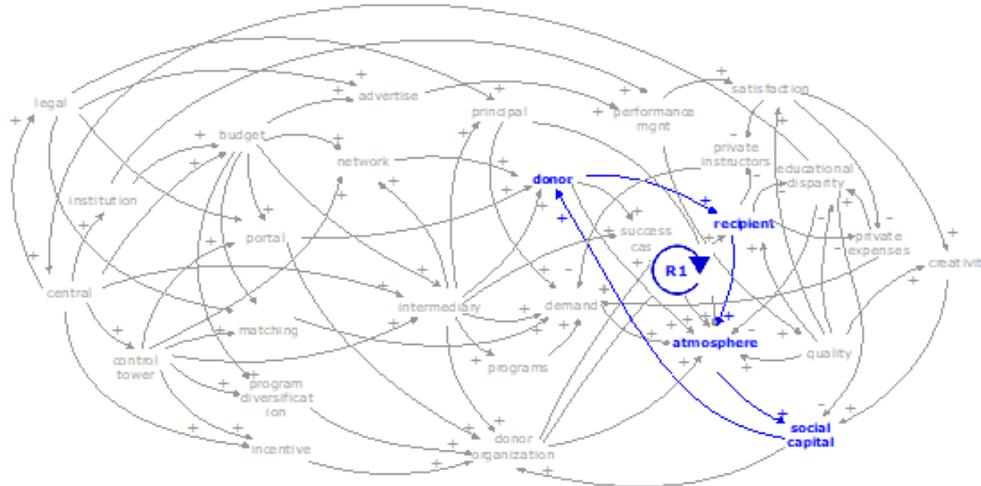


Figure 2 Education donation atmosphere loop

4.2.2 Feedback loop 2: Education donation organization loop (reinforcing loop)

As the number of donations to education increases, the atmosphere for education donation in the community improves, which in turn strengthens the level of social capital in the community, which in turn strengthens the number of educational donation organizations in the community.

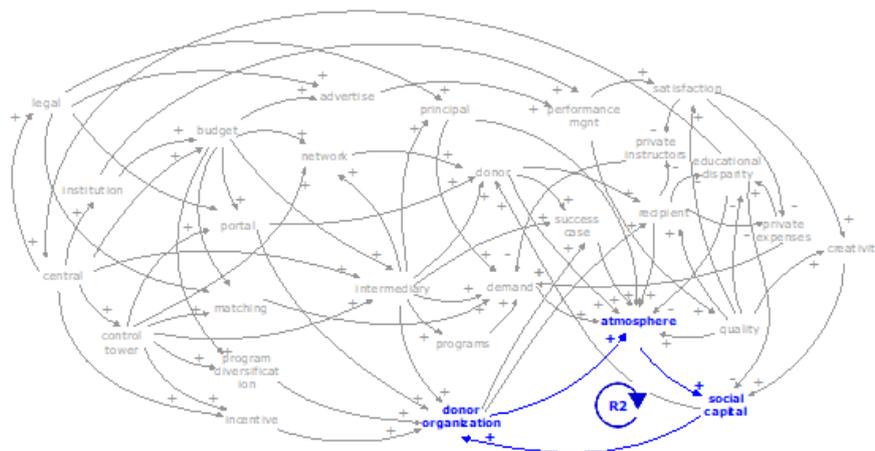


Figure 3 Education donation organization loop

4.2.3 Feedback loop 3: Education imbalance loop (reinforcing loop)

When the education imbalance increases, the level of social capital decreases, which in turn lowers the number of education donors. If the number of donors of education decreases, the number of beneficiaries of education decreases as well, which in turn creates a negative reinforcement loop structure which further intensifies the educational imbalance

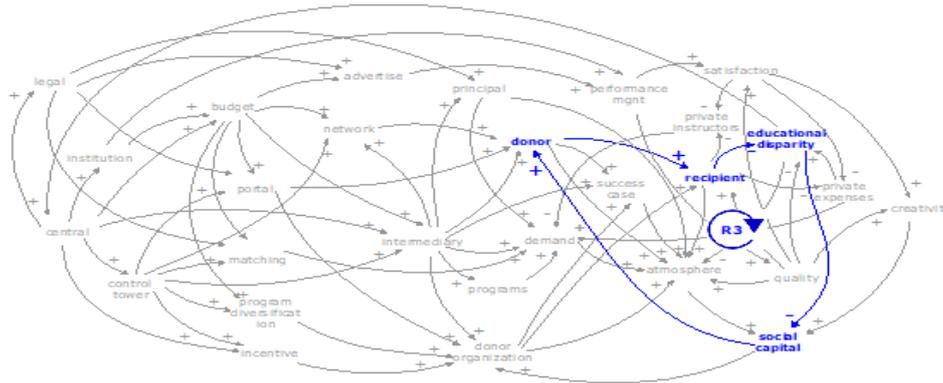


Figure 4 Education imbalance loop

4.2.4 Feedback loop 4: Number of education donors (balancing loop)

If the number of donors to education decreases, the number of beneficiaries in education decreases, and the education imbalance worsens. This in turn will strengthen central government’s commitment to education donations. This commitment to education donation policy will increase legal aid and budgets, which in turn will strengthen intermediary organizations. This in turn increases the number of education donors and the number of beneficiaries, thereby reducing the educational gap. It has a balancing loop structure.

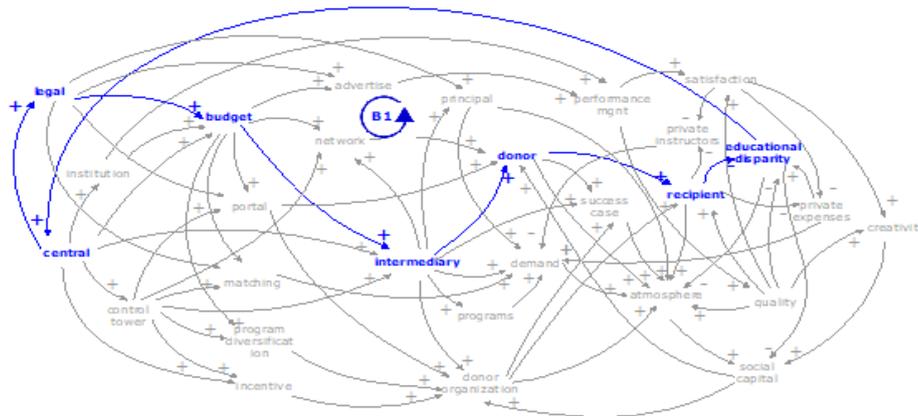


Figure 5 Number of education donors loop

4.2.5 Feedback loop 5: Education imbalance corrective effect loop (balancing loop)

When the educational imbalance increases, central government’s willingness to donate to education will increase, resulting in a strengthening of the budgetary support and inducing the promotion of education donation. This is a balancing loop structure that leads to an increase in performance management and quality of education donations, which in turn leads to a lower education gap.

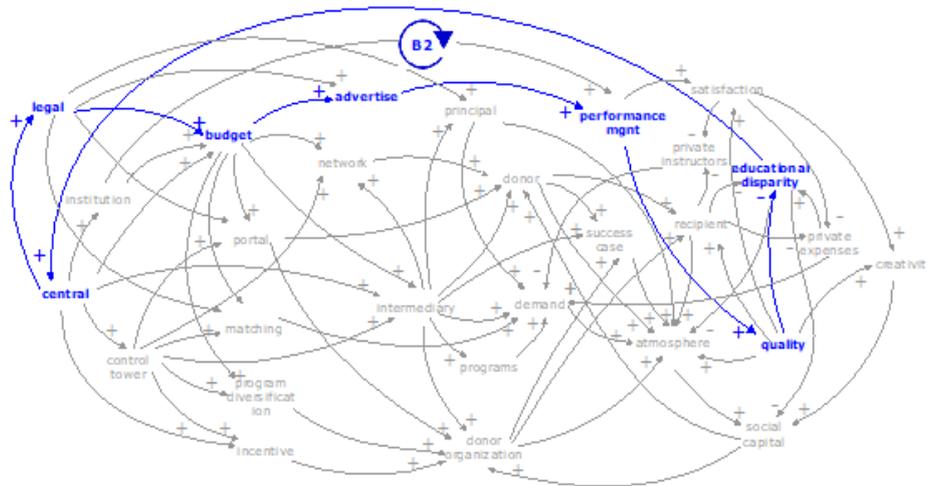


Figure 6 Correction effect of educational imbalance

4.2.6 Feedback loop 6: Education donation control tower loop (balancing loop)

If the education donation control tower network is well-established, reinforcement of the intermediate support organization is achieved, which has the characteristics of a balancing loop structure that increases the number of donors to education, thereby lowering the education gap.

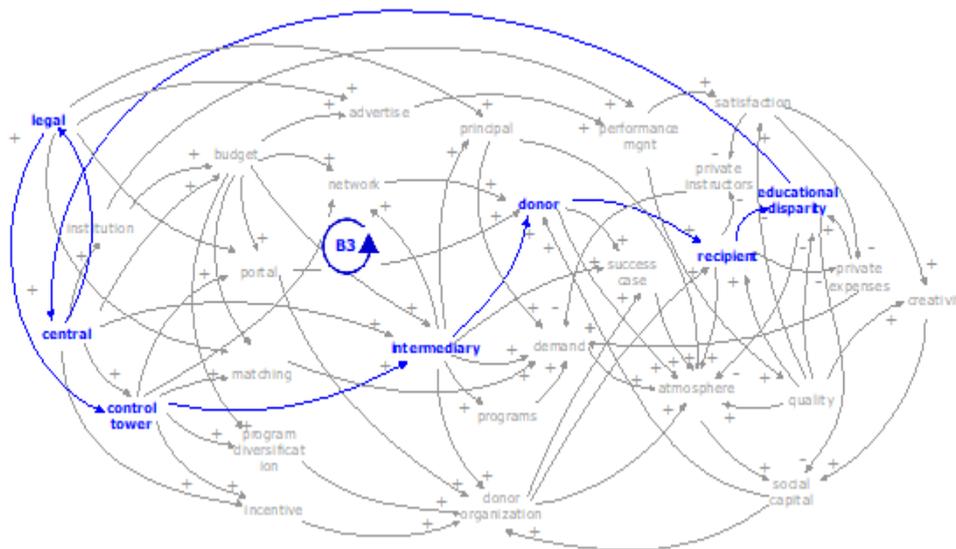


Figure 7 Education control tower loop

4.2.7 Feedback loop 7: Legal device loop (balancing loop)

If the legal institutional mechanism for education donation is well-established, the capacity of the intermediate support organization will be strengthened, which will lead to a strengthening of the network capacity of the education donation organization. This in turn has the characteristics of a balancing loop structure which lowers educational imbalance by increasing the number of education donation providers and the number of beneficiaries.

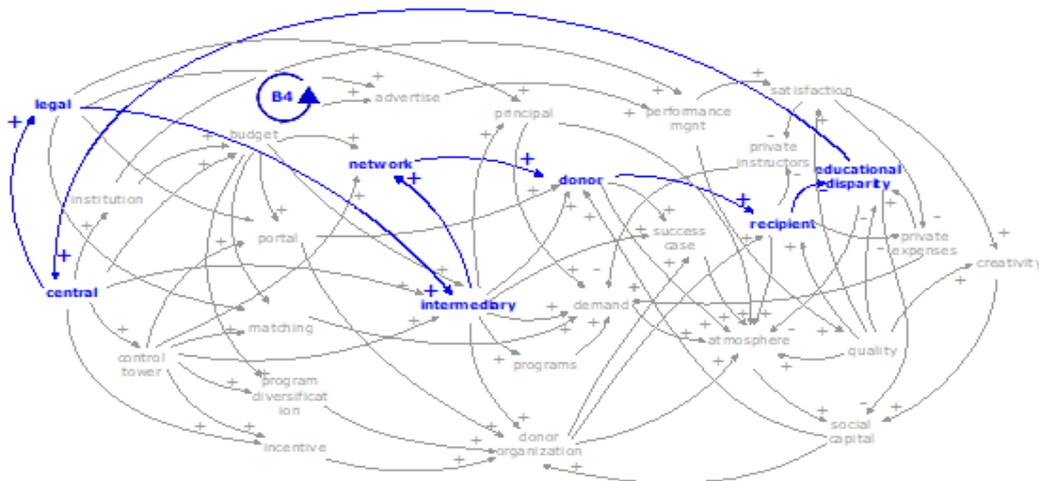


Figure 8 Legal device loop

4.2.8 Feedback loop 8: private education cost loop (balancing loop)

As private education expenses increase, demand for education donations increases, which improves the atmosphere surrounding education donation for the whole community. This in turn increases the number of social capital and educational donation organizations. This increase increases the number of beneficiaries of education donation, resulting in a virtuous circle loop structure that reduces private education expenditure.

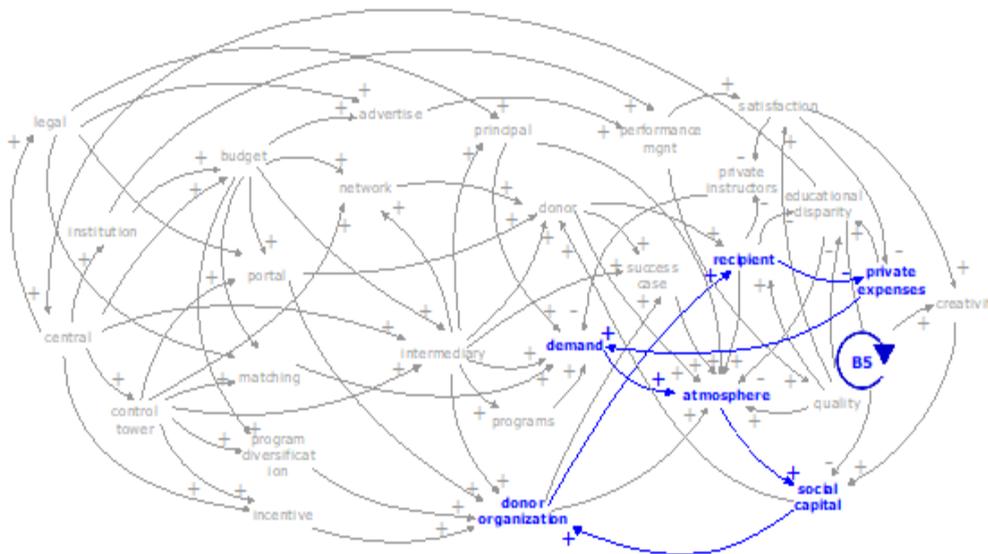


Figure 9 Private education cost loop

4.2.9 Feedback loop 9: school principal recognition loop (balancing loop)

Reinforcing awareness of school principals’ donations to education improves the atmosphere of education donation in the community, which increases the level of social capital in the community and the number of education donors and recipients, resulting in a balancing loop structure that lowers the educational gap.

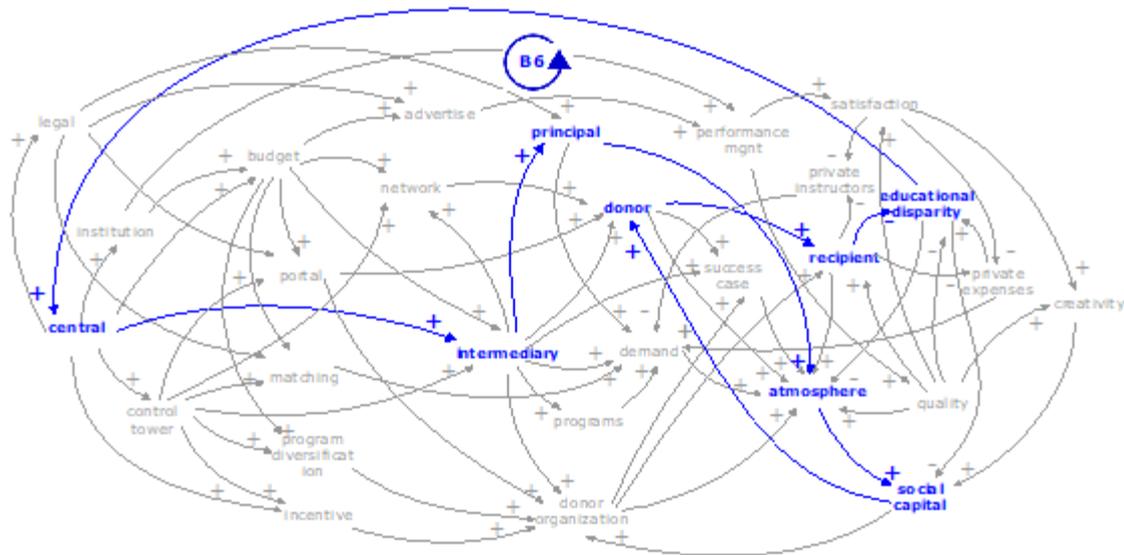


Figure 10 School Principal recognition loop

4.3 Simulation of policy sensitivity

In the following, we will analyze which policy means will bring the greatest *policy sensitivity*, assuming that policymakers choose three policy means relating to education donation. Here, the policy scenario is the *capacity* of the intermediate support institution for the first education donation; the *budget* for the second education donation; and, third, the *role of the control tower*. The aim of the study is to analyze which policy measures will have the greatest impact on the activation of educational donations if only one of the three policies is used. The change in the dependent variable is in the satisfaction of the recipient of education. In other words, the study aims to report the sensitivity of the satisfaction of education service recipients. The simulation period is from 2017 to 2026.

4.3.1 Competence variables of the intermediate support organization

Figure 12 shows how donors’ satisfaction changes as the capacity of the intermediate support organization changes. As Figure 11 shows, it is assumed that the competency of the intermediary support organization is 1 in 2017, and that this capacity will gradually increase to 1.78 in 2026. In this case, it is necessary to grasp how the satisfaction level of the recipients of education changes. Figures 11 and 12 show the degree of change in the satisfaction of beneficiaries brought about by the capacity change of the mid-term donation organization.

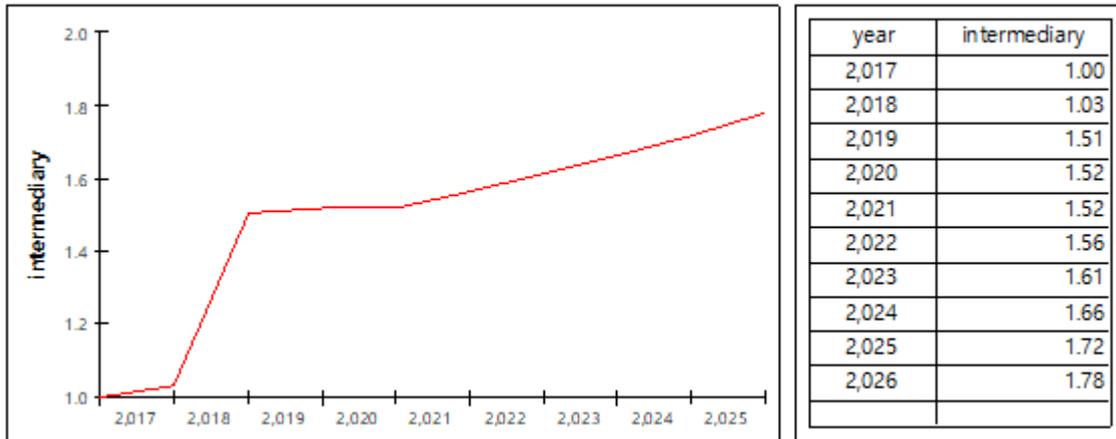


Figure 11 Changes in the competency of an intermediate support organization

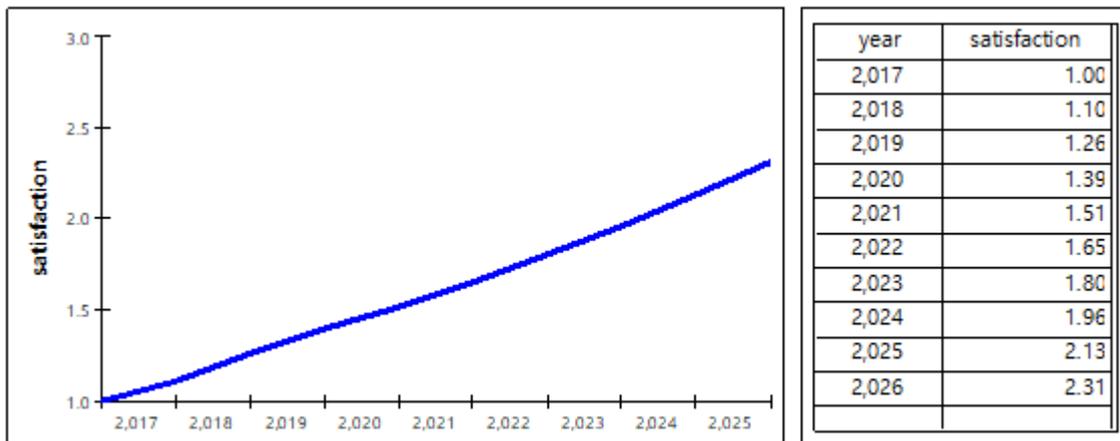


Figure 12 Satisfaction level of donor beneficiaries

The above data were used to simulate the change in the sensitivity of donors to the change in the capacity of the intermediate support organization, as shown in Figure 13.

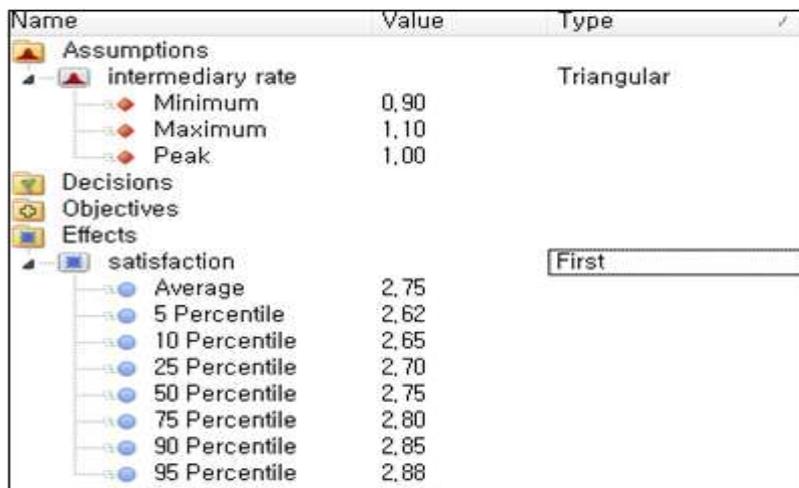


Figure 13 Sensitivity analysis structure of intermediate support organization

year	satisfaction (5 Percentile)	satisfaction (10 Percentile)	satisfaction (25 Percentile)	satisfaction (50 Percentile)
2,017	0.99	0.99	1.00	1.00
2,018	1.11	1.11	1.12	1.12
2,019	1.36	1.37	1.38	1.40
2,020	1.58	1.59	1.60	1.63
2,021	1.76	1.77	1.80	1.83
2,022	1.93	1.95	1.98	2.01
2,023	2.11	2.12	2.16	2.20
2,024	2.28	2.30	2.34	2.38
2,025	2.45	2.47	2.52	2.57
2,026	2.62	2.65	2.70	2.75

year	satisfaction (Average)	satisfaction (75 Percentile)	satisfaction (90 Percentile)	satisfaction (95 Percentile)
2,017	1.00	1.00	1.01	1.01
2,018	1.12	1.13	1.14	1.14
2,019	1.40	1.41	1.42	1.43
2,020	1.63	1.65	1.67	1.68
2,021	1.83	1.85	1.88	1.89
2,022	2.01	2.04	2.07	2.09
2,023	2.20	2.23	2.27	2.28
2,024	2.38	2.42	2.46	2.48
2,025	2.57	2.61	2.66	2.68
2,026	2.75	2.80	2.85	2.88

The change in the intermediate support organisation’s capacity (a 10% change) to donor satisfaction is shown in Figure 14.

Figure 14 Results of sensitivity analysis of the intermediate support organization

4.3.2 Budget variable for education donation

Figure 15 predicts that the budget for education donation will be 5.6 billion won (US\$ 5 million) in 2017, and 14.3 billion won (US\$ 12 million) in 2026. The extent to which these budget changes affect donor satisfaction is shown in Figure 16.

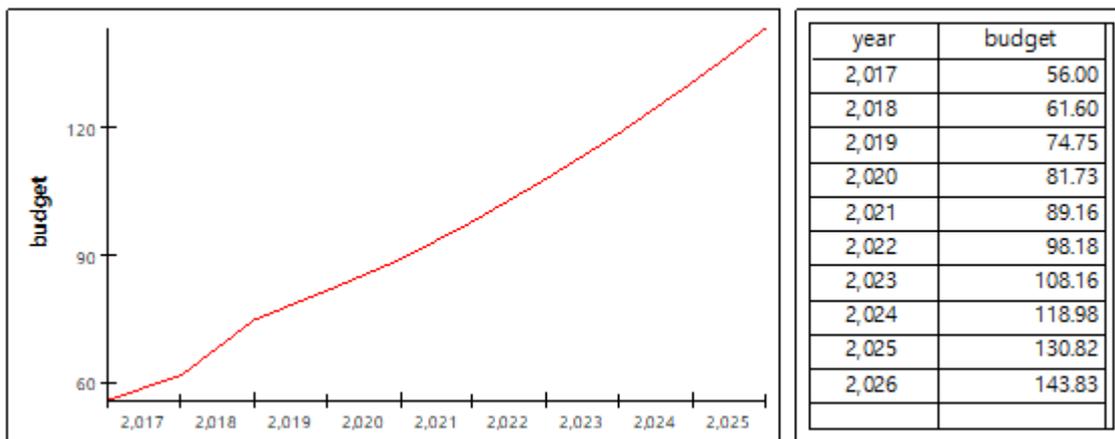


Figure 15 Budget changes relating to education donation

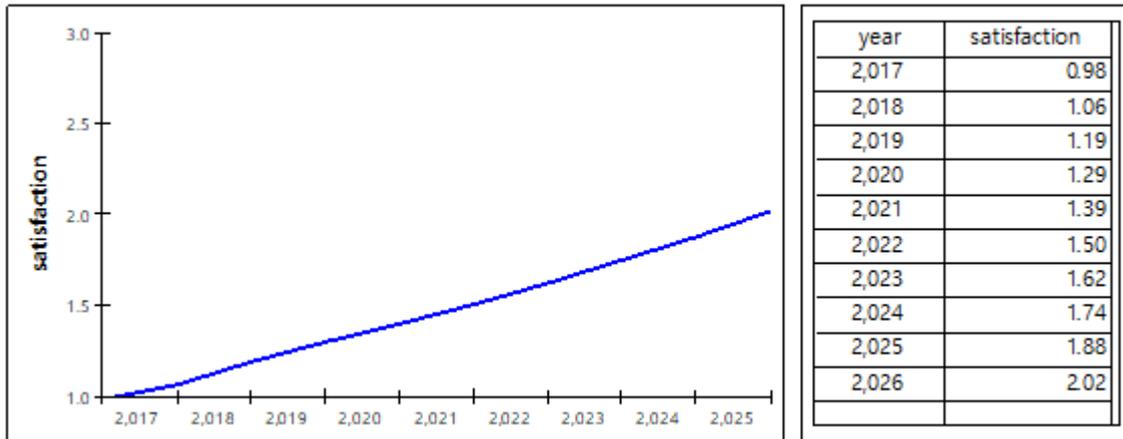


Figure 16 Satisfaction of beneficiaries according to changes in education donation budget

Figure 17 shows the analysis structure for analyzing the sensitivity of donation recipient satisfaction change according to the budget change in education donation.

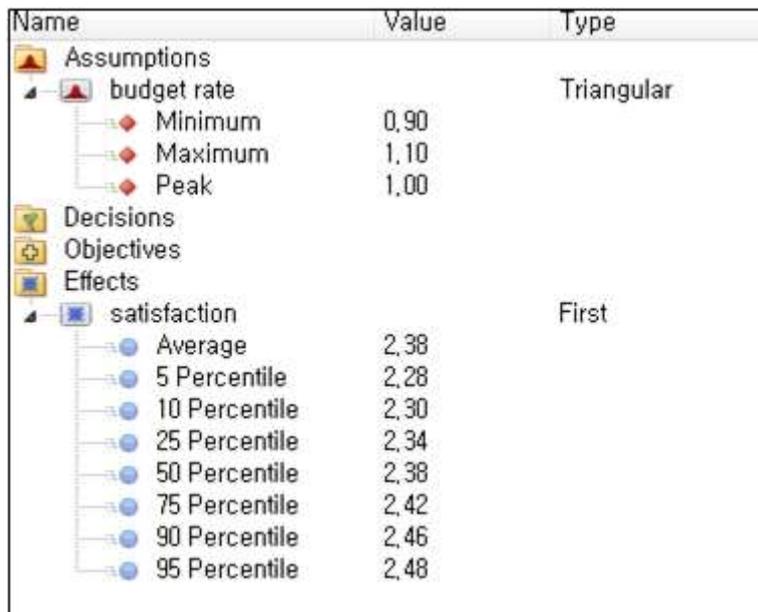
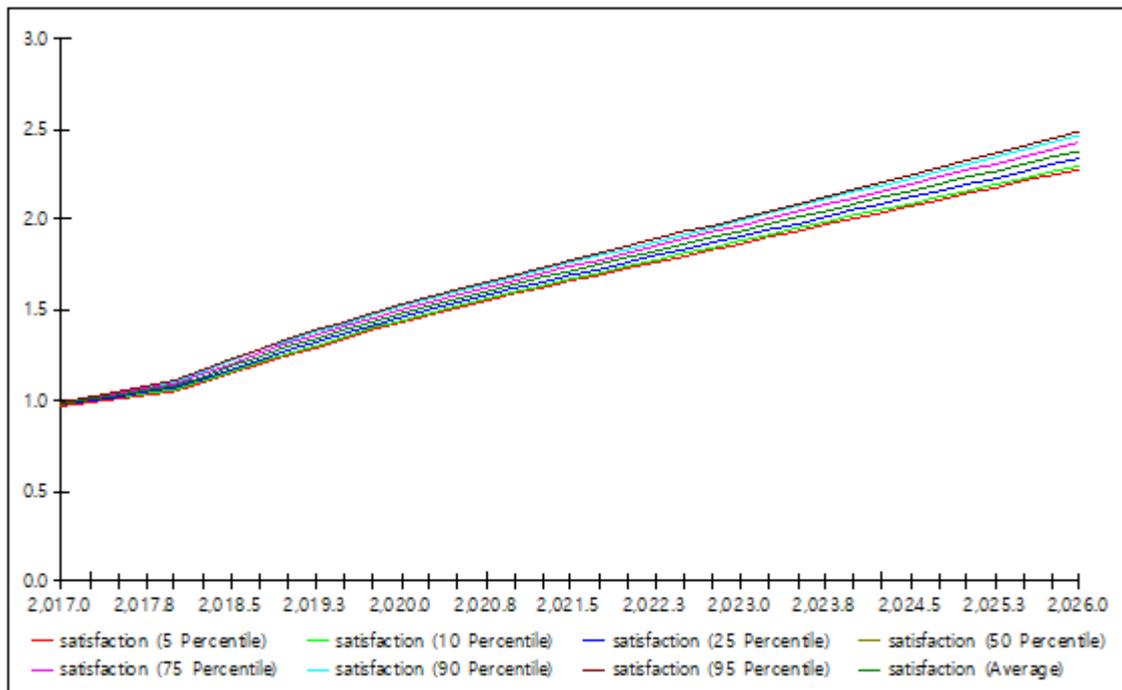


Figure 17 Structure of sensitivity analysis of education donation budget

Figure 18 shows the sensitivity of beneficiary satisfaction as the education donation budget changes by 10 percent.



year	satisfaction (5 Percentile)	satisfaction (10 Percentile)	satisfaction (25 Percentile)	satisfaction (50 Percentile)
2,017	0.97	0.97	0.98	0.98
2,018	1.05	1.06	1.07	1.08
2,019	1.25	1.26	1.28	1.30
2,020	1.43	1.44	1.46	1.48
2,021	1.59	1.60	1.62	1.64
2,022	1.73	1.74	1.76	1.79
2,023	1.86	1.88	1.91	1.94
2,024	2.00	2.02	2.05	2.08
2,025	2.14	2.16	2.19	2.23
2,026	2.28	2.30	2.34	2.38

year	satisfaction (Average)	satisfaction (75 Percentile)	satisfaction (90 Percentile)	satisfaction (95 Percentile)
2,017	0.98	0.99	0.99	0.99
2,018	1.08	1.09	1.10	1.11
2,019	1.30	1.32	1.33	1.34
2,020	1.48	1.50	1.52	1.53
2,021	1.64	1.66	1.68	1.69
2,022	1.79	1.81	1.84	1.85
2,023	1.94	1.97	1.99	2.01
2,024	2.08	2.12	2.15	2.17
2,025	2.23	2.27	2.31	2.32
2,026	2.38	2.42	2.46	2.48

Figure 18 Results of sensitivity analysis of budget changes for education donations

4.3.3 Control tower parameters

Figure 19 shows the trend of change in the control tower variable by year, and Figure 20 shows the degree of change in the satisfaction of education donor beneficiaries according to the change in the control tower variable.

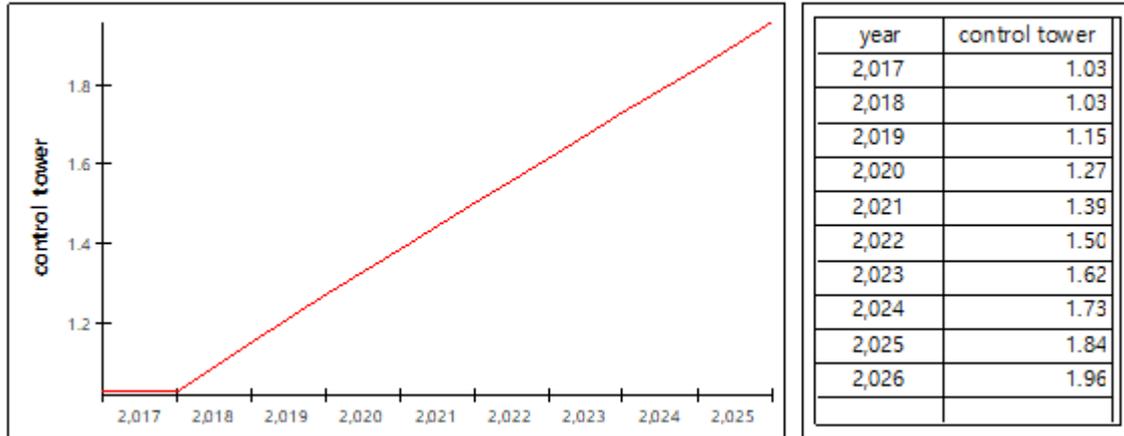


Figure 19 Control tower variable changes

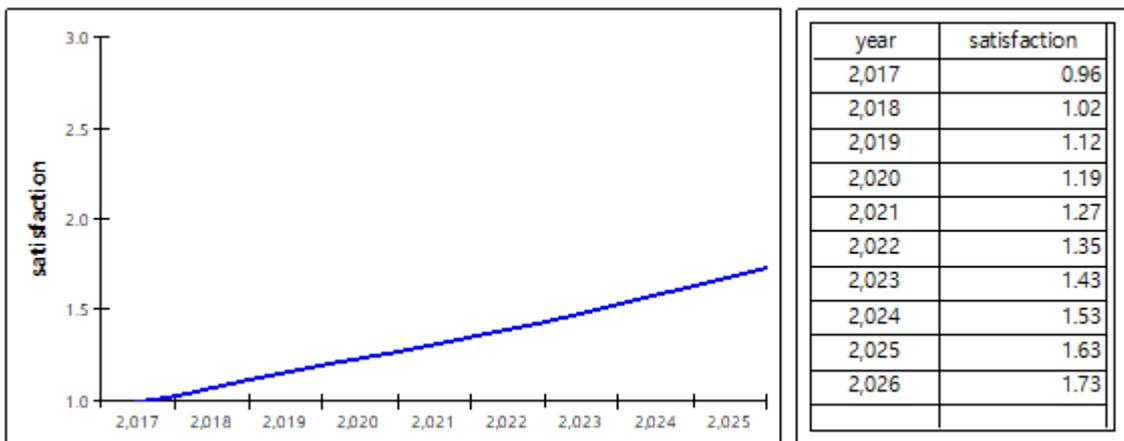


Figure 20 Changes in beneficiary satisfaction as control tower variables change

On the other hand, Figure 21 shows the analysis structure for analyzing the degree of sensitivity of beneficiary satisfaction according to the change in the control tower variable.

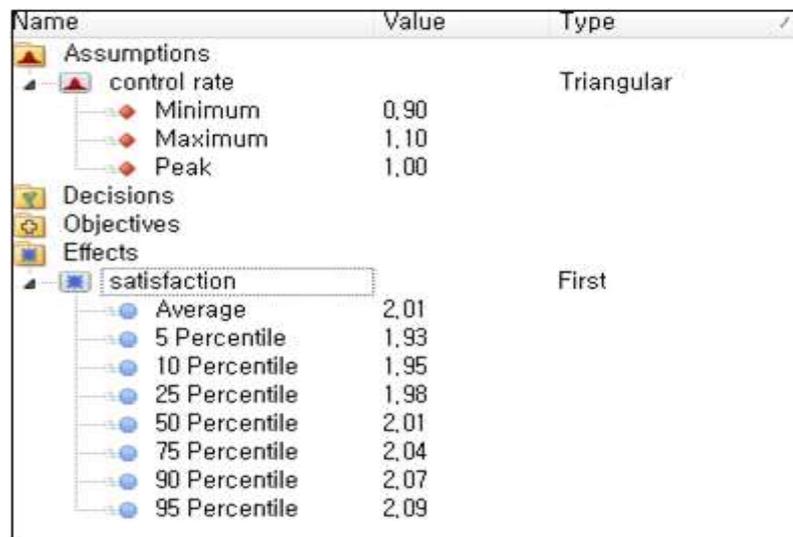
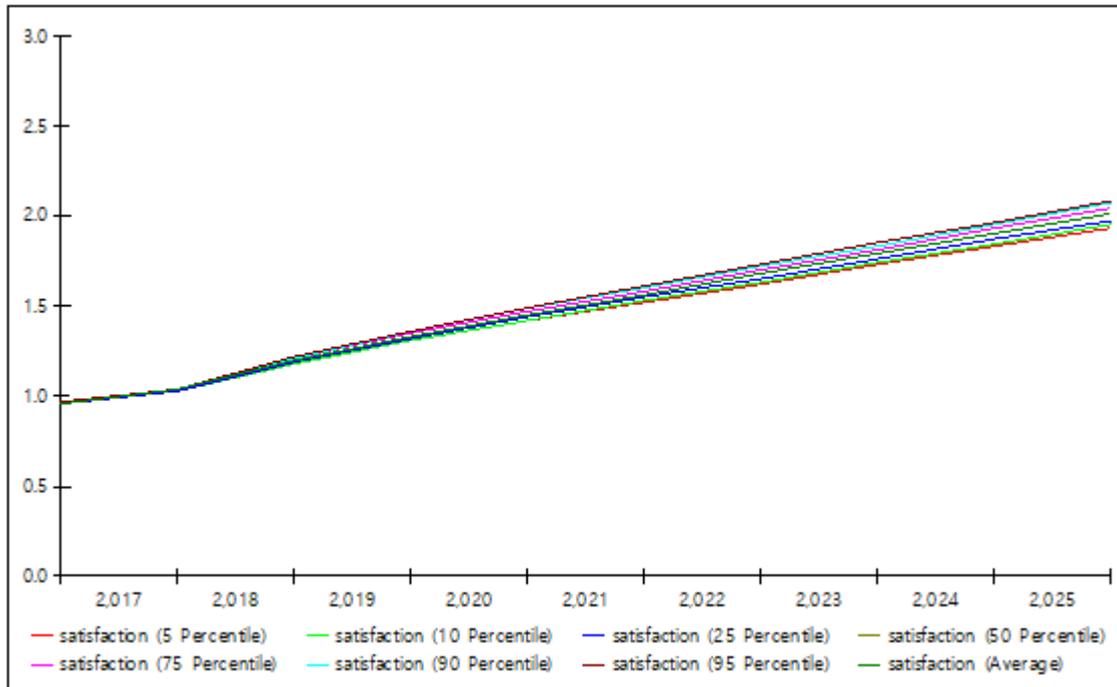


Figure 21 Sensitivity analysis structure of control tower variable

Figure 22 shows the degree of sensitivity change in the satisfaction level of recipients of education donations as 10 percent of control tower variables change.



year	satisfaction (5 Percentile)	satisfaction (10 Percentile)	satisfaction (25 Percentile)	satisfaction (50 Percentile)
2,017	0.96	0.96	0.96	0.96
2,018	1.02	1.03	1.03	1.03
2,019	1.18	1.18	1.19	1.20
2,020	1.30	1.31	1.32	1.33
2,021	1.42	1.42	1.44	1.46
2,022	1.52	1.53	1.55	1.57
2,023	1.62	1.63	1.65	1.68
2,024	1.73	1.74	1.76	1.79
2,025	1.83	1.84	1.87	1.90
2,026	1.93	1.95	1.98	2.01

year	satisfaction (Average)	satisfaction (75 Percentile)	satisfaction (90 Percentile)	satisfaction (95 Percentile)
2,017	0.96	0.96	0.96	0.96
2,018	1.03	1.04	1.04	1.04
2,019	1.20	1.21	1.21	1.22
2,020	1.33	1.35	1.36	1.36
2,021	1.46	1.47	1.49	1.49
2,022	1.57	1.59	1.60	1.61
2,023	1.68	1.70	1.72	1.73
2,024	1.79	1.81	1.84	1.85
2,025	1.90	1.93	1.95	1.97
2,026	2.01	2.04	2.07	2.09

Figure 22 Sensitivity analysis results of control tower variable changes

Figure 23 summarizes the results of the analysis of the degree of sensitivity change in the satisfaction of education donors with changes in the three independent variables.

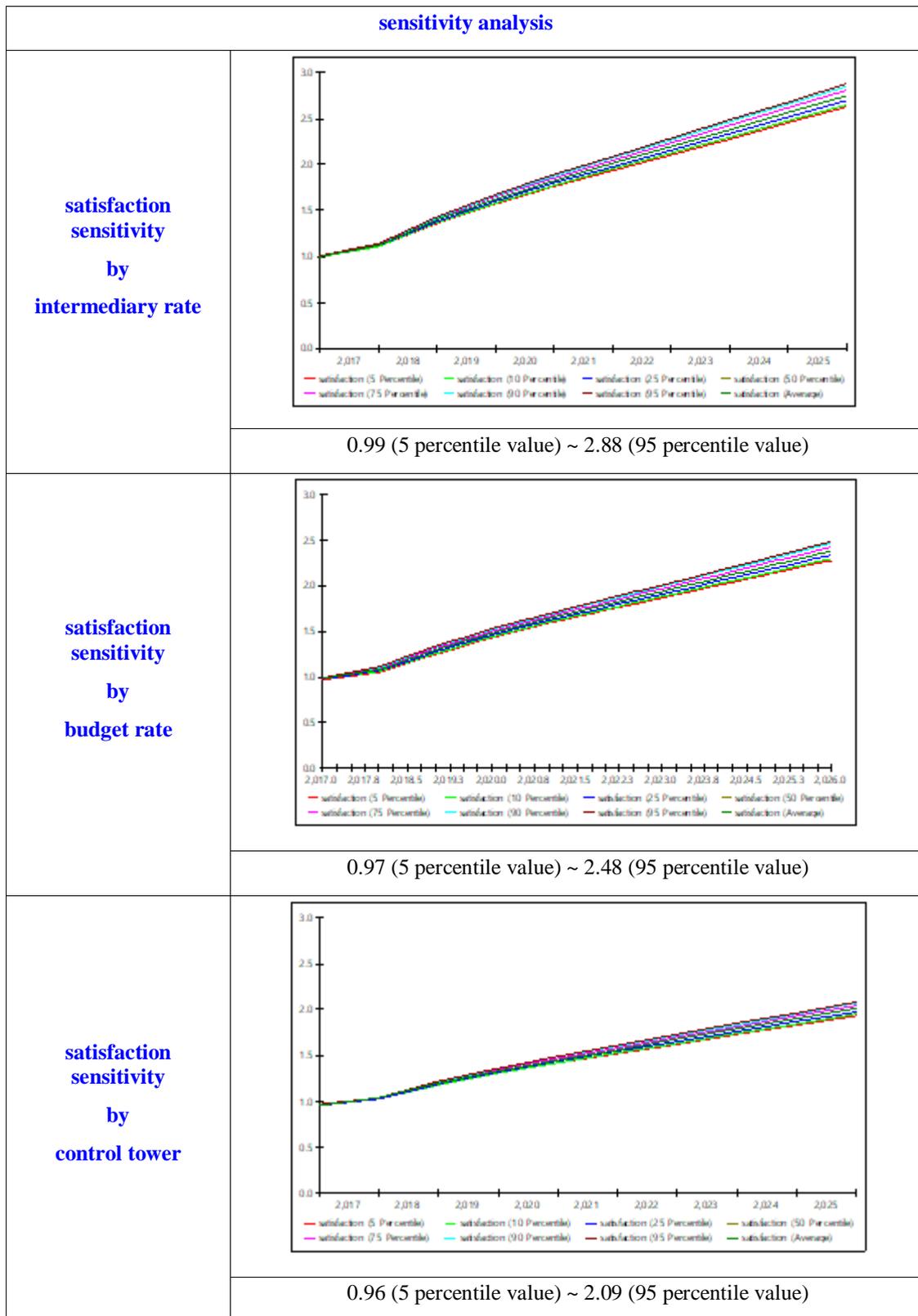


Figure 23 Comparison of changes in the sensitivity of education donor beneficiaries according to changes in the three variables

In Figure 23, among the three independent variables, the change in competency of the intermediate support

organization has the greatest influence on the satisfaction of education donors. In other words, the figure shows that in revitalizing educational donation, the competency of the intermediate support organization is very important.

V. CONCLUSION

In this study, important variables considered influential in educational donation in Korea were first drawn, and then causal maps were prepared using the causal relationship that appears during the process of these variables affecting educational donation. The reinforced feedback loop and the balanced feedback loop were derived on the basis of the causal map contents created. This feedback loop is important for policymakers: if a policymaker understands this feedback structure and decides on a policy that is faithful to this feedback structure, a strong effect can be obtained with limited resources. In this study, ten feedback loops were found.

Of these, four have the characteristics of a reinforced loop, and the other six have the characteristics of a balancing loop. In addition, three independent variables were selected to analyze which independent variables would have the greatest effect when each independent variable was used separately rather than their being used simultaneously. For this purpose, simulations for sensitivity analysis were performed. As a result, it was found that the change in competency of the education donation intermediate support organization had a greater effect on the satisfaction of education donor beneficiaries than other variables, that is, the education donation budget and control tower competency variables. This shows that, from the perspective of policymakers in charge of education donation, it is very important to change the capacity of the intermediate support organization.

VI. ACKNOWLEDGEMENTS.

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