



Review Article

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Medical and Health Services as Global Public Good and Sustainable Community Governance

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Abstract

Sustainable global medical and health mechanisms are expected to mitigate and lower future community crises. While the social and economic systems have been reformed to prevent from occurring further economic and social crises, serious problems such as Covid 19 pandemic, Climate Change, Ukraine war, have sequentially occurred in globalized communities. Great social risks probably bring problems beyond the range where the present system of economies and societies could offer the solutions. Altruistic and risk coefficients are significant indexes for sustainable communities. Corporation provides medical and health service cooperatively with many stakeholders. Digital industrial revolution and globalization grow new outside stakeholders. Global environmental problems focus on the cost and benefit of external stakeholders. Altruistic and risk coefficients provide effective initiatives for sustainable governance of medical and health services with enlarging stakeholders. Innovation and reform of social system raise altruistic coefficients. Raising regulation or standard enhances risk coefficients.

Keywords: Altruistic coefficient, Digital industrial revolution, Multi Stakeholder, Risk coefficients

Introduction

Since the last decades of the 20th centuries new liberalization and globalization have enlarged global economies. However, the global financial crisis 2008-09 exhibited that a financial crisis of one country expanded immediately into a large scale of global problems. Some local financial crises have been settled with schemes of international cooperation such as Greek government debt crisis 2011-15. The global financial crises imply that some local issues easily turn into global problems. However, globalization has been developed by accompanying digitalization. Rising innovation of digital technologies propels the fourth industrial revolution. The digitalization in global communities significantly has transformed communication mechanisms of global economies and societies [1]. Revolutionary changes in both economies and societies should construct sustainable communication mechanisms to prevent global crises. The sustainable mechanism could be achieved by appropriate provision of global public goods including medical and health mechanisms. Stiglitz [2] illustrates some examples of global public good by political stability, economic stability, the environment, humanitarian assistance, and knowledge [2].

Although global corporations aim to perform centralized governance, global communities could become sustainable by constructing decentralized medical and health mechanisms. This article explores initiatives that enhance sustainability of global medical and health mechanisms. The preceding research of this paper is described as follows. Arrow [3] states that issues of corporate responsibility (CSR) should be explored by theoretical economic approaches. Tirole [4] develops incentive analysis with one stakeholder by shareholder value evaluating performance of CSR. Researchers in new institutional economics such as Coase [5], Williamson [6,7] advocate that reforms of legislation and institution complement market failures. Tanaka [8,9] provides a theoretical model with multi stakeholder to integrate approaches from legislative and institutional economics and incentive analyses. Tanaka [10] presents a scheme of providing global public goods to share regional welfare losses globally to prevent the financial crises from enlarging to global crises. This investigation implies that medical and health is cooperatively provided with multi stakeholders. Tanaka, H and C [11] discuss that green bond finance is related with

structural change of stakeholders brought by digital industrial revolution. Bond issuance significantly contributes to global environmental problems including sustainable medical and health systems. Tanaka, H and C [12] evaluate comparatively some sustainable investment strategies.

Sustainability of Communities and Medical and Health Services

Since the 2010s global problems such as climate change, Covid 19 pandemic and war of Ukraine require an innovative cooperation of global communities beyond solutions in market mechanism. Digital industrial revolution has changed both economic and social systems in the background of global crises. Tanaka [13] assumes that the digital industrial revolution has brought unbalanced development of information industries. Tanaka [13-15] argues that evolution of digital technologies enables many large corporations to perform centralized systems beyond the borders of states. At the same time Tanaka [16,17] discusses that revolution of digital technologies develops cooperative network of production. Tanaka [18] demonstrates that sustainable communities should be achieved in a decentralized system. The decentralized mechanism has developed medical services to improve social welfare of global communities. The activation of the decentralized system improves social welfare in communities. For example, various voluntary and cooperative contributions of stakeholders improve practical initiatives to mitigate the crises in sustainability [3]. As the stakeholders increase, the corporation brings diverse relationships with stakeholders. Economic and social communication is presented by theories of symmetric information. According to information structures, stakeholders are divided into three groups, inside, outside, and external stakeholders. The inside stakeholders such as regular employees and affiliated organizations obtain common interest with the corporation and are denoted by i ($=1, \dots, n_0$). The inside stakeholders have formed conventional connections with the corporation by usual practices. They can expect to share greater common interests with corporations than temporal benefits in market transactions. Some public or regional medical services cooperatively provide health care for qualified people. The outside stakeholders represented by irregular employees and occasional customers make competitive transaction in the markets and are written by $i = n_0 + 1, \dots, n_1$. The external stakeholders are excluded from economic relations with the corporation and suffers sometimes external diseconomies from activities of the corporation. They are written by i ($=n_1+1, \dots, n$). According to legislation or contracts the corporation is obliged to pay external stakeholder i benefit t_i . Some residents in the communities become external stakeholders brought by environmental pollution and can receive medical care or benefits from the corporation. Baecker [19] argues that the digital industrial revolution has brought a serious problem of disruption in the communities. By following the definition in Tanaka [13], inside stakeholders are assumed to be positive stakeholders and outside and external stakeholders are supposed to be negative stakeholders.

Many causes of the great crises exist inside and outside of the market mechanism. The impact of the crises burdens many stakeholders such as employees and lenders and spreads over the residents who have not direct transactions with them. The risk management of global communities should cover large ranges beyond the market mechanism. The risks of sustainable communities could be calculated not only by surveying market transactions but also by exploring social welfare losses. The hidden risks behind economic activities could be exhibited partially by evaluations of many stakeholders without the market transactions. To mitigate risks on global communities, sustainable communities need a cooperative system with many stakeholders. A theory of multi stakeholder clues the sustainability problems of global communities.

Tanaka [9] provides a theoretical model for the risk governance of global communities. To proceed theoretical analysis, we introduce the following assumptions for the theoretical investigation. We consider corporation or organization to produce social products x including medical and health services for global communities with n stakeholders. Because social services need a public private cooperation, the supply of social products is required to compensate or offer a payment t_i (≥ 0) for any stakeholder t_i ($=1, \dots, n$). The payments are indicated by variables, such as the transaction or contract payments and wages for employees or fees for governmental agents. The total payment is denoted by $t = \sum_{i=1}^n t_i$. The corporation performs activities for profit and takes private net profit $\pi(x)$ by providing medical and health services. The medical and health services are public goods and provided in market mechanism. It is assumed normally that $\pi'(x) > 0$ and $\pi''(x) < 0$ is obtained. The stakeholders are exemplified by employees, shareholders, costumers, banks, corporations of supply chains, residents, local governments. Stakeholder i evaluates performance of the corporation by function $v_i(x, t_i)$, $i = 1, \dots, n$. Evaluation function V_i is assumed to increase with t_i for all i . It is exhibited by inequalities $\frac{\partial V_i}{\partial t_i} \geq 0, \frac{\partial^2 V_i}{\partial t_i^2} < 0$ for $i = 1, \dots, n$.

To achieve sustainable medical service the corporation is required to offer enough payments for every stakeholder. When $\frac{\partial V_i}{\partial t_i} = 1$ is obtained, stakeholder i evaluates the payment t_i for medical and health services efficient. To explore the sustainability of communities, stakeholder i ($=1, \dots, n$) is classified into positive stakeholder who is defined by $\frac{\partial V_i}{\partial x} \geq 0$ and negative stakeholders who is defined by $\frac{\partial V_i}{\partial x} < 0$, according to relation with the corporation. Positive stakeholders partially share profits with the corporation. But negative stakeholders bring net welfare losses from increasing production of the corporation [20-22].

Sustainable Conditions for Cooperation and Legislative Scheme

Tanaka [8,9] argues that the corporation should perform cooperation with stakeholders in a scheme of voluntary contribution and legislative schemes of societies. The previous papers assume that altruistic coefficient for all stakeholders indicates to improve communication of the corporation on communities [5]. Tanaka [15]

argues that digitalization of economies and societies brings distinguished features for each type of stakeholders. Tanaka [23] does not use a single altruistic concept but distinguishes altruistic propensities for each type to define transaction cost regarding three types of stakeholders. $\beta(x)$ denotes altruistic propensity for inside stakeholders. For inside stakeholders, the rising scale of medical and health services x is expected to increase benefits derived from the performance of the corporation [24]. Increasing function of the altruistic propensity with production x is stated by $\beta'(x) > 0$. $\beta(x)$ expresses the probability that the corporation exactly estimates evaluation by inside stakeholders. Corporation differently uses altruistic coefficients $\beta(x)$ and $\gamma(y)$ to indicate sharing benefit with inside and outside stakeholders [25-28].

Issues of asymmetric information bring various problems in communication between the corporation and stakeholders. Inside stakeholders are supposed to construct highly sensitive communication with the corporation by performing long term transactions or contracts. However, outside stakeholders have relations with the corporation by shorter term contract than inside stakeholders. On the other hand, outside stakeholders could be connected more widely and freely with the corporation than inside stakeholders. Digitalized economies can enlarge medical market transactions and bring new waves of competition and cooperation in medical research and development. Outside stakeholder i is supposed to develop medical and health services. By assuming that stakeholder i makes effort y_i on communication, digital industrial revolution takes the corporation to enhance cooperation on communities with innovative spending of information and communication technologies. Inside and external stakeholders partially join in innovative communication reforms. Innovation of intelligent technologies makes more beneficial for many stakeholders i to invest y_i . When total social effort y is expressed by $y = \sum_{i=1}^n y_i$, altruistic coefficient with outside stakeholders is indicated by $\gamma(y)$. The altruistic coefficient $\gamma(y)$ is assumed to be increasing function of y , $\gamma'(y) > 0$. Because the corporation shares more information with inside stakeholders than with outside stakeholders, inequality $1 > \beta(x) > \gamma(y)$ is supposed to hold for any x, y . Although all stakeholders are willing to enforce social communication, market mechanisms raise relative contribution by outside stakeholders. Social security legislations or standards α_i regarding stakeholder i are required. It is supposed that an inequality $\alpha_i \geq V_i$ holds. Effect of penalty or tax is expressed by the function $\phi_i(a_i - V_i)$ with conditions $\phi_i' > 0$ and $\phi_i'' > 0$ is named by risk coefficient. Tanaka [17] argues that the innovation in digital technologies changes the structure of stakeholders in medical services with radiology and medical images.

However, the corporation does not improve effectively voluntary communication with external stakeholders. The theory of multi stakeholder improves sustainability of communities. Optimal conditions of payment of three stakeholders are stated by equations (1)-(3) which Tanaka H and C [12] present optimal equations (3)-(5) with payments.

$$\frac{\partial V_i(x, t_i)}{\partial t_i} = \frac{1}{\beta(x) + \phi_i'(a_i - V_i)}, \quad i = 1, \dots, n_0. \quad (1)$$

Secondly, the optimal conditions with outside stakeholders are written by $\frac{\partial V_i(x, t_i)}{\partial t_i} = \frac{1}{\gamma(y) + \phi_i'(a_i - V_i)}$, $i = n_0 + 1, \dots, n_1$. (2)

Thirdly, the optimal conditions with external stakeholders are stated by

$$\frac{\partial V_i(x, t_i)}{\partial t_i} = \frac{1}{\phi_i'(a_i - V_i)}, \quad i = n_1 + 1, \dots, n. \quad (3)$$

According to conditions (1)-(3), t_i^i , t_i^o and t_i^e express optimal payments for inside, outside and external stakeholders. When α_i is constant among three types of stakeholders, altruistic propensities $\beta(x)$ and $\gamma(y)$ present payments with inequality $t_i^i > t_i^o > t_i^e$. And social welfare losses of stakeholders express a descending order with external, outside and inside stakeholders [6].

Proposition 1

If standards for all stakeholders are required to be identical, digital revolution restructures stakeholders and brings diverse social welfare losses.

We should decrease summation of two coefficients to achieve sustainability. Raising standards for outside and external stakeholders are expected to decrease total social welfare loss. In social optimal solution, different standards for inside, outside, and external stakeholders are required by α_i^i , α_i^o and α_i^e to hold equation (4).

$$\beta(x) + \phi_i'(a_i^i - V_i(x, t_i^i)) = \gamma(y) + \phi_i'(a_i^o - V_i(x, t_i^o)) = \phi_i'(a_i^e - V_i(x, t_i^e)). \quad (4)$$

Equation (4) brings equations (5) and (6).

$$\beta(x) - \gamma(y) = \phi_i'(a_i^o - V_i(x, t_i^o)) - \phi_i'(a_i^i - V_i(x, t_i^i)) > 0. \quad (5)$$

$$\gamma(y) = \phi_i'(a_i^e - V_i(x, t_i^e)) - \phi_i'(a_i^o - V_i(x, t_i^o)) > 0. \quad (6)$$

The equation (5) and (6) ensure inequality (7).

$$\alpha_i^i - V_i(x, t_i^i) < \alpha_i^o - V_i(x, t_i^o) < \alpha_i^e - V_i(x, t_i^e). \quad (7)$$

This result implies as follows. Considering that $V_i(x, t_i^i)$, $V_i(x, t_i^o)$, and $V_i(x, t_i^e)$ mean situations before sustainable initiatives, this condition indicates to improve standards of external stakeholders firstly. Improvement of standard with outside stakeholders follows secondly. The standard of inside stakeholders improves at last. Medical services to achieve sustainable communities should target differentiated standards for each type of stakeholder. (7) implies that advantageous standards are required for external stakeholders. Enhancement of standards raises risk coefficients. Although equations (1) and (3) contain risk coefficients and altruistic coefficients as control parameters, (3) can use only risk coefficient to achieve sustainable medical and health system.

Proposition 2

Sustainable medical and health mechanisms utilize network effects of inside and outside stakeholders and legislative initiatives of regulation and standard. Because only legislation is available for external stakeholders, initiatives to raise regulations or standards are critical to their welfare losses.

Concluding Remarks

Covid 19 pandemic and war of Ukraine have exhibited that medical and health services become global public good. Revolution of digital industries develops global markets and cooperative scheme of this global public good. However, the medical and health services must cooperate with increasing outside and external stakeholders. The sustainable scheme of medical and health services focuses on diverse altruistic coefficients regarding stakeholders. The sustainable scheme with multi stakeholder utilizes altruistic and risk coefficients. As the summation of two coefficients increases, the welfare loss of stakeholder declines. Reform of the scheme can raise altruistic coefficients of inside and outside stakeholders. However, the risk coefficients depend on standards and legislation. According to altruistic coefficients, inside stakeholders take highest value. Outside stakeholders bring the next highest value of altruistic coefficients. External stakeholders have zero value. Raising the standard of restrictive legislation needs to lower welfare loss of external stakeholders.

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None.

Conflict of Interest

None.

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